Project:

A NEW RECREATION CENTER FOR THE
BOAZ PARKS & RECREATION
BOAZ, ALABAMA

MCKEE PROJECT NO. 18-197

A3.1 GENERAL MODIFICATIONS:

A. The following changes and/or substitutions to the plans and specifications are hereby made a part of same and are incorporated in full force as part of the contract

B. Bidders shall acknowledge receipt of this Addendum in writing on his Proposal Form.

C. The following General Contractors have pre-qualified to bid this Project based on the criteria set forth by the City of Boaz:

   Eidson & Associates, Inc.
   Cullman, AL
   256-739-0176

D. See the attached Proposal Form with Unit Pricing (Revised 7.11.19), herein.
E. See the attached Supplementary General Conditions of the Contract (Revised 7.12.19), herein.

A3.2 SPECIFICATION MODIFICATIONS:

A. See the attached Section 02660, Water (Revised 7.12.19), herein.
B. See the attached Section 08700, Finish Hardware (Revised 7.12.19), herein.
C. See the attached Section 10223, Operable Folding Partitions (Revised 7.12.19), herein.
D. See the attached Section 13111, Swimming Pool Timing System (Revised 7.11.19), herein.
E. See the attached Section 13112, Concrete Pool Deck Finishes, herein.
F. See the attached Section 13312, Tensioned Fabric Structures (Revised 7.11.19), herein.
G. See the attached Division 15-Mechanical Specifications Cover Sheet, herein.
H. See the attached Section 15010, General Mechanical Provisions, herein.
I. See the attached Section 15400, Plumbing, herein.
J. See the attached Section 15700, Heating, Ventilating and Air Conditioning, herein.
K. See the attached Section 15710, Variable Refrigerant Flow (VRF) Systems, herein.
L. See the attached Section 15720, Packaged Pad Mounted Gas Fired, DX Cooling Dehumidification Unit (DHU), herein.
M. The following manufactures are hereby approved subject to the plans and specifications:

   Section 09999, Synthetic Sports Floor System – Connor Sports, ElastiPlus 7+2; Ph: 630.641.9184.
   Section 09551, Wood Gymnasium Flooring – Connor Sports, Rezill Base 222; Ph: 630.641.9184.
   Section 04220, Architectural Stone Veneer – Coronado; Ph: 972.434.2515 or 601.732.3583.

A3.3 DRAWING MODIFICATIONS:

A. See the attached Drawings as follows:

   Sheet A1.1FP SYMBOLS (Revision date 7.10.19)
B3.1 CLARIFICATIONS & RESPONSES:

A. See the following Clarifications:

1. The General Contractor shall Not include any utility tap fees or Building Permit fees in bid proposal. The owner is to cover this cost.

B. See the following responses to RFI questions received from Contractor’s

Question: Do you know if the Architect will allow Suspended Drywall Grid for the Hard ceilings instead of metal studs? Most of the time they would rather have the grid system.

Answer: Suspended drywall grid will be accepted.

Question: Please reference sheet A3.1. Is the “Sunshade Pavilion referenced” referenced here what is specified in 13312- Tensioned Fabric Structures?

Answer: Yes. All reference on drawings noted as “Sunshade” or “Pavilion” references to specification section 13312- Tensioned Fabric Structures.

Question: Please provide a specification for the “Cool Deck” finish referenced for the recreational pool deck on sheet A1.1. Sheet SP2.3 calls for the recreational pool deck to have a nonslip finish. Is this achieved with a texture in the “cool deck” finish referenced above? Light Broom finish to the concrete? Nonslip aggregate added during the finishing process (reference 033000-3.11-F…need a product specified).

Answer: Refer to Section 131120, Concrete Pool Deck Finishes, included in this addendum.

Question: Are bleachers to be manual or electric?

Answer: Telescopic bleachers at gym are electric. Aluminum bleachers at Natatorium are fixed.

END OF ADDENDUM
PROPOSAL FORM
(Revised 7.11.19)

To: __________________________________________________________  Date: ________________
(Owner/Awarding Authority)

Pursuant to and in compliance with the Advertisement To Bid and the proposed Contract Documents
prepared by McKee and Associates, including Addenda, the undersigned,

_____________________________________________________________________________________
(Legal Name of Bidder)

having become thoroughly familiar with the terms and conditions of the proposed Contract Documents and
with local conditions affecting the performance and costs of the work at the place where the work is to be
completed and having fully inspected the site in all particulars, hereby proposes and agrees to fully perform
the work within the time stated in strict accordance with the proposed Contract Documents, including
furnishing any and all labor and materials and do all work required and complete said work in accordance
with the Contract Documents required for the construction of

WORK ________________________________________________________________________________

The Bidder, which is organized and existing under the laws of the State of ________________________

having its principal offices in the City of ________________________________ is:
☐ a Corporation  ☐ a Partnership  ☐ an Individual  ☐ (other) ____________________________.

LISTING OF PARTNERS OR OFFICERS: If Bidder is a Partnership, list all partners and their addresses; if
Bidder is a Corporation, list the names, titles and business addresses of its officers:

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

ADDENDA: The Bidder acknowledges receipt of Addenda Nos.________ through ________ inclusively.

BASE BID: Amount to complete all work indicated in Contract Documents (Including Unit Prices below),
for the sum of:

__________________________________________________________ Dollars $ ___________________

ALTERNATES: If alternates as set forth in the Bid Documents are accepted, the following adjustments are
to be made to the Base Bid:

<table>
<thead>
<tr>
<th>Alternate No.</th>
<th>Description</th>
<th>Add/Deduct</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>(add)</td>
<td>$</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>(add)</td>
<td>$</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>(add)</td>
<td>$</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>(add)</td>
<td>$</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>(add)</td>
<td>$</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>(add)</td>
<td>$</td>
</tr>
</tbody>
</table>

UNIT PRICES- (See Attachment)

I agree to complete all the work to the stage “Substantially Complete” within 430 calendar days. I
understand that “substantially complete” will be complete to the stage of approval for occupancy as
I understand that the Owner reserves the right to reject this bid, but that this bid shall not be withdrawn for a period of thirty days from the date prescribed for its opening.

If written notice of the acceptance of this bid is mailed or delivered to the undersigned within thirty days after the date set for the opening of this bid or at any other time thereafter before it is withdrawn, the undersigned will execute and deliver the Contract Documents to the Owner in accordance with this bid as accepted, and will also furnish and deliver to the Owner the Performance Bond, labor and Material Payment Bond and proof of insurance coverage, all within ten days after personal delivery or after deposit in the mail of the notification of acceptance of this bid.

Notice of acceptance, or request for additional information may be addressed to the undersigned at the address set forth below.

**BID SECURITY**: The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within fifteen calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within 30 calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier’s check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply.

Attached hereto is a: *(Mark the appropriate box and provide the applicable information.)*

- [ ] Bid Bond, executed by ______________________________________________________ as Surety,
- [ ] a cashier’s check on the ____________________ __Bank of __________________________.

**BIDDER’S ALABAMA LICENSE**:  
State License for General Contracting:  __________________________________________________

<table>
<thead>
<tr>
<th>License Number</th>
<th>Bid Limit</th>
<th>Type(s) of Work</th>
</tr>
</thead>
</table>

**CERTIFICATIONS**: The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids.

**Legal Name of Bidder**  __________________________________________________

Mailing Address  __________________________________________________

* By *(Legal Signature)*  __________________________________________________ (Seal)

*Name (type or print)  __________________________________________________  (Seal)

*Title __________________________________________________

Telephone Number  __________________________________________________

Date of Proposal  __________________________________________________

*If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.
Unit Prices: The Unit Prices below establishes Unit Prices so that the Owner can delete/add quantities from the Contract(s) as required.

UNIT PRICE #1: The Contractor shall include in his Base Bid proposal the cost for 1 Cubic Yard of removal and off-site disposal of unsuitable soft earth material and replacement with suitable compacted and tested engineered fill material per the Geotechnical Report and Section 02200 "Earthwork."

1 CY @ _____ per CY = $___________ Included in Base Bid

UNIT PRICE #2: The Contractor shall include in his Base Bid proposal the cost for 1 Cubic Yard of removal and off-site disposal of concrete and/or rock using pneumatic excavation equipment and replacement with suitable compacted and tested engineered fill material per the Geotechnical Report and Section 02200 "Earthwork."

1 CY @ _____ per CY = $___________ Included in Base Bid
SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT (Revised 7.12.19)

1. The “General Conditions of the Contract for Construction” AIA Document A-201, fourteenth edition, 1997, Articles 1 through 14 inclusive, is a part of this contract.

2. The following supplements shall modify, delete, and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided or superseded shall remain in effect.

3. **Paragraph 1.1: Definitions**: Add the following:

   1.1.8: The term "product" as used in these Supplementary Conditions include materials, system and equipment.

4. **Paragraph 2.1.1**: Add the following:

   Architect: Construction documents for this project have been developed by McKee and Associates, Architects, 631 South Hull Street, Montgomery, Alabama, 36104 (334) 834-9933 commissioned by the Owner.

   Owner: The term Owner used herein refers to the The City of Boaz, Boaz, Alabama. All correspondence to the Owner shall be through the Architect.

5. **Article 3, Paragraph 3.6**: Replace the paragraph with the following:

   SALES AND USE TAX EXEMPTION Pursuant to Ala. Code §4-3-59, The City of Boaz Alabama (the "Owner") is exempt from Alabama state and local sales and use tax. The Authority will be following certain procedures established by the Alabama Department of Revenue ("ADOR") to appoint a contractor (or subcontractor) to be its agent for purposes of ordering and purchasing materials and supplies for this project defined in written agreements between the Owner and its contractors. Refer to the following documents for procedures, contract language and forms required for this project:

   a. Language to Include in Agreements with Contractors Regarding Purchasing Agent Procedures.
   b. ADOR Sales and Use Tax Division Purchasing Agent Appointment Form: ST: PAA1

6. **Paragraph 3.9.1**: Add the following:

   The Contractor shall not employ a superintendent or assistants who are deemed objectionable by the Owner.

   The Contractor shall designate a project superintendent that will be on the job while the Contractor's personnel and subcontracting personnel are working. The project
superintendent will have the authority to coordinate with Architect and Owner in making day-to-day decisions for the project. The Owner will require a resume on the project superintendent prior to commencing work. This resume should include the project superintendent's experience on projects of similar size and character. The Owner will be authorized to stop work at any time the project superintendent is not present on the site. The Architect will communicate all on-site decisions to the project superintendent and will not communicate directly with the Contractor's other personnel or any of the subcontractors. It shall be the project superintendent's primary responsibility to coordinate the continuing flow of work with the Contractor's personnel and all of the Contractor's subcontractors' personnel.

7. **Paragraph 3.18.1**: Delete in its entirety and substitute there for the following:

   To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architects' consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work.

   The Architect and the Owner shall not be liable for any damage or injury to property or any person or persons arising from the presence of or/and effects of any hazardous materials or hazardous elements in any state of form in connection with the work under this Contract. All such liability shall lie with the Contractor.

8. **Paragraph 4.1.1**: Add the following:

   The term Architect used herein refers to:
   McKee and Associates
   631 South Hull Street
   Montgomery, Alabama 36104
   Telephone: (334) 834-9933

9. **Paragraph 9.11**: Add the following:

   **Time for Completion**: The Contractor shall fully complete all work required by these specifications and construction drawings and shall be fully approved and accepted by the Architect and local municipality's building inspection department. The total project completion and full approval and acceptance, with Certificate of Occupancy, shall be as stated above and shall be **430 consecutive calendar days**, as stipulated by Owner in the Notice to Proceed. Full completion, acceptance, approval, and Certificate of Occupancy shall not be grounds for any final payment(s) to contractor. Final payment(s) shall only be made by the Owner after the contractor has completed all work along with all approvals and acceptances, as stated above, and the contracted project has been closed out, including all required paperwork, such as but not limited to Advertisement for Completion, Certified Payrolls, Release of Lien Waivers from each supplier, subcontractor and general contractor, all warranties and required manuals, all required certification and post-job submittals, etc.

   **Liquidated Damages**: As actual damages for any delay in completion are impossible of determination, the Contractor and his sureties shall be liable for and shall pay the Owner...
the sum of **Three Hundred Dollars ($300.00)** as fixed, agreed as liquidated damages for each calendar day of delay until the work is fully completed, approved, and fully accepted, as stipulated above.

The Contractor shall reimburse the owner **$300.00** per calendar day for each day the project remains incomplete beyond the scheduled completion date established in the notice to proceed. The project is deemed incomplete until a dated Substantial Completion letter is issued by the Architect.

10. **Paragraph 11.1**: Add the following:

   All insurance coverage for the Contractor shall be in companies acceptable to the Owner.

11. **Paragraph 11.1.1**: Add the following at the end of the Paragraph:

   “The insurance required by this subparagraph shall be written for not less than any limits of liability required by law by those shown below and shall include contractual liability insurance as applicable to the Contractor’s obligations under Paragraph 3.18”.

   a. Workmen’s Compensation – Statutory Employer Liability - $1,000,000
   b. Public Liability - Occurrence Policy Only; Bodily Injury, Personal Injury, Property Damages (including XC&U coverages) $1,000,00 each occurrence/$1,000,000 annual aggregate.
   c. Automobile Liability - $1,000,000 each occurrence/$1,000,000 annual aggregate.
   d. Owner's Protective Liability - $1,000,000 each occurrence/$1,000,000 annual aggregate.
   e. Aggregates referenced above should be on a per project basis.

12. **Paragraph 11.1.3**: Add the following:

   “Certificates called herein shall be furnished in duplicate and shall specifically set forth evidence of all coverage required by 11.1.1 and 11.1.2 and the Contractor shall furnish the Architect copies of all endorsements that are subsequently issued amending coverage or limits.

13. **Paragraph 11.2.1**: Delete and substitute therefore the following:

   The Contractor shall procure and maintain for the duration of the Contract a separate Owner’s Protective Liability Policy to protect the Owner, Architect, and any of its employees, officers, or agents from any claim resulting in whole or in part from the actions or negligence of the contractor, its employees or agents or any sub-contractor, its employees or agents.

14. **Paragraph 11.4.1**: Delete in its entirety and substitute therefore the following:

   The Contractor shall purchase and maintain full Builder’s Risk Insurance on the project in the amount of 100% of the contract. Said Builder’s Risk policy shall cover the Interests of the Owner, Architect, Contractor, and all sub-contractors and the mortgagee.
Any deductible on the Builder’s Risk policy shall be the responsibility of the Contractor. The Builder’s Risk policy shall be maintained, unless otherwise agreed to in writing by all parties, until final payment has been made or until no person or entity other than the Owner or Mortgagee has an insurable interest in the property.

15. **Paragraph 11.4.1.2**: Delete.

16. **Paragraph 11.4.1.3**: Delete.

17. **Paragraph 11.4.3**: Delete.

18. **Paragraph 11.4.4**: Delete.

19. **Paragraph 11.5**: Contractor shall furnish labor and material and performance bonding and pay all premiums.

20. **Ten (10) copies** of the drawings and specifications will be furnished to the Contractor by the Architect without charge. Other copies requested will be furnished at the cost of reproduction.

21. **All submittals for color selections**, to be made by the Architect, for the entire project, shall be submitted at the same time. Piece-meal submittals for color selection will not be permitted.

22. **All required work** on this project shall be performed in accordance with the appropriate current International Building Code for that portion(s) of work being renovated and any recent revisions and amendments and/or as directed and required by The Local Municipality, Chief Building Inspector and/or Code Enforcement Officer(s).

   International Plumbing Code, Revisions & Amendments  
   International Fuel Gas Code, Revisions & Amendments  
   International Mechanical Code, Revisions & Amendments  
   International Fire Prevention Code, Revisions & Amendments  
   International Life Safety Code, Revisions & Amendments  
   National Electrical Code, Revisions & Amendments  
   International Federal Accessibility for Handicap Accessibility (ADA)

   **NOTE**: The Codes as listed above constitute the "State Building Code" as prescribed by the law and should be the most recent codes with revisions and amendments.

23. **Conflicts**: Where the General Contract specification requirements exceed or conflict with those of the General Conditions, these General Contract specifications shall govern.

24. **Omissions**: All of the various drawings are intended to cooperate with and to form a part of contract documents. All notes, interlineations, details, etc. shown on drawings shall be considered as a part of the contract documents. Anything not shown on drawings, but which is mentioned in these specifications or vice versa, or anything not expressly set forth in either, but which is reasonably implied or required shall be furnished and performed as though specifically shown on drawings and mentioned in specifications.
25. **Standards**: Where the Specifications call for a named product or one that meets or exceeds it in quality, the decision of the Architect as to the acceptability of any product offered by the Contractor shall be binding. Some products may be specified only by one specific model and/or manufacturer due to matching existing products already used in prior contracts and/or due to maintenance inventory control. On all items specified as or equal substitutions must be submitted to the Architect ten (10) days prior to bid opening and Architect will act on substitution five (5) days prior to bids and notify all Contractors.

26. **Deduction for Uncorrected Work**: If the Owner and Architect deem it inexpedient to correct work injured, an equitable adjustment shall be made therefore.

27. **If this contract extends thirty (30) days past Schedule Completion Date**, Owner shall deduct from the Contractor’s final payment, a sum equal to the additional expense incurred by the Owner for the Architect for contract administration past scheduled completion date.

28. **Prior to final acceptance by the Owner**, the Contractor shall furnish a letter to the Owner, certifying that the material used on this project contained no asbestos.

29. **All labor shall be performed in the best and most workmanlike manner** by persons skilled in their respective assignments or trades. Workmen whose work is unsatisfactory to the Architect or the Owner, or who are considered unfit or unskilled, or otherwise objectionable, shall be dismissed upon notice from the Architect or Owner.

30. **All manufactures warranties** shall commence on the date as set forth on the Substantial Completion Form, no exceptions.

31. **The Contractor shall provide** all water, electrical power and other utilities required for construction. The Contractor shall make all arrangements, installations, construction, etc. necessary to bring either permanent and/or temporary service from the present locations to the construction area. This shall all be coordinated with the appropriate utility department.

32. **The Contractor shall maintain** the insurance coverage listed including “Builder’s Risk Insurance” and shall furnish to the Owner a certificate of insurance evidencing the coverage before commencing any work.

33. **Royalties and Patents**: The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringements of any patent rights and shall save the Owner and Architect harmless for loss on account thereof.

34. **Permits and Inspection Fees**: The Contractor shall obtain all necessary permits required by laws and regulations, give all required notices, and pay all lawful fees. The Contractor and each of his subcontractors shall secure and pay for all inspections and certifications of their work as required by laws and regulations in effect in the locality involved.

35. **Building Permits**: The Contractor shall obtain all building permits prior to beginning work. Upon obtaining the building permit, the Contractor shall notify the Architect of such
and only then shall any work be started. **All Building Permit fees are being waived by the City of Boaz, therefore, General Contractor shall not include building permit fees in bid proposal.**

36. **If the buildings will be occupied by the Owner’s tenants during construction,** the Contractor shall not allow the construction activities to interfere with the tenants use of the property. The Contractor shall take all necessary precautions to protect the Owner’s property from damage caused by this work.

37. **Temporary Facilities:** The Contractor shall provide all temporary facilities required to complete the work. Temporary facilities shall include but not limit the following:

   a. Suitable and sanitary toilet facilities for the workmen during the course of construction shall be provided. The facilities shall be kept clean and sanitary and shall be removed at the completion of the construction.

   b. First aid cabinet shall be provided for use in construction accidents.

   c. Fire fighting equipment for new work, etc. shall be provided in conformance with requirements of the National Board of Fire Underwriters and Insurance Companies.

   d. Barricades, scaffolding, rails, fences, lighting, warning light, signs, guards, flagmen and other safety devices and precautions as required to protect the construction personnel, the public and the work shall be provided. All items shall comply with recognized safety rules and any prevailing laws or ordinances applicable thereto.

   e. Adequate facilities for drinking water shall be provided.

   f. Telephone service at the project site shall be provided for the duration of the construction period.

38. **Material Storage:** Materials stored at site shall be done in proper manner to protect them and keep in proper condition for use and located on the site to meet approval of the Architect and Owner, and in a manner not to interfere with building operations. Contractor must furnish legible invoices covering stored material items. The invoices must identify the stored materials in some logical way other than by a series of numbers.

39. **Storage of the Contractor’s Equipment:** Site available for storage of equipment and/or job trailers shall be designated by and coordinated with the Owner and Architect.

   a. Storage and protection of material and equipment shall be solely the responsibility of the Contractor.

40. **Disposal:** All debris, cartons, trash, etc., resulting from work completed under this Contract shall not be allowed to accumulate and shall be removed from the project site at the end of each work day.
a. **Neither the project dumpsters nor tenant's trash receptacles** shall be used by the Contractor or Subcontractor(s) for disposal.

41. **Damage:**
   
a. The Contractor shall be held responsible for any damages to existing site work, property, etc. resulting from his operations and shall restore damaged portions at his expense and to the approval of the Owner and the Architect.

b. This shall include any damages to sidewalk and curbs, existing walks on site, trees, shrubbery, asphalt paving, etc.

42. **Repair:** The Contractor will be held responsible for any damage caused by the Contractor and/or Subcontractor(s) in the execution of the Contract work.
   
a. Should the Contractor in the course of his Contract work find additional repairs or replacements needed, it shall be brought to the attention of the Architect immediately. Do not proceed with any work prior to receiving instructions in writing from the Architect.

43. **Special Conditions:** Where the word "Provide" is used in the specifications, it shall be interpreted to mean the materials, labor, etc. that shall be furnished and completely installed by the Contractor and/or Subcontractor(s).

44. **Guarantee:**
   
a. Neither the final certificate of payment nor any provisions in contract documents nor partial or entire use or occupancy of premises by the Owner shall constitute an acceptance of work not done in accordance with contract documents or relieve the Contractor of liability in respect to any express warranties or responsibilities for any faulty materials or workmanship.

b. The Contractor shall remedy any defects in work and pay for any damages to other work resulting there from which shall appear within a period of one year from date of final acceptance unless a longer period is specified.

c. The Owner will give notice of observed defects within reasonable promptness.

45. **Surface Conditions:**
   
**Inspections:** Prior to starting any work in a different trade, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where proper installation may commence.

Verify that work required may be installed in accordance with the Original design, all pertinent codes and regulations and the referenced standards.

46. **Discrepancies:** In the event of discrepancy, immediately notify the Architect.
47. **Existing Conditions**: The Contractor and each Subcontractor shall be responsible for checking all existing conditions, dimensions, quantities, materials, locations, and other items required to complete the work specified herein for a complete job. All verifications shall be accomplished by the Contractor and/or Subcontractor(s) prior to his placement of material and equipment orders. Any discrepancy with plans and/or specifications shall be called to the Architects attention.

The intent of these specifications is for the Contractor to furnish a one (1) year warranted lock and key complete job for all work to be accomplished on each portion of this contract by themselves and their Subcontractors along with all required and/or specified regular manufacturer's extended warranties.

48. **Work Schedule**: The Contractor shall furnish and install necessary equipment and services for organized work to start no later than as per stated on Notice to Proceed. All work shall be completely finished as stipulated in the allotted calendar days or the Contractor shall be charged liquidated damages for each calendar day work is not fully completed, approved, and accepted by the Architect and local municipality's building inspection department, as stated below in "Time for Completion."

The Contractor shall schedule his work so that it will coincide, as closely as possible, with the normal work schedule of the project, and will not interfere with the normal Owners operations any more than is absolutely necessary. It may also be necessary for the Contractor and required subcontractor(s) to schedule work on weekends, holidays and/or nights to accomplish required tie-ins, cut-through and/or finish work as required to complete contract in the allotted time. All such work shall be scheduled and coordinated with the Owner and the Architect.

The Contractor shall coordinate his work schedule with Architect and shall notify as to each day of his proposed schedule so that they may have sufficient time to make plans for the Contractor's working schedule(s) as relates to the work.

At the issuance of the "Notice to Proceed", the Owner will release the building to the contractor for renovation.

49. **Communications**: All notices, demands, requests, instructions, approvals, proposals, and claims must be in writing. Any notice given or demand made by either party to the Contract shall be sufficiently given if delivered at the office of the other party, with receipt requested, or deposited, as certified mail with receipt requested, in the United States mail in a sealed, postage-prepaid envelope, or delivered to any telegraph company for transmission.

Any such notice shall be deemed to have been given as of the time of actual delivery, or of actual receipt in the case of telegrams, or in the case of mailing, when it should have been received in due course in post.

For communicating purposes, the office of the Contractor shall be stated on the signature page of the Contract that of the Owner shall be stated in the Advertisement for Bids. Any subsequent change in address of either party shall be communicated to the other in writing.
50. **Minimum Rates of Pay:** A schedule of the minimum wage rates of pay applicable to this Contract is as stated under the section "Wage Determination".

51. **General Use of The Site:**

   a. Damage to any property, grass, shrubbery, trees, flowers, sidewalks, curbing or asphalt paving by the General Contractor and/or any Subcontractor(s) shall be the sole responsibility of the General Contractor and in the event of damage to any of the above items, the General Contractor shall, at his own expense, return the damaged item or items to their original condition and this shall meet with the approval of the Architect and the Owner.

   b. The General Contractor and/or each Subcontractor shall be responsible for removal of all debris, rubbish, packing materials, etc. from the job site, each working day, which includes all debris from the removal of the existing roofing, old tacks form the ground and related work as outlined in the specifications and/or contract.

52. **Lead Base Paint:** The Contractor nor any subcontractor shall not be permitted to use or have in their possession any paint having a lead base. Anyone found to be using a lead base paint shall be held liable and in violation of Federal Regulations. It shall be the sole responsibility of the contractor and/or subcontractor(s) for complete removal and rectification of such findings. All contractors and subcontractors shall comply with the requirements of 24 CFR Part 35 that prohibits the use of lead based paints.

53. **The Contractor, subcontractors, or suppliers** are prohibited from placing a lien on the Owners property.

END OF SECTION
SECTION 02660 - WATER DISTRIBUTION SYSTEM (Revised 7.12.19)

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the contract including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

SCOPE OF WORK:

The work includes construction of the water distribution system including fire lines as shown on the Drawings.

Testing and disinfection of the installed system shall be incidental to the work.

QUALITY ASSURANCE:

Requirements of Regulatory Agencies: Comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state of federal authorities having jurisdiction.

Meet all requirements of the Local Water Authority and be subject to review by System inspectors.

SITE CONDITIONS:

Coordinate water distribution system with pavement construction.

Install water mains when grade is within 6 in. of final grade.

Coordinate the Work with the Local Water Authority and pay all tap fees assessed (to include valves, backflow preventers, vaults, etc.) for portions of the Work completed by the Utility Provider. All tap fees are being waived by the City of Boaz, therefore, General Contractor shall not include tap fees in bid proposal.

PART 2 – PRODUCTS

MATERIALS:

Water Main Piping:

1. Water Service Piping: Ductile iron pipe or PVC pipe.

2. Ductile Iron Pipe:
   a. Manufactured in accordance with AWWA C-151, latest revision, Class 50, min.
   b. Standard cement-lined and seal-coated with an approved bituminous seal coat in accordance with AWWA C-104, latest revision.
   c. Approved push-on, conforming to AWWA C-111, latest revision.
PVC Pipe:

1. Constructed to meet the requirements of U. S. Department of Commerce Product Standard PS 22-70, and bear the National Sanitation Foundation Testing Laboratories, Inc., seal for potable water.
2. For PVC piping less than 4” - Schedule 40, PVC, minimum; 150 psi minimum working pressure
3. 4” or greater shall be C900 PVC piping.

Fire Line:

1. Fire line shall be C900 PVC piping. Encasement shall be used under drive areas.
2. Connection to Main: Each hydrant shall be connected to the main pipe with a 6-inch ductile iron branch. Each hydrant shall be controlled by an independent 6-inch gate valve.

Fire Hydrants:

All hydrants shall be Mueller Company, M & H, or an approved equal. Fire hydrants shall be equipped with traffic break away feature. Hydrants shall be painted in accordance with the requirements of AWWA C502.

Water Main Fittings:

Ductile iron fittings shall be provided in locations as shown on the plans or in locations deemed necessary by the Engineer. Ductile iron fittings 12” and smaller shall be rated for 350 psi working pressure. Fittings shall be manufactured in accordance with AWWA C153 and provided with mechanical joints. All fittings shall be provided with a thin cement lining in accordance with AWWA C104.

PVC Fittings: Fittings For PVC Water Mains Smaller Than 6 In. In. Dia.: As recommended by the manufacturer of the pipe furnished, suitable for use under the conditions specified for the pipe, with ring-tite or fluid-tite bells or spigots at all ends for jointing.

Valves and Boxes:

Cast Iron Valve Boxes shall be provided for all valves installed vertically and shall consist of a base covering the operating nut and head of the valve, a vertical shaft of at least 5 ¼” in diameter and a top section extending to a point even with the finish ground surface, provided with a cast iron cover marked “WATER.” The valve box shall be placed concentrically over the operating nut. Precast concrete collars shall be provided around each valve box.

Valves 2” and Larger: Cast iron gate valves, AWWA type, the standard product of a recognized valve manufacturer such as Mueller, Iowa or M & H, constructed with an interchangeable parts system, with parts readily available, to meet the following requirements:

1. Iron body, bronze-mounted.
2. Double disc, parallel seat “O” ring seal.
3. 150 psi, min., working pressure.
4. Counterclockwise (left) opening.
5. 2 in. operating nut.
6. Non-rising stem.
7. Joints to be as required for pipe to be connected to.

**Valves 2” and Smaller:** Brass or bronze gate valves, conforming to Federal Specification WW-V-76.

**Underground Valves:** Two-piece, screw type, adjustable to suit the depth of bury and type of valve, with a min. shaft dia. of 5-1/4 in.

All mechanical joint valves and fittings shall be restrained by MEGALUG series 1100 restraint devices.

**PART 3 – EXECUTION**

**INSTALLATION:**

**General:** Line and Grade: Lay and maintain to the required lines and grades; with fittings, valves and hydrants at the required locations; and with joints centered and spigots plumb; and with all valve and hydrant stems plumb.

**Encasement:** Piping under paved drive shall be encased with welded steel pipe casing.

**Laying Pipe:**

**General:** Before lowering pipe into trenches, grade the bottom of the ditch so that when pipe is in the ditch it will have a bearing for its entire length. Examine the pipe for defects and clean the inside. After placing pipe in ditch, wipe the bell, gasket, and spigot free from all dirt, sand and foreign material. Apply a film of lubricant to the gasket and spigot. Enter the plain end into the socket after which force the pipe into the socket until it makes contact with the bottom of the socket.

A minimum of five (5) feet horizontal separation shall be used when installing water main or piping within areas of sanitary sewer lines. When the proposed water main or piping is required to cross sewer mains, the contractor shall encase the water main carrier pipe with a continuous pipe (sleeve or casing) of sufficient length, located such that a minimum five (5) foot horizontal separation exists between each end of the casing pipe and the sewer main. Where possible, water main shall be a minimum of 18 inches above the top elevation of the sewer main.

No. 12 THW copper locator wire shall be placed in the trench, 12 inches above the water mains and all service piping.

**Trench Water:** At times when pipe laying is not in progress, close the open ends of pipe by approved means, and permit no trench water to enter the pipe.

**Cutting Pipe:** Cut pipe for inserting valves, fittings or closure pieces in a neat and workmanlike manner without damage to the pipe.

**Direction of Laying:** Unless otherwise directed, lay pipe with bell ends facing in the direction of laying. For lines on an appreciable slope, face bells upgrade.
**Permissible Deflections:** Wherever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructing, to plumb stems, or where long radius curves are permitted, deflect as recommended by the manufacturer of the pipe.

**Unsuitable Conditions:** Lay no pipe in water or when the trench conditions or weather is unsuitable for such work.

Provide ground cover of 3 ft. min.

**Setting Appurtenances:**

**Valves and Fittings:** Set gate valves and pipe fittings to new pipe in the manner previously specified for cleaning, laying and jointing pipe.

**Valve Boxes:** Firmly support cast iron valve boxes, and maintain centered and plumb over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or at such other level as may be directed.

**FIELD QUALITY CONTROL:**

**Hydrostatic Tests:** Pressure During Test: After the pipe has been laid and partially backfilled as specified, pressure test all newly laid pipe, or any valved section of it, in accordance with Local required procedures.

**CLEANING AND DISINFECTION:**

Clean out and thoroughly flush the water distribution system piping and leave free from foreign materials of any sort prior to sterilization.

Disinfect in accordance with Local required procedures and AWWA Standard C-651, latest edition.

**END OF SECTION**
SECTION 08700 – FINISH HARDWARE (REVISED 7.11.19)

PART 1 – GENERAL

RELATED DOCUMENTS

Drawings and general provisions of Contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

SUMMARY

This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

This Section includes the following:

1. Hinges.
2. Key control system.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
7. Push/pull units.
8. Closers.
10. Miscellaneous door control devices.
11. Door trim units.
12. Protection plates.
14. Sound stripping for interior doors.
15. Astragals or meeting seals on pairs of doors.
16. Thresholds.

Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 Section "Standard Steel Doors and Frames" for silencers integral with hollow metal frames.
2. Division 8 Section "Flush Wood Doors" for factory pre-fitting and factory pre-machining of doors for door hardware.
3. Division 8 Section "Aluminum Entrances and Storefronts" for aluminum entrance door hardware, except cylinders.

HARDWARE ALLOWANCE

Allowance of $2,000.00 for Certified AHC (Architectural Hardware Consultant) & FDAI (Fire Door Assembly Inspector – document of certification from DHI must be provided) to visit job site upon substantial completion as directed by Architect. A written report will be required for the Owner, Architect, and Contractor.
QUALITY ASSURANCE

Door hardware supplier's responsibilities shall be as follows:

1. **Submittals**: Submit through Contractor required product data, final hardware schedule; separate keying schedule, and samples as specified in this Section, unless otherwise indicated.

2. **Hardware Review Meeting**: Hardware Supplier shall attend a scheduled “Hardware Review Meeting” with the Contractor, Owner and Architect representative. All Hardware products, hardware installation locations, finishes, color selections, ratings and keying is to be reviewed and discussed. The Hardware Supplier understands the Hardware Submittal is not deemed “Fully Approved” until the Owner has completed their review and given “Approval”.

3. **Construction Schedule**: Inform Contractor promptly of estimated times and dates that will be required to process submittals, to furnish templates, to deliver hardware, and to perform other work associated with furnishing door hardware for purposes of including this data in construction schedule. Comply with this schedule.

4. **Coordination and Templates**: Assist Contractor as required to coordinate hardware with other work in respect to both fabrication and installation. Furnish Contractor with templates and deliver hardware to proper locations.

5. **Product Handling**: Package, identify, deliver, and inventory door hardware specified in this Section.

6. **Discrepancies**: Based on requirements indicated in Contract Documents in effect at time of door hardware selection, furnish types, finishes, and quantities of door hardware, including fasteners, and Owner's maintenance tools required to comply with specified requirements and as needed to install and maintain hardware. Furnish or replace any items of door hardware resulting from shortages and incorrect items at no cost to the Owner or Contractor. Obtain signed receipts from Contractor for all delivered materials.

Contractor's responsibilities shall be as follows:

1. **Submittals**: Coordinate and process submittals for door hardware in same manner as submittals for other work.

2. **Hardware Review Meeting**: Contractor is to schedule and attend a “Hardware Review Meeting” with the Owner, Hardware Supplier and Architect Representative. All Hardware products, hardware installation locations, finishes, color selections, ratings and keying is to be reviewed and discussed. The Contractor understands the Hardware Submittal is not deemed “Fully Approved” until the Owner has completed their review and given “Approval”.

3. **Construction Schedule**: Cooperate with door hardware supplier in establishing scheduled dates for submittals and delivery of templates and door hardware. Incorporate in construction schedule the times and dates related to furnishing hardware by door hardware supplier.

4. **Coordination**: Coordinate door hardware with other Work. Furnish hardware supplier or manufacturer with shop drawings of other work where required or requested. Verify completeness and suitability of hardware with supplier.

5. **Product Handling**: Provide secure lock-up for hardware delivered to the site. Inventory hardware jointly with representative of hardware supplier and issue signed receipts for all delivered materials.
6. **Installation Information:** The general types and approximate quantities of hardware required for this Project are indicated at the end of this Section in order to establish Contractor's costs for installation and other work not included in allowance.

7. **No adjustments in Contract sum will be made for costs other than those covered by the allowances for subsequent increases or decreases in quantity of one or more hardware types that do not exceed 5 percent.**

**SUBMITTALS**

**General:** Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Upon return of the reviewed finish hardware schedule, arrange for a meeting with the Owner and representatives of Architect. A keying schedule will be established and submitted to the Architect and Owner. After review, the keying schedule will be returned to representatives of Finish Hardware Supplier so that permanent cylinders and keys can be prepared on a timely basis.

**QUALITY ASSURANCE**

**Substitutions:** All substitution requests must be submitted before bidding and within the procedures and time frame as outlined in Division 1, General Requirements. Approval of products is at the discretion of the architect and his hardware consultant.

**Single Source Responsibility:** Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

**Supplier Qualifications:** A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for a minimum of 10 years, for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced "Certified architectural hardware consultant (AHC)" as recognized by the Door and hardware Institute (DHI). All submittals shall be signed by an AHC who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

**Fire-Rated Openings:** Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
PRODUCT HANDLING
Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.

Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

MAINTENANCE
Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 – PRODUCTS
HINGES:

A. Manufacturers:
   1. Ives
   2. McKinney
   3. Bommer

B. Material:
   1. Provide only template produced units
   2. Provide Phillips flat-head or machine screws for installation of units, except furnish Phillips flat-head wood screws for installation of units in to wood. Finish screw heads to match surface of hinges or pivots.
   3. Hinge pins, except as noted, are to be provided as follows:
      a. Steel Hinges: Steel pins
      b. Non-ferrous Hinges: Stainless steel pins
      c. Exterior Doors: Use Non-Removable Pins
      d. Interior Doors: Non-rising pins
      e. Electric Hinges: Non-removable pins
   4. Tips shall be flat button and matching plug, finished to match leaves.
   5. Provide number of hinges indicated but not less than three (3) hinges for door leaf of 90” or less in height and one additional hinge for each 30” of additional height.
6. Provide ball bearing hinges of the type and weight suggested by the hinge manufacturer for each type of door application.

**LOCK CYLINDERS AND KEYING:**

A. **Manufacturers:**
   
   Schlage Everest 29 series

B. **Material:**

1. Establish a new, factory registered, Schlage master key system for the project, Schlage 29 series, controlled access, large format interchangeable core (LFIC). Master key all permanent cores as directed by the owner. All locks and cylinder housings shall be capable of accepting Schlage core number 23-030.
2. Provide temporary brass construction cores for all locks and exit devices. The General Contractor shall be responsible for removal of temporary cores at the completion of the project and for the installation of all permanent cores. The General Contractor shall test all permanent keys and cores for proper operation during the install of permanent cores. The General Contractor shall return all temporary cores to the hardware supplier.
3. Acceptable substitutes: Sargent Signature Series, Corbin Russwin Pyramid Series.
4. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
5. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
6. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol. Stamp all operating keys, except one of each key change, with the notation: “DO NOT DUPLICATE”.
7. Key Material: Provide keys of nickel silver only.
8. Key Quantity: Furnish (3) change keys for each lock, (5) master keys for each master system, (5) grandmaster keys for each grandmaster system, (12) construction master keys.
   a. Furnish one extra blank for each lock.
   b. Furnish construction master keys to General Contractor.
   c. Deliver keys to Owner.
8. Provide one wall mounted key cabinet, Lund Deluxe 1200 series. Capacity shall be 150% of quantity of keys required for the project. General contractor shall mount the key cabinet in the location to be determined by the architect.

**LOCKSETS AND LATCHSETS**

A. **Manufacturers:**

1. Schlage ND Series, RHO design
2. Sargent 11 Line, T-Zone Series, OL Design
3. Corbin Russwin 3100 Series, NZD Design

B. **Material:**
1. Locksets and latch-sets of all manufacturers must conform to the requirements of Sub paragraphs 2 and be approved by the Architect.

2. Cylindrical Lock Type:
   a. Locksets and latch sets must conform to ANSI A156.2 Series 4000, Operational Grade 1, and be UL10C for 4'0" x 10'0" 3-hour fire door.
   b. Grade 1 performance standards for strength, security and durability in the categories below:
      1. Abusive locked lever torque – minimum 3,100 inch pounds without gaining access.
      2. Offset lever pull – minimum 1,600 foot pounds without gaining access.
      3. Vertical lever impact – minimum 100 impacts without gaining access.
      4. Cycle life – minimum 16 million cycles with no visible lever sag, without the use of performance aids (i.e. – set screws, spacers, etc.)

3. Provide wired electrified options as scheduled in the hardware sets.
   a. 12 through 24V DC operating capability, autodetecting.
   b. Selectable EL (Fail Safe)/EU (Fail Secure) operating mode via switch on chassis.
   c. 0.230A (230mA) maximum current draw. 0.010A (10mA) holding current. Modular / “plug in” Request to Exit switch.

EXIT DEVICES

A. Manufacturers:
   1. Von Duprin 98 Series
   2. Apex 2000 Series
   3. Detex 10 Series

B. Material:
   1. All exit devices to be of one manufacturer and provided in same finish design as locksets.
   2. Provide sex nuts and bolts for attachment of surface applied items to doors.
   3. Devices shall be UL listed. Devices for fire rated openings shall bear factory installed UL markings that indicate approval for fire rated openings.
   4. All exit devices shall be touch-bar type design.
   5. All exit devices shall comply with ANSI A156.3, Grade 1.
   6. Exit device lever trim shall be equal to Von Duprin break away vandal resistant #996L.

CLOSERS

A. Manufacturers:
   1. LCN 4050/1460 Series
   2. Norton 7500/8501 Series
   3. Falcon SC71A/SC81A Series
   4. Provide the series specified in the door hardware sets.

B. Material:
1. Size of units: Except as otherwise specifically indicated, comply with the manufacturer’s recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.
   a. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
   b. Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units, ANSI opening force and delayed action closing.

2. Closers are to be fully hydraulic, rack and pinion action with high strength cast aluminum cylinders and one piece forged steel pistons. Closer Piston diameter at exterior doors shall be minimum 1½”. Hydraulic regulation to be controlled by tamper-proof, non-critical screw values, adjustable with a hex by tamper-proof, non-critical screw valves, adjustable with a hex wrench. Separate adjustments for back check, general speed, and latch speed. Where detailed in the door hardware sets, provide delayed action feature to delay closing up to one minute for maximum opening to approximately 75. Back check shall be properly located for protection of the door, frame and applied hardware.

3. All door closers shall comply with ANSI A156.4 Grade 1 and meet the standards of ANSI A117.1 for barrier-free accessibility.

4. Provide closers with full metal covers.

OVERHEAD STOPS AND HOLDERS

A. Manufacturers:

   1. Glynn Johnson
   2. Sargent
   3. Rixson

B. Material:

   1. Conform to ANSI A156.8 Grade 1.

PUSH/PULLS & PROTECTION PLATES

A. Manufacturers:

   1. Ives
   2. Trimco
   3. Burns

B. Material:

   1. Provide manufacturers standard exposed fasteners for installation, through bolted for matched pairs, but not of single units.
   2. Provide 16 gauge minimum thickness for plates.
   3. Where specified in the schedule, push/pulls shall have an antimicrobial coating.
THRESHOLDS, WEATHERSTRIPPING & GASKETING

A. Manufacturers:
   1. Zero
   2. National Guard
   3. K.N. Crowder

B. Material:
   1. Provide continuous weather-stripping at each edge of every exterior door leaf, except as otherwise indicated.
   2. Provide type, size and profile shown as scheduled.
   3. Provide non-corrosive fasteners as recommended by manufacturer for application indicated. Do not specify adhesive backed weather-strip or gasket material.
   4. Where replaceable seal strips are scheduled, provide only those units where resilient or flexible seal strip is easily replaceable from stocks maintained by manufacturer.
   5. Proved standard metal threshold unit of type, size and profile shown as scheduled.

ELECTRO-MAGNETIC LOCKS

C. Manufacturers:
   1. Von Duprin
   4. Securitron
   5. Security Door Controls

FINISHES

Hardware finishes shall conform to ANSI and shall be as listed below for aluminum, FRP, hollow metal and wood doors:

<table>
<thead>
<tr>
<th>Hardware Type</th>
<th>Finish Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butt Hinges</td>
<td>652 Satin Chrome Plated Steel</td>
</tr>
<tr>
<td>Continuous Geared</td>
<td>628 Clear Anodized Aluminum, except at aluminum storefront doors.</td>
</tr>
<tr>
<td>Aluminum Hinges</td>
<td>At Aluminum storefront doors, provide anodized or Kynar finish as required to</td>
</tr>
<tr>
<td></td>
<td>match specified door finish.</td>
</tr>
<tr>
<td>Cont. Pin &amp; Barrel Hinges</td>
<td>630 Satin Stainless Steel</td>
</tr>
<tr>
<td>Flush Bolts</td>
<td>626AM Satin Chrome Plated, Anti-Microbial</td>
</tr>
<tr>
<td>Locksets</td>
<td>626AM Satin Chrome Plated, Anti-Microbial</td>
</tr>
<tr>
<td>Exit Devices</td>
<td>626AM Satin Chrome Plated, Anti-Microbial</td>
</tr>
<tr>
<td>Door Closers</td>
<td>689 Powder Coat Aluminum with LCN SRI - Rust Inhibitive Coating</td>
</tr>
<tr>
<td>Push Plates</td>
<td>630AM Satin Stainless Steel, Anti-Microbial</td>
</tr>
<tr>
<td>Pull Plates</td>
<td>630AM Satin Stainless Steel, Anti-Microbial</td>
</tr>
<tr>
<td>Protective Plates</td>
<td>630 Satin Stainless Steel</td>
</tr>
<tr>
<td>Door Stops</td>
<td>626 Satin Chrome Plated</td>
</tr>
<tr>
<td>Overhead Holders</td>
<td>630 Satin Stainless Steel</td>
</tr>
</tbody>
</table>
PART 3 – EXECUTION

INSTALLATION

Install each hardware item in compliance with manufacturer’s instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted of finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, reinstall each item.

1. Do not install surface mounted items until finishes have been completed on the substrate.

Conform to ANSI A117.1 for positioning requirements for the handicapped.

PROTECTION AND CLEANING

After installation, clean metal surfaces on both interior and exterior of all mortar, paint and other contaminants. After cleaning, protect work against damage.

FINAL ADJUSTMENT

Whenever hardware is installed more than one month prior to occupancy or acceptance, return during the week prior to acceptance or occupancy and make a final inspection and adjustment of all hardware items in such space or area.

SCHEDULE

HWSET: 01

DOOR NUMBER:
B106

EACH TO HAVE:

| 1 | CONT. HINGE | 224XY | IVE |
| 1 | PANIC HARDWARE | 98-NL | VON |
| 1 | RIM CYLINDER | 20-057 ICX | SCH |
| 1 | FSIC CORE | 23-030 | SCH |
| 1 | SURFACE CLOSER | 4050 SCUSH | LCN |
| 1 | GASKETING | 188 | ZER |
| 1 | DOOR SWEEP | 8198 | ZER |
| 1 | THRESHOLD | 65A | ZER |
HWSET: 02

DOOR NUMBER:
B107

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
<td>224XY</td>
</tr>
<tr>
<td>2</td>
<td>MANUAL FLUSH BOLT</td>
<td>FB458</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND80TD</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>OH STOP</td>
<td>90S</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>1450 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>RAIN DRIP</td>
<td>142</td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
</tr>
<tr>
<td>1</td>
<td>MEETING STILE</td>
<td>43STST</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>8198</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>65A</td>
</tr>
</tbody>
</table>

HWSET: 03

DOOR NUMBER:
A128C

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
<td>224XY</td>
</tr>
<tr>
<td>2</td>
<td>MANUAL FLUSH BOLT</td>
<td>FB458</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>L9080T</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>OH STOP</td>
<td>90S</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>1450 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
</tr>
<tr>
<td>1</td>
<td>MEETING STILE</td>
<td>43STST</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>8198</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>65A</td>
</tr>
</tbody>
</table>
HWSET: 04

DOOR NUMBER:
A126A       A126C

EACH TO HAVE:
1   CONT. HINGE    224XY       IVE
1   CONT. HINGE    224XY EPT    IVE
1   POWER TRANSFER EPT10       VON
2   MANUAL FLUSH BOLT FB458     IVE
1   STOREROOM LOCK ND80TDEU    SCH
1   FSIC CORE      23-030       SCH
1   SURFACE CLOSER 4050 SHCUSH  LCN
2   KICK PLATE     8400 8" X 2" LDW B-CS IVE
1   RAIN DRIP      142          ZER
1   GASKETING      188          ZER
1   MEETING STILE  43STST       ZER
2   DOOR SWEEP     8198         ZER
1   THRESHOLD      65A          ZER
1   CREDENTIAL READER BY SECURITY/ACCESS CTRL SYSTEMS
2   DOOR CONTACT   679-05HM     SCE
1   POWER SUPPLY   PS902        SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HWSET: 04A

DOOR NUMBER:
A131       A132

EACH TO HAVE:
2   CONT. HINGE    224XY       IVE
1   REMOVABLE MULLION 4854B (6300 X 299 PREP) VON
1   ELECTRIC STRIKE 6300       VON
1   PANIC HARDWARE  98-NL       VON
1   PANIC HARDWARE  98-EO       VON
1   RIM CYLINDER    20-057 ICX  SCH
1   FSIC CORE      23-030       SCH
1   SURFACE CLOSER 4050 SHCUSH  LCN
2   KICK PLATE     8400 8" X 2" LDW B-CS IVE
1   RAIN DRIP      142          ZER
1   GASKETING      188          ZER
1   MULLION SEAL   8780         ZER
2   DOOR SWEEP     8198         ZER
1   THRESHOLD      65A          ZER
1   CREDENTIAL READER BY SECURITY/ACCESS CTRL SYSTEMS
2   DOOR CONTACT   679-05HM     SCE
1   POWER SUPPLY   PS902        SCE

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
HWSET: 05

<table>
<thead>
<tr>
<th>Door Number:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A118</td>
<td>A121</td>
</tr>
</tbody>
</table>

**Each to Have:**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Model/Length/Color</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Hinge</td>
<td>5B81HW 4.5 X 4.5</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DBL CYL DEAD LOCK</td>
<td>L462T</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>FSIC CORE</td>
<td>23-030</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PUSH PLATE</td>
<td>8200 6&quot; X 16&quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PULL PLATE</td>
<td>8303 10&quot; 6&quot; X 16&quot;</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MOP PLATE</td>
<td>8400 6&quot; X 1&quot; LDW B-CS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RAIN DRIP</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>8198</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>656</td>
<td></td>
</tr>
</tbody>
</table>

HWSET: 06

<table>
<thead>
<tr>
<th>Door Number:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A124</td>
<td>A125</td>
</tr>
</tbody>
</table>

**Each to Have:**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Model/Length/Color</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CONT. HINGE</td>
<td>224XY</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CORRIDOR LOCK</td>
<td>L9456T L583-363 L283-721</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RAIN DRIP</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>8198</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>656A-223</td>
<td></td>
</tr>
</tbody>
</table>

HWSET: 07

<table>
<thead>
<tr>
<th>Door Number:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B105</td>
<td>A130-Omit</td>
</tr>
</tbody>
</table>

**Each to Have:**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Model/Length/Color</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CONT. HINGE</td>
<td>224XY</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND80TD</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>OH STOP</td>
<td>90S</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>8198</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>65A</td>
<td></td>
</tr>
</tbody>
</table>

A New Recreation Center for the
Boaz Parks and Recreation
Boaz, Alabama

MCKEE PROJECT # 18-197
<table>
<thead>
<tr>
<th>HWSET: 08</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DOOR NUMBER:</td>
<td>A110</td>
</tr>
<tr>
<td>EACH TO HAVE:</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
</tr>
<tr>
<td>2</td>
<td>POWER TRANSFER</td>
</tr>
<tr>
<td>1</td>
<td>REMOVABLE MULLION</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
</tr>
<tr>
<td>2</td>
<td>LONG DOOR PULL</td>
</tr>
<tr>
<td>2</td>
<td>SURFACE CLOSER</td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
</tr>
<tr>
<td>2</td>
<td>MULLION SEAL</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
</tr>
<tr>
<td>1</td>
<td>CREDENTIAL READER</td>
</tr>
<tr>
<td>2</td>
<td>DOOR CONTACT</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

OPERATION: DOOR NORMALLY CLOSED AND SECURE. REMOTE SIGNAL VIA CARD READER AND ACCESS CONTROL SYSTEM TO RETRACT LATCHES. FREE EGRESS AT ALL TIMES.

<table>
<thead>
<tr>
<th>HWSET: 09</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DOOR NUMBER:</td>
<td>B102 B108B</td>
</tr>
<tr>
<td>EACH TO HAVE:</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
</tr>
<tr>
<td>2</td>
<td>POWER TRANSFER</td>
</tr>
<tr>
<td>1</td>
<td>REMOVABLE MULLION</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
</tr>
<tr>
<td>2</td>
<td>LONG DOOR PULL</td>
</tr>
<tr>
<td>2</td>
<td>SURFACE CLOSER</td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
</tr>
<tr>
<td>2</td>
<td>MULLION SEAL</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
</tr>
<tr>
<td>1</td>
<td>CREDENTIAL READER</td>
</tr>
<tr>
<td>2</td>
<td>DOOR CONTACT</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

OPERATION: DOOR NORMALLY CLOSED AND SECURE. REMOTE SIGNAL VIA CARD READER AND ACCESS CONTROL SYSTEM TO RETRACT LATCHES. FREE EGRESS AT ALL TIMES.
<table>
<thead>
<tr>
<th>DOOR NUMBER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B103A</td>
</tr>
</tbody>
</table>

EOACH TO HAVE:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1HW 5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>98-L</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 EDA</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CVX</td>
</tr>
</tbody>
</table>

HWSET: 11

<table>
<thead>
<tr>
<th>DOOR NUMBER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B112</td>
</tr>
</tbody>
</table>

EOACH TO HAVE:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>98-L</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
</tbody>
</table>

HWSET: 12

<table>
<thead>
<tr>
<th>DOOR NUMBER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B108A</td>
</tr>
</tbody>
</table>

EOACH TO HAVE:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>REMOVABLE MULLION</td>
<td>4954</td>
</tr>
<tr>
<td>2</td>
<td>PANIC HARDWARE</td>
<td>98-L</td>
</tr>
<tr>
<td>2</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>2</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>2</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
</tr>
<tr>
<td>2</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>MULLION SEAL</td>
<td>8780</td>
</tr>
</tbody>
</table>

A New Recreation Center for the Boaz Parks and Recreation Boaz, Alabama MCKEE PROJECT # 18-197

FINISH HARDWARE 08700-14 (REVISED 7.11.19)
HWSET: 13

DOOR NUMBER:
B109A

EACH TO HAVE:

<table>
<thead>
<tr>
<th>HWSET</th>
<th>DOOR NUMBER</th>
<th>EACH TO HAVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>B109A</td>
<td>3 HINGE 5BB1 4.5 X 4.5 IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 CLASSROOM LOCK ND70TD SCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 FSIC CORE 23-030 SCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 SURFACE CLOSER 1450 RW/PA LCN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ARMOR PLATE 8400 34&quot; X 2&quot; LDW B-CS IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 WALL STOP WS406/407CCV IVE</td>
</tr>
</tbody>
</table>

HWSET: 14

DOOR NUMBER:
B110

EACH TO HAVE:

<table>
<thead>
<tr>
<th>HWSET</th>
<th>DOOR NUMBER</th>
<th>EACH TO HAVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>B110</td>
<td>6 HINGE 5BB1 4.5 X 4.5 IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 MANUAL FLUSH BOLT FB458 IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 DUST PROOF STRIKE DP1 IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 CLASSROOM LOCK ND70TD SCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 FSIC CORE 23-030 SCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 ARMOR PLATE 8400 34&quot; X 2&quot; LDW B-CS IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 WALL STOP WS406/407CVX IVE</td>
</tr>
</tbody>
</table>

HWSET: 15

DOOR NUMBER:
A101  A102  A103

EACH TO HAVE:

<table>
<thead>
<tr>
<th>HWSET</th>
<th>DOOR NUMBER</th>
<th>EACH TO HAVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>A101</td>
<td>3 HINGE 5BB1 5 X 4.5 IVE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 ENTRANCE/OFFICE LOCK ND50TD SCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 FSIC CORE 23-030 SCH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 WALL STOP WS406/407CCV IVE</td>
</tr>
</tbody>
</table>
HWSET: 16

DOOR NUMBER:
A100

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 5 X 4.5 IVE</td>
</tr>
<tr>
<td>1 ENTRANCE/OFFICE LOCK</td>
<td>ND50TD SCH</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030 SCH</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>1450 RW/PA LCN</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS IVE</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>WS406/407CVX IVE</td>
</tr>
</tbody>
</table>

HWSET: 17

DOOR NUMBER:
B114

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 4.5 X 4.5 IVE</td>
</tr>
<tr>
<td>1 ENTRANCE/OFFICE LOCK</td>
<td>ND50TD SCH</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030 SCH</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>1450 SCUSH LCN</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS IVE</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>WS406/407CVX IVE</td>
</tr>
</tbody>
</table>
HWSET: 18

DOOR NUMBER:
A126B

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 HINGE</td>
<td>5BB1 4.5 X 4.5</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 REMOVABLE MULLION</td>
<td>9854B (6300 X 299 PREP)</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 ELECTRIC STRIKE</td>
<td>6300</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 FIRE EXIT HARDWARE</td>
<td>98-L-NL-F</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 FIRE EXIT HARDWARE</td>
<td>98-EO-F</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 RIM CYLINDER</td>
<td>20-057 ICX</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>2 SURFACE CLOSER</td>
<td>1450 SCUSH</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>2 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYSTEMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 DOOR CONTACT</td>
<td>679-05HM</td>
<td>SCE</td>
<td></td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

HWSET: 19

DOOR NUMBER:
A115A A123A

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 CLASSROOM DEAD LOCK</td>
<td>L463T</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1 PUSH PLATE</td>
<td>8200 6&quot; X 16&quot;</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 PULL PLATE</td>
<td>8303 10&quot; 6&quot; X 16&quot;</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>4050 RW/PA</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1 MOP PLATE</td>
<td>8400 6&quot; X 1&quot; LDW B-CS</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>WS406/407CVX</td>
<td>IVE</td>
<td></td>
</tr>
</tbody>
</table>
HWSET: 20

DOOR NUMBER:
A116   A119

EACH TO HAVE:

<table>
<thead>
<tr>
<th>HWSET: 20</th>
<th>DOOR NUMBER:</th>
<th>EACH TO HAVE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>DBL CYL DEAD LOCK</td>
<td>L462T</td>
</tr>
<tr>
<td>2</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>PUSH PLATE</td>
<td>8200 6&quot; X 16&quot;</td>
</tr>
<tr>
<td>1</td>
<td>PULL PLATE</td>
<td>8303 10&quot; 6&quot; X 16&quot;</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 RW/PA</td>
</tr>
<tr>
<td>1</td>
<td>MOP PLATE</td>
<td>8400 6&quot; X 1&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CVX</td>
</tr>
</tbody>
</table>

HWSET: 21

DOOR NUMBER:
A115B   A123B

EACH TO HAVE:

<table>
<thead>
<tr>
<th>HWSET: 21</th>
<th>DOOR NUMBER:</th>
<th>EACH TO HAVE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>DBL CYL DEAD LOCK</td>
<td>L462T</td>
</tr>
<tr>
<td>2</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>PUSH PLATE</td>
<td>8200 6&quot; X 16&quot;</td>
</tr>
<tr>
<td>1</td>
<td>PULL PLATE</td>
<td>8303 10&quot; 6&quot; X 16&quot;</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>MOP PLATE</td>
<td>8400 6&quot; X 1&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
</tbody>
</table>

HWSET: 22

DOOR NUMBER:
A106

EACH TO HAVE:

<table>
<thead>
<tr>
<th>HWSET: 22</th>
<th>DOOR NUMBER:</th>
<th>EACH TO HAVE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1 4.5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>PUSH PLATE</td>
<td>8200 6&quot; X 16&quot;</td>
</tr>
<tr>
<td>1</td>
<td>PULL PLATE</td>
<td>8303 10&quot; 6&quot; X 16&quot;</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4050 RW/PA</td>
</tr>
<tr>
<td>1</td>
<td>MOP PLATE</td>
<td>8400 6&quot; X 1&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CVX</td>
</tr>
</tbody>
</table>

A New Recreation Center for the
Boaz Parks and Recreation
Boaz, Alabama

MCKEE PROJECT # 18-197

FINISH HARDWARE 08700-18
(REVISIED 7.11.19)
HWSET: 23

DOOR NUMBER:
A107  B115

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 4.5 X 4.5</td>
<td>IVE</td>
</tr>
<tr>
<td>1 PRIVACY LOCK</td>
<td>ND40S</td>
<td>SCH</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>4050 RW/PA</td>
<td>LCN</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td>IVE</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>WS406/407CVX</td>
<td>IVE</td>
</tr>
</tbody>
</table>

TEMPLATE CLOSER FOR 180 SWING WHERE APPLICABLE.

HWSET: 24

DOOR NUMBER:
A104  B123

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 4.5 X 4.5</td>
<td>IVE</td>
</tr>
<tr>
<td>1 STORAGE ROOM LOCK</td>
<td>ND80TD</td>
<td>SCH</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
</tr>
<tr>
<td>1 OH STOP</td>
<td>90S</td>
<td>GLY</td>
</tr>
</tbody>
</table>

HWSET: 25

DOOR NUMBER:
A111  B122

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 5 X 4.5</td>
<td>IVE</td>
</tr>
<tr>
<td>1 STORAGE ROOM LOCK</td>
<td>ND80TD</td>
<td>SCH</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>1450 RW/PA</td>
<td>LCN</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td>IVE</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>WS406/407CVX</td>
<td>IVE</td>
</tr>
</tbody>
</table>

TEMPLATE CLOSER FOR 180 SWING WHERE APPLICABLE.
### HWSET: 26

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>Door</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>B116</td>
<td></td>
</tr>
<tr>
<td>B117</td>
<td></td>
</tr>
<tr>
<td>B118</td>
<td></td>
</tr>
<tr>
<td>B120</td>
<td></td>
</tr>
</tbody>
</table>

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 5 X 4.5</td>
</tr>
<tr>
<td>1 STOREROOM LOCK</td>
<td>ND80TD</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>1450 RW/PA</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>WS406/407CVX</td>
</tr>
</tbody>
</table>

*TEMPLATE CLOSER FOR 180 SWING WHERE APPLICABLE.*

### HWSET: 26

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>Door</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>B116A</td>
<td></td>
</tr>
</tbody>
</table>

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 4.5 X 4.5</td>
</tr>
<tr>
<td>1 PANIC HARDWARE</td>
<td>98-NL-OP</td>
</tr>
<tr>
<td>1 SINGLE PULL TRIM</td>
<td>ND170</td>
</tr>
<tr>
<td>1 RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>1450 CUSH</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
</tr>
</tbody>
</table>

### HWSET: 27

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>Door</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>A112A</td>
<td></td>
</tr>
</tbody>
</table>

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 HINGE</td>
<td>5BB1 5 X 4.5</td>
</tr>
<tr>
<td>1 POWER TRANSFER</td>
<td>EPT10</td>
</tr>
<tr>
<td>1 STOREROOM LOCK</td>
<td>ND80TDEU</td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1 OH STOP</td>
<td>90S</td>
</tr>
<tr>
<td>1 SURFACE CLOSER</td>
<td>1450 RW/PA</td>
</tr>
<tr>
<td>1 CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYS</td>
</tr>
<tr>
<td>1 DOOR CONTACT</td>
<td>679-05HM</td>
</tr>
<tr>
<td>1 POWER SUPPLY</td>
<td>PS902</td>
</tr>
</tbody>
</table>

*COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.*

---

**A New Recreation Center for the**

Boaz Parks and Recreation
Boaz, Alabama

**MCKEE PROJECT # 18-197**

**FINISH HARDWARE**

08700-20

(REVISED 7.11.19)
HWSET: 28

DOOR NUMBER:
B104A

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HINGE</td>
<td>5BB1 5 X 4.5</td>
</tr>
<tr>
<td>1</td>
<td>POWER TRANSFER</td>
<td>EPT10</td>
</tr>
<tr>
<td>1</td>
<td>STORE ROOM LOCK</td>
<td>ND80TDEU</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>1450 EDA</td>
</tr>
<tr>
<td>1</td>
<td>CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYSTEMS</td>
</tr>
<tr>
<td>1</td>
<td>DOOR CONTACT</td>
<td>679-05HM</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
<td>PS902</td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
HWSET: 29

DOOR NUMBER:
B113

EACH TO HAVE:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
<td>112XY EPT</td>
</tr>
<tr>
<td>2</td>
<td>POWER TRANSFER</td>
<td>EPT10</td>
</tr>
<tr>
<td>1</td>
<td>REMOVABLE MULLION</td>
<td>4954</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
<td>LXRX-LC-98-EO</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
<td>LXRX-LC-QEL-98-NL-OP-110MD</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>2</td>
<td>LONG DOOR PULL</td>
<td>9264 36&quot; O</td>
</tr>
<tr>
<td>2</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>PERIMETER SEAL</td>
<td>BY ALM DOOR MFR</td>
</tr>
<tr>
<td>1</td>
<td>MEETING EDGE SEAL</td>
<td>BY ALM DOOR MFR</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>BY ALM DOOR MFR</td>
</tr>
<tr>
<td>1</td>
<td>CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYSTEMS</td>
</tr>
<tr>
<td>2</td>
<td>DOOR CONTACT</td>
<td>679-05HM</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
<td>PS902 900-4RL</td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

OPERATION: DOOR NORMALLY CLOSED AND SECURE. REMOTE SIGNAL VIA CARD READER AND ACCESS CONTROL SYSTEM TO RETRACT LATCHES. FREE EGRESS AT ALL TIMES.

HWSET: 30

DOOR NUMBER:
B101B  B101C

EACH TO HAVE:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
<td>112XY EPT</td>
</tr>
<tr>
<td>2</td>
<td>POWER TRANSFER</td>
<td>EPT10</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
<td>LXRX-LC-QEL-98-EO</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
<td>LXRX-LC-QEL-98-NL-OP-110MD</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>2</td>
<td>LONG DOOR PULL</td>
<td>9264 36&quot; O</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4021 W/18G DROP PLATE</td>
</tr>
<tr>
<td>1</td>
<td>CONCEALED O.H. STOP</td>
<td>100S (FOR INACTIVE DOOR LEAF)</td>
</tr>
<tr>
<td>1</td>
<td>SURF. AUTO OPERATOR</td>
<td>9542 DD MS AS REQ ()</td>
</tr>
<tr>
<td>1</td>
<td>ACTUATOR/BOLLARD</td>
<td>8310-3836TW</td>
</tr>
<tr>
<td>1</td>
<td>ACTUATOR, JAMB MOUNT</td>
<td>8310-818T</td>
</tr>
<tr>
<td>1</td>
<td>ACTIVATION SENSOR</td>
<td>8310-854</td>
</tr>
<tr>
<td>1</td>
<td>CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYSTEMS</td>
</tr>
<tr>
<td>2</td>
<td>DOOR CONTACT</td>
<td>679-05HM</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY</td>
<td>PS902 900-4RL</td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.
COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
COORDINATE ADA OPERATOR OPERATION, SENSOR FUNCTION, AND SENSOR MODEL WITH LOCAL CODES AND OWNER INPUT.
OPERATION: DOOR NORMALLY CLOSED AND SECURE. REMOTE SIGNAL VIA CARD READER AND ACCESS CONTROL SYSTEM TO RETRACT LATCHES. INTERIOR ACTUATOR ALWAYS ENABLED. EXTERIOR ACTUATOR ENABLED REMOTELY BY ACCESS CONTROL SYSTEM. FREE EGRESS AT ALL TIMES.
HWSET: 31

DOOR NUMBER:
B103B    B103D    B103F

ALL HARDWARE BY ACCORDION DOOR MANUFACTURER/SUPPLIER.

HWSET: 32

DOOR NUMBER:
A112B    A112C    A127A    A127C    B101A
B104B    B109B    B109C    C100B

ALL HARDWARE BY OVERHEAD/COILING DOOR MANUFACTURER/SUPPLIER.

HWSET: 33

EACH TO HAVE:
1  MORTISE CYLINDER  20-061 ICX  SCH
1  FSIC CORE  23-030  SCH

BALANCE OF HARDWARE BY KNOX BOX PROVIDER.

HWSET: 34

DOOR NUMBER:
A128D

EACH TO HAVE:
2  PIVOT SET  BY GATE MFR
1  DOOR CORD  798-18 LESS WIRES  SCE
1  PANIC HARDWARE  98-EO-1609/299-WH  VON
1  ELEC PANIC HARDWARE  WPRX-98-L-1609/299-WH  VON
1  RIM CYLINDER  20-057 ICX  SCH
1  FSIC CORE  23-030  SCH
1  GATE MAG LOCK  M490G  SCE
2  FLOOR STOP  FS18L  IVE
1  CREDENTIAL READER  BY SECURITY/ACCESS CTRL SYSTEMS

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
COORDINATE HARDWARE WITH GATE MANUFACTURER/SUPPLIER.
BALANCE OF BY HARDWARE WITH GATE MANUFACTURER/SUPPLIER.
HWSET: 35

DOOR NUMBER:
A128A

EACH TO HAVE:

1  PIVOT SET             BY GATE MFR
1  DOOR CORD            798-18 LESS WIRES     SCE
1  ELEC PANIC HARDWARE  WPRX-98-L-1609/299-WH VON
1  RIM CYLINDER         20-057 ICX           SCH
1  FSIC CORE            23-030              SCH
1  GATE MAG LOCK        M490G              SCE
1  FLOOR STOP           FS18L              IVE
1  CREDENTIAL READER    BY SECURITY/ACCESS CTRL SYSTEMS

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
COORDINATE HARDWARE WITH GATE MANUFACTURER/SUPPLIER.
BALANCE OF BY HARDWARE WITH GATE MANUFACTURER/SUPPLIER.

HWSET: 36

DOOR NUMBER:
A128B

EACH TO HAVE:

2  PIVOT SET             BY GATE MFR
1  DOOR CORD            798-18 LESS WIRES     SCE
1  PANIC HARDWARE       98-EO-1609/299-WH     VON
1  ELEC PANIC HARDWARE  WPRX-98-L-1609/299-WH VON
1  RIM CYLINDER         20-057 ICX           SCH
1  FSIC CORE            23-030              SCH
1  GATE MAG LOCK        M490G              SCE
2  FLOOR STOP           FS18L              IVE
1  CREDENTIAL READER    BY SECURITY/ACCESS CTRL SYSTEMS

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
COORDINATE HARDWARE WITH GATE MANUFACTURER/SUPPLIER.
BALANCE OF BY HARDWARE WITH GATE MANUFACTURER/SUPPLIER.
**HWSET: 37** **PART "C" DEDUCTIVE ALTERNATE**

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>C100C</th>
<th>C100D</th>
<th>C100E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 CONT. HINGE</td>
<td>224XY EPT</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>2 POWER TRANSFER</td>
<td>EPT10</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 REMOVABLE MULLION</td>
<td>4954</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 ELEC PANIC HARDWARE</td>
<td>LXRX-LC-98-EO</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 ELEC PANIC HARDWARE</td>
<td>LXRX-LC-QEL-98-NL-OP-110MD</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>1 RIM CYLINDER</td>
<td>20-057 ICX</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1 FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>2 LONG DOOR PULL</td>
<td>9264 36&quot; O</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>2 SURFACE CLOSER</td>
<td>4050 SCUSH</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1 GASKETING</td>
<td>188</td>
<td>ZER</td>
<td></td>
</tr>
<tr>
<td>2 MULLION SEAL</td>
<td>8780</td>
<td>ZER</td>
<td></td>
</tr>
<tr>
<td>2 DOOR SWEEP</td>
<td>8192</td>
<td>ZER</td>
<td></td>
</tr>
<tr>
<td>1 CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYSTEMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 DOOR CONTACT</td>
<td>679-05HM</td>
<td>SCE</td>
<td></td>
</tr>
<tr>
<td>1 POWER SUPPLY</td>
<td>PS902 900-4RL</td>
<td>VON</td>
<td></td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.

OPERATION: DOOR NORMALLY CLOSED AND SECURE. REMOTE SIGNAL VIA CARD READER AND ACCESS CONTROL SYSTEM TO RETRACT LATCHES. FREE EGRESS AT ALL TIMES.

---

**HWSET: 38** **PART "C" DEDUCTIVE ALTERNATE**

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>C100A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**EACH TO HAVE:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Description</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 REMOVABLE MULLION</td>
<td>4954</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>2 PANIC HARDWARE</td>
<td>98-L</td>
<td>VON</td>
<td></td>
</tr>
<tr>
<td>2 RIM CYLINDER</td>
<td>20-057 ICX</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>2 FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>2 SURFACE CLOSER</td>
<td>4050 SCUSH</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>2 KICK PLATE</td>
<td>8400 8&quot; X 2&quot; LDW B-CS</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1 MULLION SEAL</td>
<td>8780</td>
<td>ZER</td>
<td></td>
</tr>
</tbody>
</table>
## HWSET: 39 PART "C" IF DEDUCTIVE ALTERNATE IS NOT TAKEN

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>C100B-A</th>
<th>C100C-A</th>
<th>C100D-A</th>
<th>C100E</th>
</tr>
</thead>
</table>

**EACH TO HAVE:**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>PIVOT SET</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DOOR CORD</td>
<td>798-18 LESS WIRES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>98-EO-1609/299-WH</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>ELEC PANIC HARDWARE</td>
<td>WPRX-98-L-1609/299-WH</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>GATE MAG LOCK</td>
<td>M490G</td>
<td>VON</td>
</tr>
<tr>
<td>2</td>
<td>FLOOR STOP</td>
<td>FS18L</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>CREDENTIAL READER</td>
<td>BY SECURITY/ACCESS CTRL SYSTEMS</td>
<td></td>
</tr>
</tbody>
</table>

COORDINATE HARDWARE WITH ELECTRICAL, SECURITY AND ACCESS CONTROL SYSTEMS.
COORDINATE HARDWARE WITH GATE MANUFACTURER/SUPPLIER.
BALANCE OF BY HARDWARE WITH GATE MANUFACTURER/SUPPLIER.

## HWSET: 40 PART "C" IF DEDUCTIVE ALTERNATE IS NOT TAKEN

**DOOR NUMBER:**

<table>
<thead>
<tr>
<th>C100A-A</th>
</tr>
</thead>
</table>

**EACH TO HAVE:**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
<td>224XY</td>
</tr>
<tr>
<td>1</td>
<td>REMOVABLE MULLION</td>
<td>4954</td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>98-EO</td>
</tr>
<tr>
<td>1</td>
<td>PANIC HARDWARE</td>
<td>98-NL</td>
</tr>
<tr>
<td>1</td>
<td>RIM CYLINDER</td>
<td>20-057 ICX</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>2</td>
<td>SURFACE CLOSER</td>
<td>4050 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>RAIN DRIP</td>
<td>142</td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
</tr>
<tr>
<td>1</td>
<td>MULLION SEAL</td>
<td>8780</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>8198</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>65A</td>
</tr>
</tbody>
</table>
HWSET: 42 PART "C" IF DEDUCTIVE ALTERNATE IS NOT TAKEN

DOOR NUMBER:
**A128C-A**

EACH TO HAVE:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>CONT. HINGE</td>
<td>224XY</td>
</tr>
<tr>
<td>2</td>
<td>MANUAL FLUSH BOLT</td>
<td>FB458</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK</td>
<td>ND80TD</td>
</tr>
<tr>
<td>1</td>
<td>FSIC CORE</td>
<td>23-030</td>
</tr>
<tr>
<td>1</td>
<td>OH STOP</td>
<td>90S</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>1450 SCUSH</td>
</tr>
<tr>
<td>1</td>
<td>RAIN DRIP</td>
<td>142</td>
</tr>
<tr>
<td>1</td>
<td>GASKETING</td>
<td>188</td>
</tr>
<tr>
<td>1</td>
<td>MEETING STILE</td>
<td>43STST</td>
</tr>
<tr>
<td>2</td>
<td>DOOR SWEEP</td>
<td>8198</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>65A</td>
</tr>
</tbody>
</table>

END OF SECTION
SECTION 10223 - OPERABLE FOLDING PARTITIONS (Revised 7.12.19)

PART 1 GENERAL

1.1 Scope

1.1.1 Furnish and install accordion partition and suspension system specified.
1.1.2 Provide all tools, equipment and labor necessary to complete the accordion partition installation.
1.1.3 No Pocket Storage for Partitions.

1.2 Related Work By Others

1.2.1 Preparation of opening and surrounding construction.
1.2.2 All header, support structure, partition pockets, backing at jambs and wall surface preparation.
1.2.3 All adjacent structure sound attenuation work, insulation and fireproofing as required in section 1.4.

1.3 Submittals

1.3.1 Complete shop drawings, indicating location and product construction details. Include plans, elevations, sections, and attachment to other construction.
1.3.2 Partition covering samples showing full range of colors available.
1.3.3 Manufacturer's literature, including product brochures, technical sheets, installation instructions and operation and maintenance instructions as requested.

1.4 Quality Assurance

1.4.1 Accordion partition acoustical rating shall be verified through testing by qualified independent acoustical testing laboratory in accordance with ASTM E90 and ASTM E413 test procedures.
1.4.2 Surface burning rating shall be class A in accordance with ASTM E84.
1.4.3 Preparation of the opening shall conform to the criteria set forth per ASTM E557.

1.5 Delivery and Storage

1.5.1 Product shall be packaged for shipment from manufacturer in custom-fabricated protective wrapping.
1.5.2 All shipping containers shall be properly marked externally for content and destination.
1.5.3 Contractor shall assume responsibility for delivered product integrity if product is shipped and stored prior to installation. Contractor is responsible for product integrity after wall delivery.
1.5.4 Contractor shall insure the area to be used for uncrating and/or staging the accordion partition prior to installation is clean and free of debris.

1.6 Warranty

1.6.1 KWIK-WALL’s limited warranty guarantees the product to be free from factory originated defects in materials and workmanship for a period of five (5) years from the date of installation.
1.6.2 Pantograhic frame, wheels, trolleys and track shall be guaranteed against operating
failure in the course of normal usage for a period of five (5) years from the date of installation.

PART 2 PRODUCTS

2.1 Acceptable Manufacturers

2.1.1 Kwik-Wall; 1010 E. Edwards, Springfield, IL 62703; Phone: 217-522-5553 Fax: 217-522-1170; www.kwik-wall.com

Accordion partitions shall be Model VL-8 supplied by Curition a division of Kwik-Wall.

2.1.2 Other manufacturers wishing to bid product similar to KWIK-WALL’s VL Series shall submit data to the architect at least ten (10) days prior to bid opening to support compliance with bid specification.

2.1.3 Alternative bidders shall guarantee their product specifications comply with the product specified.

2.2 Operation

2.2.1 Accordion partitions shall be top supported and moved manually to the closed (latched) position or to the open (stacked) position by pulling or pushing the handle through the range of partition movement. The partition shall be secured in the closed position by the latch mechanism, tiebacks or pocket door, if specified, in the closed position.

2.3 Materials

2.3.1 Partition covers shall be fastened to the frame with permanent rivets through concealed nylon webbing, double stitched to the inside surface. Rivets shall not penetrate outer lining and shall not be visible.

2.3.2 Sound retardant liners shall be filled polyvinyl sheets. VL-8 to have 1/2” [13mm] fiberglass blankets.

2.3.3 Covers shall have multi-ply rubberized sweep strips of neutral color, top and bottom, both sides, for sound attenuation. Top sweep strips shall be 1/2” [13mm]. Bottom sweep strips shall be (select):
(A) 1 1/2” [38mm] (standard)
(B) 4” [102mm] for field trimming to compensate for non-level floor conditions.

2.3.4 Internal framing shall be 3/16” [5mm]-diameter wire rod, welded to interlocking, collapsible/extendible full channel hinges and shall provide true pantographic motion. Hinges shall be custom formed 14-gauge [2mm] steel plate, welded to frame at top, bottom and intermediate points not to exceed 3′-6” [1067mm] vertical spacing on any partition over 6′-8” [2032mm] in height. Steel spacing chain shall be installed along the frame centerline to control hinge movement.

2.3.5 Lead and end posts shall be of minimum 14-gauge [2mm] box-channel steel. The lead post shall be mounted to the leading partition edge and will contain die cast chrome plated latch hardware and rubber acoustical seals. All jambs and posts and shall be wrapped with the same material as the partition covers.

2.3.6 Stack dimensions shall be:
2.3.7 Hanging weight shall be:

<table>
<thead>
<tr>
<th></th>
<th>VL-8</th>
<th>VL-6</th>
<th>VL-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>lbs./sq. ft.</td>
<td>7.0 (34.2)</td>
<td>3.7 (18.1)</td>
<td>3.2 (15.6)</td>
</tr>
<tr>
<td>(kg/sq. m.)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.4 Finishes

2.4.1 Panel face finish shall be factory-applied Class "A" rated material (select):

(A) Reinforced vinyl fabric with woven backing weighing not less than 21 ounces per yard [653 g/m].

(B) Carpet of non-woven, 100% Polyester staple fiber with fusible latex backing weighing not less than 23 ounces per yard [745 g/m].

2.5 Options

2.5.1 Available options shall include:

(A) Locks: Both sides.

(B) Radius construction for curved applications as required.

(C) Track switches for alternate storage or multi-location applications as required.

(D) Floating posts for latching of multiple partitions in L, T and X configurations as required.

(E) Sliding jamb boards for pocket storage as required.

(F) Conversion latch as required.

2.6 Suspension System

2.6.1 Track shall be Kwik-Wall #4 architectural grade aluminum extrusion with custom taper design to prevent wheel chatter. Optional aluminum ceiling guard shall be available. Track mounting shall be (select): Surface Mounted or Concealed.

2.6.2 Frame shall be supported by 1” [25mm] steel wheels mounted over matched precision bearings, with nylon tires affixed to load rated, heat treated swivel joint carriers.

2.6.3 Carriers shall be four-wheel units at the lead post and two-wheel units at every support point, with spacing of carriers not to exceed 11” [279mm] apart.

2.7 ACOUSTICAL PERFORMANCE

2.7.1 An accredited acoustical testing laboratory (U.S. Commerce, NVLAP) shall have tested laboratory acoustical performance of the partition in accordance with ASTM E90 test standards. Laboratory Sound Transmission Classification (STC) ratings shall be:

<table>
<thead>
<tr>
<th></th>
<th>VL-8</th>
<th>VL-6</th>
<th>VL-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC</td>
<td>40</td>
<td>38</td>
<td>35</td>
</tr>
</tbody>
</table>

2.7.2 Copies of original test reports shall be made available upon request.

PART 3 EXECUTION

3.1 Preparation
3.1.1 Preparation of opening to house accordion partition shall be by others in accordance with architectural plans, manufacturers shop drawings and ASTM E557.

3.1.2 Prior to installation, a manufacturer-authorized representative shall inspect the accordion partition. Any discrepancies noted shall be brought to the attention of the site supervisor, architect and manufacturer for remediation.

3.2 Installation

3.2.1 Installation shall be accomplished in strict accordance with approved shop drawings and architectural plans.

3.2.2 Installation shall be accomplished by an authorized representatives in full compliance with manufacturer's written instructions (included with each shipment).

3.2.3 General Contractor shall be responsible for on-site product integrity.

3.2.4 Installer shall train owner's representatives in proper wall operation and maintenance.

3.2.5 Installer shall insure removal and proper disposal of all shipping materials and packaging associated with the accordion partitions from the work site upon completion of the installation.

END OF SECTION
SECTION 13312 - TENSIONED FABRIC STRUCTURES (Revised 7.11.19)

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions and division 1 Specification Sections apply to this section.

1.2 SUMMARY

The shade structure contractor shall be responsible for the design, engineering, fabrication, supply and installation of the work specified here in.

A. The Shade Structures must comply with the latest revision of the applicable codes and regulations including the International Building Code (IBC) 2012.

B. American Society of Testing materials (ASTM).


1.3 SUBMITTALS

A. Provide proof of installed reference sites with structures of similar scope of project and installation that are engineered to IBC specifications. Include in reference list of structure dimensions with install date and project location.

B. Provide proof of all quality assurance items including:
   1. Proof of general liability, professional liability, and umbrella insurance as per section 1.5C.
   2. Proof of a minimum of $6,000,000 aggregate bonding capacity as per Section 1.5D.
   3. Proof of a Corporate Safety Program along with an injury and Illness Prevention Program.
   4. Proof of an Annual Maintenance Inspection Program.
   5. Proof of a Corporate Quality Control Manual as per Section 1.5F

1.4 QUALITY ASSURANCE

A. A single shade contractor shall design, engineer, manufacture, and erect the shade structure(s).

B. All bidders shall engineer to IBC 2012 requirements with similar scope.

C. All bidders shall be able to provide proof of a minimum of $1,000,000 general/public liability insurance, $3,000,000 professional liability (PL) insurance, and an additional $5,000,000 umbrella/excess liability insurance.

D. The shade structure contractor shall have a Corporate Quality Control program and manual describing their complete quality assurance program.
E. All bidders must have an in-house warranty and service department to assist in repairs and service calls.

1.5 PROJECT CONDITIONS

Field Measurements: Verify layout information for the shade structure(s) shown on the project drawings in relation to the property survey and existing structures, and verify locations by field measurements prior to construction for the shade structures.

1.6 WARRANTY

A. The successful bidder shall provide a 12-month warranty on all labor and materials.

B. A supplemental limited warranty from the manufacturer shall be provided for 20 years Non-Prorated against Structural Integrity of the steel components and 10 years Prorated on the fabric canopy(s).

PART 2 – PRODUCTS

2.1 GENERAL

A. Scope

1. (1) 16’ X 40’ Hypar Sail Shade with 6 columns, consisting of 3 columns with attachment points at 8’ and 3 column with an attachment point at 12’ (columns alternate heights)

2. (1) Hypar Sail Shade manufactured from HDPE mesh fabric and all hardware to attach to the 6 columns

3. Structure columns shall have base plates mounted 6” below final grade.

4. Manufacture to supply steel bolt templates 2 weeks prior to structure shipment to allow time for footer installation and cure time.

B. Manufacturer

The proposed shade structure(s) to be manufactured by Superior Recreational Products Shade Division, also recognized as (SRP Shade or Superior Shade) or approved equal, shall be modular and pre-fabricated, and include the structural steel frame, fabric roof, steel cables and all fasteners.

1. Manufactured by:

   SRP Shade
   1050 Columbia Dr.
   Carrollton, GA 30117

2. Distributed by:

   Great Southern Recreation
   Kyle Peggram
   470-298-2428
   kyle@greatsouthernrec.com

3. Or Equal: Standard for approved equal. Ten (10) days prior approval required for substitution of product design, materials and features specified above. Submittals must
include plans, drawings, cut sheets, material data sheets, testing results and samples. Bids failing to meet this requirement will be deemed non-responsive.

C. Materials

1. Fabric Specifications Manufactured as ALNET ExtraBlock
   A. The fabric knit is to be made using Monofilament and tape HDPE yarns.
   B. UV shade fabric is made of UV stabilized materials.
   C. The high-density polyethylene material shall be manufactured with tensioned fabric structures in mind.
   D. Shade fabric has a weight Ave. of 9.6oz. sq. yd.
   E. Material to be Rachel-knitted to ensure material will not unravel if cut.
   F. Burst Strength of 363 lb. (ASTM 3786)
   G. Cloth meets fire resistance tests as follows:
      1. Alnet Extra Block: California State fire Marshall Reg. #F-93501
      2. Others: NFPA 701-99 (Test Method 2). ASTM E-84
   H. Fabric Properties:
      1. Tear Tests (lbs/ft): WARP 33 and WEFT 36 (ASTM D2261)
      2. Burst Test (lbs ft): 363 lbs. (ASTM D3787)
      3. Fabric Weight (oz/sqFT) Average: 1.02 to 1.07
      4. Roll Length 150'
      5. Roll Size: 63" x 16.5"
      6. Weight: 120 lbs.
      7. Life Expectancy: 10 Years
      8. Fading: Minimum fading after 6 years (Note: 3 years for Red and Yellow)
      9. Minimum Temperature: -77 degrees F
      10. Maximum Temperature: 167 degrees F

2. Fabric Specifications Manufactured as Monotec 370
   A. The fabric knit is to be made using only Round Monofilament HDPE yarns.
   B. UV shade fabric is made of UV stabilized materials.
   C. The high-density polyethylene material shall be manufactured with tensioned fabric structures in mind.
   D. Shade fabric has a weight of 11.0 oz. sq. yd.
   E. Material to be Rachel-knitted to ensure material will not unravel if cut.
   F. Burst Strength of 533.9 lb (ASTM 3787)
   G. Cloth meets fire resistance tests as follows:
      1. Monotec 370 FR: California State fire Marshall Reg. #F-03301
      2. Others: NFPA 701-99 (Test Method 2). ASTM E-84
   H. Fabric Properties:
      1. Tear Tests (lbs/ft): WARP 49.3 lbs. and WEFT 63.8 lbs. (ASTM D5587)
      2. Burst Test (lbs ft): 533.9 lbs. (ASTM D3787)
      3. Fabric Weight (oz/sqFT) Average: 1.22
      4. Roll Length 165 ly
      5. Roll Size: 128" x 12"
      7. Life Expectancy: 15 Years for the ASTM E84 rated product, 10 Years for the FR rated product ASTM E84, NFPA 701 Method 2, California Title 19
      8. Minimum Temperature: -70 degrees F
      9. Maximum Temperature: 170 degrees F
3. Thread
   A. Shall be 100% expanded PTFE fiber which carries a 10-year warranty that is high
      strength and low shrinkage.
   B. Shall have a wide temperature and humidity range.
   C. Abrasion resistant and UV radiation immunity.
   D. Shall be unaffected by non-hydrocarbon based cleaning agents, acid rain, mildew,
      rot, chlorine, saltwater, and pollution.
   E. Lockstitch thread – 1200 Denier or equal.
   F. Chain stitch thread – 2400 denier or equal

4. Steel Tubing
   A. All fabricated steel must be in accordance with approved shop drawings and
      calculations.
   B. All steel is cleaned, degreased or etched to ensure proper adhesion of powder-coat
      in accordance with manufactures specifications.
   C. All Steel used on this project needs to be new and accompanied by the mill
      certificates if requested. Structural steel tubing up to 5”-7 gauge shall be galvanized
      per Allied Steel FLO-COAT specifications. Schedule 49 black pipe fabrications shall
      be sandblasted and primed as described below.
   D. All non-hollow structural shapes comply with ASTM A-36, unless otherwise noted.
   E. All hollow structural steel shapes shall be cold formed HSS ASTM A-53 grade C,
      unless otherwise noted.
   F. Plate products shall comply with ASTM A-36.

5. Powder Coating and Priming
   A. All steel (galvanized and non-galvanized) must be coated with rust inhibiting primer
      prior to applying the powder coat. Primer shall be Marine Grade Cardinal Industrial
      Finishes Corp. E396 – GR1372 epoxy powder coating semi-gloss smooth zinc rich
      primer.
   B. All non-galvanized steel shall be sandblasted and primed prior to powder coating
      using brown fused aluminum oxide grit and the aforementioned primer.
   C. All steel parts shall be coated for rust protection and finished with a minimum 3.5 mil
      thick UV-inhibited weather resistant powder coating.
   D. Power used in powder-coat process shall have the following characteristics:
      1. N.3.1 | Specific Gravity | 1.68+/-.05
      2. N.3.2 | Theoretical Coverage | 114+/-.4 ft. 2/lb/mil
      3. N.3.3 | Mass Loss During Cure | <1%
      4. N.3.4 | Maximum Storage Temperature | 75 degrees F
   E. Powder-coating shall meet the following tests:
      1. ASTM | Gloss at 60 | 85 to 95
      2. HOI TM 10.219 | PCI Powder Smoothness | 7
      3. ASTM D2454-91 | Over-Bake Resistance Time | 200%
      4. ASTM D3363-92A | Pencil Hardness | H-2H
      5. ASTM D2794-93 | Dir/Rev Impact, Gardner | 140/140 in./lbs
      6. ASTM D3359-95B | Adhesion, Cross Hatch | 5B PASS
      7. ASTM D522-93A | Flexibility Mandrel | ¼” Diameter, No Fracture
      8. ASTM B117-95 | Salt Spray | 1000 Hours
      9. UL Dtov2 | Organic Coating Steel Enclosures, Elect Eq. | Recognized
   F. Application Criteria:
      1. N.5.1 | Electrostatic Spray Cold | Substrate: 0.032 in. CRS
6. Welding
   A. All shop welds shall be executed in accordance with the latest edition of the American Welding Society Specifications.
   B. Welding procedures shall comply in accordance with the AWS D1.1-AWS Structural Welding Code-Steel.
   C. All welds to be performed by a certified welder. All welds shall be continuous where length is not given unless otherwise shown or noted on drawings.
   D. All welds shall develop the full strength of the weaker member. All welds shall be made using E70xx.035 wire.
   E. Shop connections shall be welded unless noted otherwise. Field connections shall be indicated on the drawings. Field welded connections are not acceptable.
   F. All filet welds shall be a minimum of ¼" unless otherwise noted.
   G. All steel shall be welded shut at terminations to prevent internal leakage.
   H. Internal weld sleeving is not acceptable.
   I. On-site welding is not acceptable.

7. Sewing
   A. On-site sewing of a fabric will not be accepted.
   B. All corners shall be reinforced with Kevlar® extra non-tear cloth and strap to distribute the load.
   C. The perimeters that contain the cables shall be double lock stitched.

8. Installation Hardware
   A. Bolt and fastening hardware shall be determined based on calculated engineering loads.
   B. All bolts shall comply with SAE-J429(Grade 8) or ASTM A325 (Grade BD). All nuts shall comply with the ASTM F-594, alloy group 1 or 2.
   C. Upon request, Stainless Steel hardware shall comply with ASTMA-304.
   D. ⅛” galvanized wire rope shall be 7x19 strand with a breaking strength of 7,000 lbs. for shades generally under 575 sq. ft. unless requested larger by the customer. For shades over 575 sq. ft., cable shall be 5/16” with a breaking strength of 9,800 lbs. Upon request, ¼” Stainless Steel wire rope shall be 7x19 strand with a breaking strength of 6,400 lbs. 5/16” Stainless steel wire rope shall be 7/19strand with a breaking strength of 9,000 lbs.
   E. All fittings required for proper securing of the cable are hot dipped galvanized.

PART 3 – EXECUTION

3.1 INSTALLATION
   A. Installations of shade structure(s) shall be performed by an installer who shall follow the manufacturer’s instructions for assembly, installation, and erection, per approved drawings.
   B. Concrete
      1. Concrete work shall be executed in accordance with the latest edition of American Concrete Building Code ACI 318 unless specified by the governing municipality.
      2. Concrete specifications shall comply in accordance with, and detailed as per plans as follows:
         A. 28 days Strength F’c = 2500 psi
B. Aggregate: HR
C. Slump: 3-5
D. Portland Cement shall conform to C-150
E. Aggregate shall conform to ASTM C-33
3. All reinforcement shall conform to ASTM A-615 grade 60
4. Reinforcing steel shall be detailed, fabricated and placed in accordance with the latest ACI Detailing Manual and Manual of Standard Practice.
5. Whenever daily ambient temperatures are below 80 degrees Fahrenheit, the contractor may have mix accelerators and hot water added at the batch plant. (see table 1)
6. **TABLE 1**

<table>
<thead>
<tr>
<th>Temperature Range %</th>
<th>Accelerator Type</th>
<th>Accelerator</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-80 degrees</td>
<td>1% High Early</td>
<td>(non calcium)</td>
</tr>
<tr>
<td>70-75 degrees</td>
<td>2% High Early</td>
<td>(non calcium)</td>
</tr>
<tr>
<td>Below 70 degrees</td>
<td>3% High Early</td>
<td>(non calcium)</td>
</tr>
</tbody>
</table>

C. Footings
1. All anchor bolts set in new concrete shall be ASTM A-307, or ASTM F-1554 if specified by engineer.
2. All anchor bolts shall be zinc plated unless specified otherwise.
3. Footing shall be placed in accordance with and conform to engineered specifications and drawings.

END OF SECTION
These specifications sections were prepared by and under the direct supervision of the Engineer of Record for this project.

Division 15 – MECHANICAL
15010  Mechanical General Provisions
15400  Plumbing
15700  Heating, Ventilating & Air Conditioning
15710  Variable Refrigerant Flow (VRF) System
15720  Packaged Pad Mounted Gas Fired, DX Cooling Dehumidification Unit (DHU)

July 12, 2019
SECTION 15010

GENERAL MECHANICAL PROVISIONS

PART 1. GENERAL

1.1. General Requirements: Division One is applicable in full hereto. For the purpose of this specification the word, "provide", shall mean, "furnish and install, complete and ready for use". No materials or products that contain asbestos, formaldehyde, lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

Manufacturers not named in the specifications require prior approval, seven (7) days prior to bid date. Follow procedures set forth in Division 1 of the specifications.

1.2. Spare Parts: Manufacturer of any equipment specified shall have a wholesale outlet for readily available replacement parts in the nearest major USA city.

1.3. Codes and Standards and Listings: Unless specified otherwise, comply with all current editions of all referenced publications within these specifications and all current editions of applicable NFPA, ASME, OSHA, IBC, ASHRAE, ASTM, ASME, ANSI, SMACNA, Americans with Disabilities Act (ADA), 2010 ADA Standards for Accessible Design, with Local Building Codes, Mechanical Codes, Gas Codes, Plumbing Codes, ANSI/ASHRAE/IESNA Standard 90.1 (2013), International Energy Conservation Code (IECC), International Fuel Gas Code (IFGC), International Fire Code (IFC), Americans with Disability Act Accessibility Guidelines (ADA) and with all applicable local ordinances and codes. Equipment shall bear Underwriters Laboratories Inc. (UL) listing label, Canadian Standards Association (CSA) listing label or ETL approved rating. All electrical components and products shall also comply with the respective Code of Federal Regulations (CFR).

Where conflicts occur between a Code, Standard or Listing and the contract drawings or contract specifications, the most stringent requirements shall govern and be applied. Advisory provisions listed in all Codes referenced in the Contract Documents are mandatory and the word “should” shall be interpreted as “shall”.

1.4. Permits: Provide all permits, pay all fees and arrange for inspections as required by all applicable Governing Authorities. Furnish certificates of all inspections and approvals from all Governing Authorities. Provide additional materials, parts, methods, etc. and modify the work as required by Governing Authorities’ Inspections and Regulations. Correct all deficiencies required by Code officials at no additional cost to the Owner or the Owner’s Project Design Professionals.

1.5. Inspections: It is the contractor’s responsibility to have the job ready for inspections when they are scheduled. If the project is not ready for the requested inspection and the Architect, any governmental agency or any other entity requires a re-inspection, the contractor shall pay Zgouvas, Eiring & Associates a re-inspection fee of $1,500. The payment shall be made directly to Zgouvas, Eiring & Associates 5 days prior to the scheduled re-inspection.

The Contractor shall also refer to Paragraph “Identification” in this Section of the specifications and note that identification shall be completed before certain inspections. Failure to comply with the identification section of the specification
1.6. **Drawings:** In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, all required appurtenances for duct and piping, ducts, and equipment with the architectural and electrical drawings, and lay out work to fit in with ceiling grids, lighting and other parts. Make minor adjustments in the field as required to provide the optimum result to facilitate ease of service, efficient operation and best appearance. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision, in writing, before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question. **DO NOT SCALE** the Plumbing, Fire Protection or HVAC drawings. The various scales used on the drawings do not allow for all fittings, offsets and accessories that may be required to complete the work. The Contractor shall carefully investigate the conditions that would affect the work to be performed and shall arrange such work as necessary to comply with the intent of the construction documents. Refer to Architectural drawings for dimensions and verify scale shown on the drawings. All drawings are diagrammatic and are intended to quantify the materials specified and indicate their intended relationship to each other. The drawings and specifications are complementary and work shown, but not specified, or specified, but not shown, shall be the same as though required by both.

The Contractor shall carefully examine the contract documents during the bidding phase. Any missing information in the contract documents that is required for obtaining accurate pricing shall be brought to the attention of the Architect, **prior to bid date**, so all may be clarified and/or corrected. Failure to identify and resolve the issues prior to bid shall require the Contractor to provide said items, complete, without additional cost to the Owner or the Owner’s Project Design Professionals, using materials and methods specified by, and as directed by, the Owner’s Design Professionals.

1.7. **Conflicts, Coordinations and Changes:** In the event that interferences or conflicts occur, the Architect shall decide which equipment shall be relocated regardless of which was first installed. In the interest of avoiding such conflicts, each Sub-Contractor who is using common space, etc., shall coordinate his work with all other trades and other parts of his own work. If, during this coordination, it is discovered that necessary or desirable changes should be made, advise the Architect and secure his decision in writing. Do not fabricate any duct nor install any pipe until all coordination has been accomplished.

1.8. **Coordination Drawings:** Follow procedures set forth in Division One. Before starting work, submit for approval, coordination shop drawings showing proposed arrangement of equipment, all piping, ducts, floor drains, power requirements, and controls. As a minimum, submit detail layouts of potential conflicts at plumbing risers, equipment rooms, limited ceiling space, etc. Refer to subsequent Sections for additional specific requirements.

Failure to submit shop drawings will make the Contractor responsible for changes required to facilitate installation of, and the proper operation of, all systems at no additional cost to the Owner or the Owner’s Project Design Professionals.

1.9. **Maintenance, Replacement and Service Access:** Locate equipment as shown on the plans. The Contractor shall install equipment, valves, piping, etc. with the maintenance, service and replacement access required by the Manufacturer of the respective
installed item. All items shall be installed to provide maximum safety, service, replacement and maintenance access. All piping with valves, mechanical equipment and other items that may require maintenance, service or replacement, shall be located no more than 24” above the finished ceiling and no more than 14'-0” above finish floor in areas without ceilings, to ensure proper access.

Coordinate all questionable access or location of items that may present a problem, if installed as specified above, with the Engineer or the Architect’s field representative prior to installing any item; else, relocation will be at the Contractor’s expense once discovered.

1.10. Warranty: Refer to Division 1. Additionally, guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of substantial completion of the project as determined by the Architect, to include a minimum of five (5) years for all air conditioning equipment compressors. Provide free maintenance and service during the guarantee period. See other Division 15 Sections for additional requirements for guarantee of air conditioning compressors, air filter replacement, sensor operated plumbing fixtures, etc.

1.11. Submittal Data: Partial or incomplete submittals will not be reviewed. Within 25 days after award of the contract, submit for approval a complete schedule of material and equipment proposed. When incomplete schedules of materials and equipment are submitted, the Contractor is responsible for providing all items as specified. Include catalog data, scheduled capacities, fan curves, sound data, etc.

Manufacturers not named in the specifications require prior approval. Follow procedures set forth in Division 1 of the specifications. Where substitutions are proposed, unless the Contractor states in writing, on a separate summary sheet in the front of the respective submittal, the differences of the substituted equipment or material, he shall be held responsible to replace such items any time discrepancies are found.

All submittals shall be separately bound in pdf format. Submittals shall be electronically indexed and tabbed. Refer to the Architectural General Conditions and Division 1 for the format required by the Architect.

A cover sheet shall be provided in the front of the submittal package which states, as a minimum, the Project name and location, the name of the Owner, the Architectural firm, the Engineering firm, the General Contractor, the Mechanical Contractor and each Contractors’ point of contact, with phone number. A summary sheet shall be inserted at the beginning of each tabbed section to summarize the contents of each respective tabbed section. The summary sheet shall include any items that have been changed or removed due to Project cost constraints, addendums or Value Engineering (VE). Failure to include items changed or removed due to Project cost constraints, addendums or VE items that require an additional review by the Engineer will require the Contractor to reimburse the Engineer a minimum of $500 for time involved to review the corrected submittal.

Submittals shall include materials used, methods of installation, product manufacturer, equipment capacities, etc. HVAC equipment items shall follow the identical tabular format, category by category, shown on the HVAC equipment schedules. As a minimum, the summary sheet shall indicate the submitted values compared to each of the specified values. Failure to provide the submittals in the format specified will be cause for automatic rejection without review. Plumbing and Fire Protection
The General Contractor shall review and approve all submittals prior to submitting them to the Architect. Submittals without the General Contractor’s approval will be rejected without review.

1.12. **Submittal Rejection and Resubmittal:** The Contractor shall carefully review the submittal data requirements specified above. Pay particular attention to specific items within the specifications that are cause for immediate rejection when submittals are not provided to the Engineer as specified. Any submittal or portions thereof that are rejected TWICE and resubmitted a third time for review will require the Contractor to reimburse the Engineer for his time. **The minimum fee for reviewing any item or submittal a third time is $500.**

1.13. **Site and Existing Conditions:** Bidders shall visit the site and become acquainted with all job conditions. Report to the Architect, prior to bid, any conditions that are required to accomplish the installation of all systems. Provide for required adjustments to complete the intent of the work. No consideration will be given after bid opening for alleged misunderstanding regarding job conditions, utility connections, permits, fees, etc.

1.14. **Line Locators:** Before proceeding with excavating or trenching, arrange with the Owner, all utility companies, and line locating firm(s) to describe and mark all of the systems which might be damaged by construction operations.

1.15. **Phasing:** Interrupt existing services only at times approved by the Architect and the Owner. The General Contractor shall provide a written request to the Architect and the Owner for permission to interrupt services to the facility. The request shall be provided a minimum of seven (7) days prior to the desired date of the interruption. Hold interruptions to a minimum in duration and frequency.

1.16. **Record Documents:** Provide in such detail, as is set forth under General and Supplemental Conditions.

   Additionally, keep an accurate record of changes made during construction. The Contractor shall complete the Record Documents, using the As-Built Drawings from the General Contractor’s construction site office. Transfer these changes to a set of reproducible copies of original drawings that the Architect will sell to Contractor at printing cost. The drawings will be provided to the Contractor “As Is”. The final drawing set within the Record Documents shall be labeled “Record Documents” in the Title Block and shall not include “clouds” or other indications of the changes during the project process. The Contractor shall provide hard copies and an electronic set of all documented modifications to the contract documents.

   The Contractor is responsible for providing and showing all changes to the drawings that are different from the original contract drawings, including but not limited to addendums, change-orders, VE items, RFI’s, test reports, field observation/inspection reports, etc. Hard copy plans may be a set of reproducible copies of the final corrected contract drawings. When work is completed, submit corrected reproducible drawings to the Architect for record and include copies in the Owner’s Operating and Maintenance Manual. Record documents shall also be provided in PDF digital format on CD-R type CD(s).

   Drawing files shall be provided (as a minimum) in ACAD (AutoCAD) 2018 format. Verify ACAD Release version desired by the Owner and provide as required. DXF or DWF
files are not acceptable. If desired, the Contractor may obtain CAD files from the Engineer for a fee of $150 per sheet. The Contractor shall also be required to sign a letter of agreement pertaining to the use of the electronic files and the Contractor’s responsibilities for the use of those electronic files, prior to the Engineer sending the electronic files. The ACAD files will be provided to the Contractor “As Is”. The Contractor is responsible for providing and showing all changes to the drawings that are different from the original contract drawings, including but not limited to addendums, change-orders, VE items, RFI’s, test reports, field observation/inspection reports, etc.

PART 2. WORK RELATED TO OTHER TRADES

2.1. **Foundations and Supports:** Respective Plumbing, Fire Protection or Mechanical Contractor, as applicable, shall provide foundations, supports, etc. not specified under other Divisions and as required to mount all items in a safe, sound, professional and structurally sound manner. The respective Contractor shall provide all supplemental steel between various types of structural members, including between bar joists, purloins, miscellaneous structural items, etc. as required for the item(s) proper support. Where the Contractor has doubt as to proper supporting requirements, he shall consult with, and seek the guidance of, the Architect and the project Structural Engineer. Consult all contract documents pertaining to other trades to determine extent of their work. Concrete pads for outside equipment are specified under other Sections. Concrete work shall meet requirements of Division 3.

2.2. **Pipe Sleeves:** Fit all pipes passing through walls, partitions and floors (except slabs on grade construction) with sleeves. Sleeves shall be built-in as work progresses. Sleeves in existing construction shall be firmly grouted in place.

Sleeves for piping passing through exterior walls or exterior partitions that contain refrigerant piping or condensate shall be Schedule 40 PVC pipe, 1” larger in diameter than piping and piping covering.

Sleeves for any piping passing through interior walls or partitions above the ceiling shall be 16 gage galvanized steel, 1/2” larger in diameter than pipe or piping covering and shall extend a minimum of 1” on each side of the interior wall or partition **and firestopped**. See plan details.

Where any piping passes through interior walls or partitions located in the return air plenum, sleeves shall be galvanized as specified above. **NO COMBUSTIBLES ARE ALLOWED IN A RETURN AIR PLENUM OR RETURN AIR PLATFORM.**

All floor sleeves, except slab on grade, shall be cast-in-place schedule 40 steel pipe. Floor sleeves shall terminate 4” above finish floor or housekeeping pad, as applicable, and 4” below the bottom side of the concrete foundation as applicable.

Any pipe that passes through a below grade foundation wall shall be provided with a relieving arch, or a pipe sleeve pipe shall be built into the foundation wall. The sleeve shall be two pipe sizes greater than the pipe passing through the wall. Example: A 4” uninsulated pipe shall require a 6” sleeve. Piping installed through a foundation wall shall be structurally protected from any transferred loading from the foundation wall. The annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete or masonry wall. Sealant selected for the earth side of the wall shall be compatible with damp proofing/waterproofing materials that are specified in Architectural section of the
specifications to be applied over the joint sealant.

2.3. **Access Panels and Doors**: All access panels or doors required in the natatorium space shall be as specified below except constructed with aluminum. Do not locate serviceable items above inaccessible, hard ceilings without written approval from the Architect. Coordinate all items locations with the Architectural ceiling plans before installing any items. Furnish access panels and doors to the General Contractor for installation wherever required for access to valves, controllers, actuators, motorized dampers, air vents, cleanouts, smoke detectors, fire dampers, smoke dampers and similar devices. Doors/panels shall be suitable for wall or ceiling finish involved, 16" x 16" unless otherwise indicated or as required to permit removal of equipment and acceptable maintenance access. Access panels and doors shall be fire rated where rated assemblies are penetrated. Access panels and doors for items located outdoors shall be weatherproof.

Provide access doors/panels upstream and downstream in ductwork of all duct-mounted coils, electric duct heaters, duct smoke detectors, and downstream of all VAV terminal units’ coils.

Provide access doors/panels in all plenums behind outside air intake louvers and relief air louvers to facilitate cleaning of bird screens. Doors/panels in plenums at outside air intake louvers and relief air louvers shall be minimum 10" wide x full height of plenum.

See specification section 15010, "Miscellaneous Requirements, Identification" for materials and methods required. Access panels and doors shall be as manufactured by Milcor, Philip Carey, Zurn, Mifab or other approved equal. The Architect must approve the use of, and type of, panels and doors to be installed in areas that are exposed to view and in finished areas. Exposed access panels and doors shall be factory cleaned and primed for painting in the field. Colors shall be as selected by the Architect. Refer to Architectural Section, Painting, for additional information.

Where device occurs above a lift-out acoustical ceiling panel, provide engraved plastic labels of type specified in "Miscellaneous Requirements, Identification" below.

In addition to identification of items above the ceiling, provide engraved plastic labels below the item, on the ceiling grid. Engraved plastic labels shall match ceiling grid color and be neatly glued to the ceiling grid adjacent to the ceiling tile that should be removed for access to the item. The label shall have engraved on it the item being identified and its designation as shown on the plans, valve chart, etc. Refer to Section "Identification" below for additional requirements.

2.4. **Cutting and Patching**: Openings are to be laid out and built-in. Furnish detailed layout drawings to other trades in advance of their work. Failure to furnish layout shop drawings to General Contractor shall make the applicable Mechanical/Plumbing/Fire Protection Contractor responsible to rebuild openings as directed by the Architect. Piping within walls or behind walls must be installed before wall is erected. Otherwise, walls, etc. affected must be reworked by trade which erected it at expense of the respective Contractor. Chasing and cutting of new work will not be accepted.

2.5. **Painting and Finishing**: Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts (except duct straps/band hangers), piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc. Include black steel pipe, uncoated
cast iron pipe, hangers, brackets, etc. **Bare, unprotected/uncoated steel or galvanized hangers, brackets, unistrut, supports, etc., are not allowed.** In lieu of painting, the Contractor may substitute factory painted, powder coated or epoxy coated items to prevent rusting of the items listed above.

All items within the pool equipment room, pool chemical storage room and the natatorium do not require painting. All hangers, straps, hanger rods, etc. within those spaces shall be aluminum with chlorine resistant epoxy coating or powder coating.

All paints and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements.

Painting of ducts, piping, grilles, diffusers and other surfaces in finished areas is specified in Architectural Section "Painting" or similar section. Refer to those sections for requirements. Where the Architectural specifications require items to be painted, the Contractor shall furnish it with a Manufacturer provided, factory applied prime coat.

Where factory finished items are marred, scratched or damaged, replace the item, or upon approval from the Architect or Owner, refinish or touch-up as required to bring to a like new condition.

**PART 3. EXCAVATION, TRENCHING & BACKFILLING**

3.1. **Broken Pavement:** In public streets or on the project site, backfill and repair to satisfaction of authorities having jurisdiction and the Architect.

**PART 4. PIPE HANGERS AND SUPPORTS**

4.1. **General:** Provide factory fabricated pipe hangers and supports for all piping of type and size specified bolts, washers, etc. as required for a complete functional installation. Material items, methods and general requirements not covered in this specification shall be provided in strict accordance with current edition of Manufacturer’s Standardization Society Specification MSS SP-58 and Manufacturer’s Published Product Information. All items shall be sized as required, at a minimum, to support TWICE (2x) the anticipated weight unless specified to be higher.

**ALL ITEMS WITHIN THE POOL EQUIPMENT ROOM, POOL CHEMICAL STORAGE ROOM AND THE NATATORIUM SHALL BE ALUMINUM WITH CHLORINE RESISTANT EPOXY OR POWDER COATED FINISH.**

4.2. **Painting:** **Bare, unprotected/uncoated steel or galvanized hangers, brackets, supports, etc., are not allowed.** Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of any piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. In lieu of painting, the Contractor may substitute factory painted, powder coated or epoxy coated items to prevent rusting of the items listed above. All paints and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements.
All items within the pool equipment room, pool chemical storage room and the natatorium do not require painting. All hangers, straps, hanger rods, etc. within those spaces shall be aluminum with chlorine resistant epoxy coating or powder coating.

4.3. **Spacing:** Install supports as required to prevent sags, bends or vibration. Provide additional building supports and attachments where support is required for additional concentrated loads, including valves, in-line pumps, flange guides, strainers, expansion joints and at all changes in direction of piping.

At no-hub pipe, support as specified below for cast iron piping.

**In all cases,** provide on all sides of, and within 6 inches of, all elbows, take-off fittings, joints, valves, any change in direction of item supported, at ends of branches over 5 feet long and on centers not exceeding the following:

<table>
<thead>
<tr>
<th>Piping Material</th>
<th>Pipe Size</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper tubing</td>
<td>1 1/4” or less</td>
<td>6 ft. Horizontal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 ft. Vertical</td>
</tr>
<tr>
<td></td>
<td>1 1/2” or larger</td>
<td>8 ft. Horizontal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 ft. Vertical</td>
</tr>
<tr>
<td>Cast Iron</td>
<td>All</td>
<td>4 ft. Horizontal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 ft. Vertical</td>
</tr>
<tr>
<td>Steel pipe</td>
<td>All</td>
<td>6 ft. Horizontal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 ft. Vertical</td>
</tr>
</tbody>
</table>

Where cast iron pipe is installed in 10ft. lengths, spacing may be increased to 8ft. In addition to specified cast iron support requirements, provide additional support for cast iron pipe within 6” of each fitting on all sides of the fitting.

| Schedule 40 PVC  | All                | 4 ft Horizontal  |
|                 |                    | 8 ft. Vertical   |
| Schedule 40 CPVC| 1” or less         | 3 ft. Horizontal |
|                 |                    | 5 ft. Vertical   |
|                 | Greater than 1”    | 4 ft. Horizontal |
|                 |                    | 6 ft. Vertical   |

For Schedule 40 PVC or CPVC pipe sizes 2” and smaller, a guide shall be installed midway between the required vertical supports. Such guides shall prevent pipe movement in a direction perpendicular to the axis of the pipe.

4.4. **At Typical Suspended Horizontal Pipe:** Painted, powder coated or epoxy coated adjustable clevis or split-ring type equal to Elcen Fig. 12 or 10c. See part “Hanger Rods” below for limitations on use of clevis hangers. Do not use clevis hangers for refrigerant piping. See refrigerant piping support requirements in Section 15700, Refrigerant Piping and Accessories. Painted, powder coated or epoxy coated items
shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

4.5. **Sway Bracing**: For all drainage piping greater than 4 inches, restraints shall be provided for drain pipes at all changes in direction and at all changes in diameter greater than two pipe sizes. Braces, blocks, rodding and other suitable methods as required by the coupling manufacturer shall be utilized. Sway bracing shall be Eaton/Cooper B-Line Tolco Steel Pipe Clamps for Sway Bracing, transitional fittings, bracing, etc. as required for a complete sway braced assembly. The entire bracing assembly shall be selected and sized by the Manufacturer. All components of the finished assembly shall be of a single manufacturer, resulting in a UL listed and FM approved sway bracing assembly. Eaton/Cooper B-Line is basis of design. Equivalents by Anvil International, Rilco Manufacturing Co and Piping Technology and Products will be considered.

4.6. **Manifolds and Parallel Runs**: At his option, Contractor may provide a painted; powder coated or epoxy coated Unistrut system complete with standard fittings, clamps and accessories required. Refer to “Hanger Rods” below for locations that require a unistrut assembly. Furnish for approval proposed system components. Regardless of system used, **piping insulation shall be continuous and not cut away for installation of clamps**, etc.

Unistrut assemblies shall also be provided for refrigerant piping. Refer to Section 15700, Refrigerant Piping and Accessories for additional requirements.

4.7. **Where in Contact with Copper Pipe**: Same as above except assembly shall be copper plated.

4.8. **Hanger Rods**: Shall be mild steel, threaded as required. Use not smaller than 3/8” rods for pipe 2” and under, 1/2” rods for pipes 2 1/2” through 4”, 3/4” rods for 5” through 12” and 1” rods for piping over 12”, but generally as standard for the hanger selected. Support rods with threaded Underwriters’ listed inserts, expansion shields or beam clamps shall be all galvanized. Beam clamps shall be equal to Elcen Fig. 34 or 36 with rod and eye end.

At bar joists, support from bottom chord at panel points. For piping over 6” provide supplemental steel angle supports and welding to span 3 joists when running parallel to joists and welded angle between two panel points for piping running perpendicular to joists. Concrete inserts shall be equal to Grinnell Figure 282.

Wherever piping hanger support rods heights exceed 36” length from top of the supported item to the structure above, Contractor shall provide a uni-strut support assembly and bracing of the assembly with minimum 1”x1”x1/4” angle iron or as required for the weight of the supported item, whichever is greater, and anchor to structure above to prevent swaying. Assembly shall be welded at connection to unistrut and building structural assembly. Follow welding procedures set forth in the structural division of the specifications.

4.9. **Bracing**: Where hanger rods heights exceed 36”, provide sway bracing as specified above in “Hanger Rods”. Bracing shall be provided at each uni-strut assembly and attached to the building structural system.

4.10. **Approved Equivalents**: By Grinnell, Elcen, Stockham or Crane will be accepted.
PART 5. MISCELLANEOUS REQUIREMENTS

5.1. **Materials and Equipment:** New and of best quality in every respect. Pipe and fittings shall conform to the ASTM Standard designated for pipe of each material. Equipment shall bear Underwriters Laboratories Inc. (UL) listing label, Canadian Standards Association (CSA) listing label or ETL approved rating. All electrical components and products shall also comply with the respective Code of Federal Regulations (CFR). All pressure vessels shall be constructed and tested in accordance with applicable ASME Codes and shall bear ASME stamps unless specified otherwise. Minimum pressure rating shall satisfy job conditions. Where conflicts occur between a Code, Standard, Listing and the contract drawings or contract specifications, the most stringent requirements shall govern and be applied. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer, however, the component parts of each unit need not be. No materials or products that contain asbestos, formaldehyde, lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

5.2. **Workmanship:** First class, premium and in accordance with best practice. Pipe shall be cut clean, properly reamed, threaded or soldered, erected plumb and secure. Make changes in pipe size with reducing fittings without the use of bushings. Work shall be executed by experienced mechanics and shall present a neat appearance. Install all equipment in accordance with manufacturer’s recommendations. Absolute coordination is required with the other Contractors on the project before proceeding with installation of any system or item.

At all stages of installation, protect pipe openings, fixtures, ductwork, condenser coils and equipment against the entrance of foreign materials and from damage by the elements, mortar, paint, etc... If air moving equipment must be used during construction, temporary filtration media with a Minimum Efficiency Reporting Value (MERV) of 8, as determined by ASHRAE 52.2, current edition, and shall be installed at each return air grille, return air register, exhaust grille, exhaust register, and unit return air inlet. ALL open portions of ductwork and equipment shall be covered with a self-adhesive film (not visqueen) or airtight sheetmetal caps to prevent the intrusion of contaminants. All equipment openings, duct taps, duct take-offs, etc., shall be protected immediately after the tap, take-off, etc. has been fabricated in the field. In effect, there shall be no ductwork opening or equipment opening that is exposed to the ambient air. The material shall be a minimum of 3 mils thick and have a minimum tensile strength of 10 psi. It shall be waterproof and recyclable. Material shall be DuroDyne Dyn-O-Wrap or approved equivalent. Where bare sheetmetal is delivered unassembled to the job site, all ductwork shall be covered and protected with visqueen. After fabricating the duct in the field, the interior bare metal shall be wiped clean with a clean damp cloth before erection in the field. After erection, duct shall be protected as specified above. Any ductwork discovered to be unprotected as specified is subject to immediate rejection for use on this project.

5.3. **Testing Documentation:** Through out the Division 15 specifications, there are various tests required. Provide the Architect written certification and results of all tests specified, including those indicating failure. The absence of written testing certification and results will be considered the same as if testing was never done. Include all testing documentation in the Operating and Maintenance Manuals.

5.4. **Factory Finishes:** Furnish to the Architect, color cards for standard and premium colors available. The Architect shall select color where choices exist. Provide
Manufacturer’s standard color where color choices are not available. Coordinate all color selections with appropriate Architectural specification sections.

5.5. **Expansion:** Provide for expansion and contraction of all piping, ductwork, etc. and make proper provisions so that excessive strain will not occur on piping, ductwork or other parts. Provide flexible connections for all piping and ductwork at all building expansion joints.

5.6. **Safety Provisions:** Provide covers or guards on all hot, moving and projecting items that could be construed as a hazard to occupants of the building or to service personnel.

5.7. **Cleaning and Adjusting:** Upon completion of work, clear all drains, traps, fixtures, ducts and pipe. Adjust all valves, remove rubbish and leave work in clean and excellent operating condition. Install final permanent type filters only after cleaning of building is completed.

5.8. **Escutcheons:** Where pipes pass through floors, walls and ceilings of finished rooms provide pressed chrome-plated brass or steel plates securely fastened in place. Pack penetrations with insulation or firestopping compound as required. Caulk pipe openings behind escutcheons to prevent passage of smoke and make vermin proof.

5.9. **Identification:** All above ceiling identification specified, including firestopping identification, shall be completed prior to the above ceiling inspection. All remaining identification shall be completed prior to the final inspection. Failure to comply with this provision will be cause for cancellation of the inspection with all costs of the re-inspection to be borne by the Contractor responsible. All identification shall follow nomenclature used on the plans. Identify all piping, including refrigerant piping, and jacket of insulated pipe exposed to view and/or accessible through removable ceilings, attics or access panels, with Seton “Snap-Around” or Seton “Strap-Around” pipe line markers, Marking Services Inc (MSI) Series MS-970 or approved equivalent. The markers shall be color-coded in accordance with ANSI Standard A13.1. Identification shall bear name of pipe contents and show direction of flow and in the case of gas/air systems, shall indicate pressure of the pipe contents. “Stick-on” type markers are unacceptable. Install markers adjacent to all valves, flanges, fitting, change in piping direction, and both sides of floor and wall penetrations, at each branch take-off and along runs of pipe as required for proper identification but not further apart than 10 feet. Gas piping identification intervals shall be a maximum of 6’-0”. Provide piping identification in small areas (closets, storage rooms, etc.) above ceilings where partition walls go to the structure above. All plumbing system piping identification shall comply with IBC/IPC requirements.

Paint all piping and jacket of insulated pipe in Mechanical Rooms and any room with exposed piping with two coats of enamel paint. Colors to be in accordance with ANSI A-13.1 standard. The Contractor shall obtain ANSI A-13.1 and comply with all requirements.

Refrigerant lines to and from the various VRF System branch controllers shall be identified with plastic labels as specified for piping and provided at maximum fifteen (15) foot intervals. All branch controllers shall be identified with engraved laminated plastic as specified below. Numbering of Branch Controllers shall follow nomenclature indicated on the plans and equipment schedule. Refrigerant piping identification shall be of the type specified for piping. Refrigerant piping identification upstream and downstream of all VRF Controllers shall also indicate the respective indoor and outdoor
unit number and associated branch controller. Example: Refrigerant suction line - BC VRF-1, VRF-1A. **VRF System will require custom factory fabricated labels.** Handwritten labels are unacceptable.

All equipment, smoke detectors, smoke dampers, fire dampers, filter access locations, access panels, access doors, motor starters, disconnects, thermostats, humidistats, sensors, other control systems components, control switches, and related devices shall be equipped with engraved laminated plastic nameplates, as described below, but not less than 1/4" high. Filter access locations’ identification shall include the size and number of filters required for that specific piece of equipment.

Provide identification for all access doors as specified hereinbefore. Identify all access panels and doors to indicate item for which access is provided. Ex. Motorized damper, fire damper, filters, etc. Additionally, add the following to each access panel identifier: “ACCESS PANEL - DO NOT BLOCK”. Refer to Paragraph “Access Panels and Doors” above for additional requirements.

Labels shall be a minimum of 4" x 3" x 1/16" thick, laminated plastic labels (larger if needed) with 1" high x 1/4" stroke numerals and all capital letters to identify all equipment furnished under this Section. Labels attached to the ceiling grid shall be the same width as the ceiling grid it is attached. Properly adjust lettering height to fit within the smaller width label. Red with white lettering or white with red lettering as required for maximum contrast with color of the equipment. In finished areas where identification is attached to the ceiling grid, the Architect shall select colors of materials. Engrave equipment designation and numbers as shown on plan and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner. Where equipment is typed (HP-A, HP-B, EF-A, etc.) rather than numbered (HP-1, HP-2, EF-1, etc.) the tag shall include the room number(s) of the area served. Room numbers shall be as designated by the Owner. In absence of Owner’s room numbers, numbers shall be as indicated on the architectural plans. Additionally, each piece of equipment (in-line fan, vav terminal, access door, fire damper, etc.) located above the ceiling shall be identified with an engraved laminated label, of the type specified above, and neatly glued to the ceiling tile grid below the item. Neatly attach identification with permanent adhesive.

Permanently affixed warning labels shall be attached to all equipment, on a highly visible location on the equipment, which can be automatically started. The warning label shall read as follows: **"CAUTION!! This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect switch to “OFF” position before servicing or attempting to work on equipment"**. Permanently affixed warning labels shall be attached to all motor starters and all control panels which are connected to multiple power sources utilizing separate disconnect switches. The warning labels shall read as follows: **“This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing or working on this Item”**.

Fit all **dielectric unions** and all valves (except equipment service valves and sprinkler valves) with engraved laminated plastic valve tags firmly secured with brass jack-chain and S-hooks to valve yoke or stem (not handles) or adjacent pipe. Fabricate tags as 2" x 3" x 1/16" white plastic with beveled corners, engraved both sides with 1/2" high x 1/4" stroke red letters and numerals. Locate numbers at one edge of tag leaving room for future engraving by others. Number tags in sequence, starting with number 1; prefix the number with the trade (“P” for plumbing items and “M” for HVAC/Mechanical items). Also, provide an engraved laminated label, of the type specified above, and glue to the
ceiling tile grid below the valve for each valve concealed from view. Provide a valve chart framed under glass or plastic which shows the number and location of each valve and type of service. Locate a valve chart in each equipment room and each janitor closet. Permanently attach each chart to the wall as directed by the Architect. Include a copy of the valve chart in the Owner's Operation and Maintenance Manuals.

Where the tag, label or marker occurs in a plenum (return air) space, the plastic employed shall carry a Class A Flame Spread Rating per ASTM E-84, and shall meet ASTM D-635 (such as Westinghouse Micarta engraving stock).

Access openings to fire dampers and smoke dampers shall be permanently identified on the exterior of the access panel and on the ceiling grid below by a label having letters not less than 3/4” in height and reading: “FIRE DAMPER – DO NOT OBSTRUCT ACCESS” or “SMOKE DAMPER – DO NOT OBSTRUCT ACCESS”.

5.10. Firestopping: Wherever pipes, ducts, hanger rods, etc. penetrate any type of construction that extends to the underside of the structure above it, regardless if the wall, partition or floor is a rated assembly or not, the space between the penetrating member and the building construction shall be sealed with a U.L. certified firestop assembly that provides an effective barrier against the spread of fire, smoke and gas, equal to the rating of the respective wall, partition or floor. Where partitions are not indicated as fire rated, the firestopping assembly used shall provide a minimum of one-hour resistance. Where walls or partitions do not extend to the structure above, firestopping material is not required in the penetration. Instead, pack the respective openings with insulation and seal on both sides with material equal in characteristics of the penetrated partition.

All fire stop material employed on the project must be same brand throughout. At each through penetration, attach identification labels on both sides, in location where label will be visible to anyone seeking to remove penetrating items or firestopping. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Provide metal labels in areas used as return air plenums. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Additionally, secure to wall with metal thumbtack at each corner of the label. Labels shall be Hilti Firestop Identification Labels 00339611, 3M Sticker 98040056289 or approved equivalent. Firestop identification labels shall include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

Carefully coordinate work with types of construction encountered and with Par. Pipe Sleeves above.

5.11. **Delivery and Storage**: All equipment and materials delivered and placed in storage
shall be protected from the weather, humidity and temperature variations, dirt and dust, and other contaminants. See Section 15700 and this Section 15010 for additional requirements for ductwork and equipment.

5.12. **Dielectric Isolation**: Provide dielectric isolation where dissimilar metals are joined, at supports, etc. For pipe sizes 2” through 6”, copper piping flanges shall be drilled to ANSI B 16.5 150/125 Standard and powder coated, with an EPDM insulator adhered to the plate steel flange protruding inside of the steel flange to prevent contact with the copper flange adapter. The copper component of the flange adapter shall be Third Party Classified by Underwriters Laboratories, Inc. Minimum working pressure shall be 300 psi at 272°F.

Wherever any bare metallic piping or conduit is in contact with externally insulated duct or bare sheet metal duct, there shall be dielectric separation provided. The Contractor shall provide 1” thickness, unslit AP Armaflex insulation of sufficient inside tubular diameter to snugly and completely cover the respective piping. The insulation shall extend the full length of the affected area. Where channel shapes are used, orient the open side, down. Refer to Section 15700, Part “Pipe and Miscellaneous Insulation Work” for AP Armaflex material specification.
SECTION 15400
PLUMBING

PART 1. GENERAL & MISCELLANEOUS

1.1. General Provisions: Section 15010 is applicable in full hereto. No building materials or products that contain asbestos, formaldehyde, lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.

1.2. Scope: Include all equipment, material and labor required for a complete operating plumbing system even though every item involved is not indicated. Refer to architectural drawings and verify all plumbing fixtures, locations and mounting heights. Notify the architect prior to bid of any discrepancies. Do not attach any items to other trades' assemblies. Items shall be attached to building structural system. Advisory provisions listed in all Codes referenced in the Contract Documents are mandatory. Where conflicts occur between a Code, Standard, the contract drawings or specifications, the more stringent requirements shall govern and be applicable. Manufacturers not named in the specifications require prior approval, seven (7) days prior to bid date. Follow procedures set forth in Division 1 of the specifications.

1.3. Warranty: Guarantee work as set forth in Section 15010 and Division 1. Guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of acceptance of the project unless specified otherwise. Provide free maintenance and service during the guarantee period. Refer to other parts for additional requirements and extended warranty requirements.

1.4. Site Visits / Inspections: It is the contractor’s responsibility to have the job ready for site visits / inspections when they are scheduled. If the project is not ready for the requested inspection and the Architect, any governmental agency or any other entity requires a re-inspection, the contractor shall pay Zgouvas, Eiring & Associates a re-inspection fee of $1,500. The payment shall be made directly to Zgouvas, Eiring & Associates 5 days prior to the scheduled re-inspection.

The Contractor is cautioned to carefully review the extensive requirements of Paragraph "Identification" in Section 15010 of the specifications and note that identification is required to be completed before certain inspections.

1.5. Miscellaneous: The Contractor shall carefully examine the contract documents during the bidding phase. Any missing information in the contract documents that is required for obtaining accurate pricing shall be brought to the attention of the Architect, prior to bid date, so all may be clarified and/or corrected. Failure to identify and resolve the issues prior to bid shall require the Contractor to provide said items, complete, without additional cost to the Owner or the Owner’s Project Design Professionals, using materials and methods specified by, and as directed by, the Owner’s Design Professionals.

1.6. Qualifications: Must be properly licensed and established as a Plumbing Contractor at location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least six (6)
systems of this type, size and scope.

1.7. **Spare Parts:** Manufacturer of any equipment specified shall have a wholesale outlet for readily available replacement parts in the nearest major USA city.

1.8. **Electrical Work:** All electric power wiring required for installation of equipment under this Section is specified under Electrical Division. Plumbing Contractor shall furnish and install all controls and control wiring as specified or required to properly complete the installation. Control conduit is specified under Electrical Division or shown on electrical drawings; all other control conduit shall be provided under this Section of the work. Electrical work performed under this Section shall meet requirements set forth in the Electrical Division. Refer to Section 15700, Part 2, Electrical Work and Equipment for requirements not specified in Electrical Division.

1.9. **Submittals:** Refer to Section 15010 for **strict** requirements especially as it applies to Project cost constraints, addendums or Value Engineering (VE) items.

1.10. **Identification:** Refer to Section 15010 for identification requirements. There are specific requirements prior to the above ceiling and final inspections, respectively, that are mandatory. The identification section of the specification is extensive. The Contractor shall refer to Section 15010, review and provide all identification requirements specified. **Failure to comply with this provision will be cause for cancellation of the inspection with all costs of the re-inspection to be borne by the respective Contractor responsible.**

1.11. **Firestopping:** Refer to Section 15010 for requirements. **Note that Division 15 firestopping specifications require firestopping of all penetrations regardless of wall/ceiling/floor construction. Refer to Division 1 for additional requirements.** Where there is a conflict between Division 1 specifications and Division 15 specifications, the most stringent requirements shall govern, be applicable and shall be provided.

1.12. **Motors:** All motors furnished shall be designed, manufactured, and tested in accordance with the current applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the current applicable sections of NEMA Standard No. MG-1. Motors must meet or exceed The Consortium for Energy Efficiency (CEE) Premium Efficiency full load efficiencies. All motors shall be listed under UL recognized component file as applicable. All motors shall be suitable for installation according to the requirements of NEC. Motors shall be wound for the specified voltage and a 1.5 service factor, 1750 RPM open drip proof construction unless otherwise shown or specified.

All motors shall be provided with overload protection and phase protection on all legs. Do not run motors until correct overload elements are installed in starters, as applicable. Premium efficient motors shall be **warranted for 36 months** from date of acceptance of the project. Motors shall be by Allis Chalmers, General Electric Goulds, Louis Allis, and Westinghouse or approved equivalent. All motors serving outdoor equipment exposed to weather shall have TEFC motors meeting the requirements set forth previously.

1.13. **Bound and Framed Instructions:** Two weeks before final inspection, furnish three complete sets of operating and maintenance instructions, bound in hard cover,
indexed and tabbed. The first sheet in the bound instructions shall be a list with each product, name, address and telephone number of:

a. Subcontractor or installer.
b. Table of Contents listing all products numbers in the order which they appear in the specifications and label the tab accordingly. Include all “P” numbers also.
c. Provide a summary page that lists each item with its respective warranty listed
d. Local source of supply for parts and replacement
e. Include wiring and control diagrams with explanatory data describing start-up, operation and shutdown; operating and maintenance instructions for each piece of equipment; manufacturer’s bulletins and catalog data; parts list and recommended spare parts. Fold in large sheets of drawings.
f. Provide a list indicating all routine maintenance procedures based on the respective manufacturer’s recommended intervals. As a minimum, maintenance shall be grouped and individually tabbed to indicate maintenance operations required:
   1. Once a month
   2. Quarterly
   3. Once every six months
   4. Once a year

g. Provide drawings of system and wiring diagrams, condensed operating instructions and include in binder. All components shall be numbered and identified on diagram.
h. Record drawings of the Plumbing drawings in hard copy and PDF format and in ACAD “.dwg” format, on CD. Refer to Section 15010, Para. 1.15, Record Drawings.
i. Provide copy of Section 15400 Specifications
j. Provide written results of all tests specified.
k. Copies of all Site Visit / Inspection Reports including Contractor’s written response that items listed were corrected.
l. Provide domestic water samples testing and results specified.
m. Provide copy of valve chart required in Section 15010, Identification. Include all dielectric unions on chart.
n. All cleanouts and dielectric unions shall be indicated on record/as-built drawings.

Additionally, the Contractor shall provide all of the aforementioned information, in digital Adobe Acrobat PDF format, on a CD-R CD. The PDF file shall be provided with an embedded index for each item specified. It shall appear in the left hand window of the opened document so that the Owner or his maintenance personnel can “click” on the indexed item and move immediately to that specific item.

PART 2. TESTS

2.1. **General:** Perform all tests in the presence of the Architect. Refer to Division One for Fuel, water and power required therefore. In absence of specific testing procedure comply with code requirements and/or nationally acceptable industry standards. Furnish written reports of all tests results specified to Architect.

2.2. **Drainage and Vent System:** Plug all openings, fill entire system with water to point of
overflow and hold for a minimum of twenty-four (24) hours without pressure loss before inspection. System must remain full during the test without leakage. Each vertical stack with its branches may be tested separately, but any portion tested must have minimum ten-foot head.

2.3. **Water Supply System:** Test and secure acceptance of entire system before the piping or hot water storage heaters are insulated or otherwise concealed. Test as follows: disconnect and cap all outlets to plumbing fixtures and all other equipment not designed for the full test pressure. Fill the system with water; apply 150 psi hydrostatic pressure and hold for a minimum of twenty-four (24) hour period without pressure loss. All piping throughout shall be tight under test. Water piping shall remain under normal water pressure during construction except when freezing weather is expected. Do not use air.

2.4. **Fixtures:** Test for soundness, stability of support and satisfactory operation.

2.5. **Gas System:** Apply 75 psi air test for a twenty-four (24) hour period without pressure loss through leakage. Test before tanks, equipment, appliances, etc. are connected.

### PART 3. SANITARY PIPING

3.1. **Scope:** Provide a system of soil, waste and vent piping connecting all plumbing fixtures, equipment, etc. to the house sewer, with **consolidated vent connections** extending through the building roof, all as shown on the drawings and as required for complete installation. **Do not begin work until elevation of final connection point is verified and grading of entire system can be determined (even if final connection is specified under another Section).** Rework existing waste roughing as required to facilitate renovation work.

3.2. **Utility Connection:** See Division 2. Make sanitary connection as indicated.

3.3. **Soil, Waste and Vent Piping Inside the Building Walls and to Points Outside the Building as Indicated:** Does not apply to Natatorium C100, Pool Equipment 127, Storage A126, Chemical Storage A131 and Elec. Rm. 132. See other paragraphs below for requirements.

Provide service weight hub-and-spigot cast iron soil pipe and fittings for underground service and hubless for above ground service, meeting ASTM A-74 for hub and spigot and ASTM A-888 for hubless, coated inside and out. Pipe exposed within the building shall be uncoated outside and left clean for painting. Fittings to receive screwed pipe arms shall be recessed drainage type. Soil and waste pipe shall have long sweep connections. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

Joints for hub and spigot pipe shall be made with compression gaskets meeting ASTM C-564. Joints for hubless pipe and fittings shall be equivalent to MG couplings meeting ASTM A-48 and C-564, or Anaco Husky SD 4000, super-duty, shielded couplings of Type 304 AISI stainless steel, meeting ASTM C1540 standard or equivalent by Ideal Tridon Heavy Duty HD or Mission Rubber Company, Heavy Weight, shielded.

**Option:** Does not apply to Natatorium C100, Pool Equipment 127, Storage A126,
Chemical Storage A131 and Elec. Rm. 132. See other paragraphs below for requirements.
Contractor may use solid wall PVC schedule 40 DWV pipe and fittings meeting ASTM Standard D2665 and 1785 for above ground service and underground service with the following exceptions. Use cast iron as specified hereinbefore or PVDF (Polyvinylidene Fluoride) piping and fittings in areas used as return air plenums, return air platforms or where passing through or within a fire rated assembly.

PVDF piping and fittings, where required, shall be Orion Super Blue PVDF (Polyvinylidene Fluoride) or equivalent products as manufactured by Enfield, Zurn, GEO or Fisher. The PVDF material shall conform to ASTM D3222 ASTM F1673, ASTM E-84 and UL 723. Pipe shall be marked with its UL Classification to indicate compliance with UL723 (ASTM E84). All fittings shall meet or exceed Schedule 40 dimensions.

All vents thru roof shall be cast iron pipe (minimum 12” both sides of the roof). See other paragraphs in this section for vents through roof requirements.

Secure the cast iron VTR to structure with heavy gauge 1-hole strap. THE CAST IRON PIPING THROUGH THE ROOF DOES NOT APPLY TO GAS FIRED APPLIANCES. Vents through the roof for gas appliances shall be as specified for the appliance in its respective specification section.

All floor drains shall have cast iron deep seal p-traps except in the natatorium, pool chemical storage room and pool equipment room. Piping and fittings above the floor shall be solid wall PVC schedule 40 DWV pipe and fittings or PVDF as specified hereinbefore and with exceptions as noted.

THE USE OF “CELLCORE” OR “FOAMCORE” PIPING IS EXPRESSLY FORBIDDEN.

3.4. Natatorium C100 Soil, Waste and Vent Piping: Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe, fittings, and solvent cement shall be supplied together as a system, as Charlotte Pipe ChemDrain chemical waste system manufactured by Charlotte Pipe and Foundry or approved equivalent. Pipe and fittings shall conform to the National Sanitation Foundation Standard (NSF) 14. Pipe and fittings shall be manufactured with CPVC Type IV, Grade I, ASTM Class 23447. All system components shall be certified by NSF International for use in chemical waste drainage systems and bear the mark NSF-cw. All system piping shall be Schedule 40 CPVC produced to the dimensional requirements of ASTM F 2618 and the manufacturer’s specifications. All pipe and fittings shall be CPVC drainage patterns meeting the requirements of ASTM F 2618, ASTM D 1784 Rigid CPVC Vinyl Compounds, ASTM D 2321 Underground Installation of Thermoplastic Pipe (non-pressure applications) ASTM F 493 Solvent Cements for CPVC Pipe and Fittings ASTM F 1668 Procedures for Buried Plastic Pipe ASTM F 2618 Standard for Chlorinated Poly (Vinyl Chloride) Chemical Waste Drainage Systems and the manufacturer’s specifications, as applicable. Provide PVC to CPVC adapters as required to connect PVC floor drains to CPVC piping. Coordinate requirement with drains and drain lines.

Installation shall comply with the latest installation instructions published by the respective piping/fitting manufacturer and shall conform to all applicable plumbing
and building code requirements. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent welded joints shall be made with mustard yellow ChemDrain One-Step solvent cement conforming to ASTM F 493. The system shall be protected from items that are not compatible with CPVC compounds; materials like thread sealants, plasticized vinyl products, fire stopping devices, or other aggressive chemical agents. See Drainage Specialties for drain and cleanout requirements.

3.5. Acid-Resisting (AR) Soil, Waste, and Vent Piping for Storage A126, Pool Equipment 127, Chemical Storage A131 and Elec. Rm. 132: All piping and fittings shall be a flame retardant, corrosive waste drainage system equal to Zurn Flame Retardant polypropylene Schedule 40 pipe and fittings. Provide fusion joints below slab and mechanical joints above the slab. Joints and piping installation shall be in strict accordance with manufacturer's recommendations. Pipe shall be marked with its UL Classification to indicate compliance with its required UL listing. Equal products as manufactured by Enfield, Orion and GSR will be accepted.

Acid resisting soil, waste and vent piping located in the return air plenum, return air platforms, and where passing through or within a fire rated assembly, shall conform to ASTM F1673, ASTM D3222, UL 723, ASTM E84 25/50 requirements for flame spread and smoke and made of PVDF (Polyvinylidene Fluoride).

All PVDF pipe and fittings located below the slab shall be joined using fusion method. All PVDF pipe and fittings located above the slab shall be joined by no-hub mechanical joint method with plain end fittings and No-Hub couplings. Each No-Hub coupling shall have an outer band of 300 series stainless steel with 5/16" bolts, nuts and washers plated to meet a 100-hour salt spray test per ASTM B117. The No-Hub joint shall conform to the requirements of ASTM F1673. PVDF piping shall be marked with its UL Classification to indicate compliance with UL723 (ASTM E84). All fittings shall meet or exceed Schedule 40 dimensions.

All PVDF piping and fittings installation shall be in strict accordance with the Manufacturer’s recommendations. Piping and fittings shall be Orion Super Blue PVDF (Polyvinylidene Fluoride). Equivalent products as manufactured by Enfield, GEO, Zurn and Fisher will be accepted.

See Drainage Specialties for acid resistant piping (AR) drain and cleanout requirements.

3.6. Laying Out Work: Vents from any fixture, when connected to a vent line serving other fixtures, shall be extended at least 6 inches above flood level rim of highest of such fixtures to prevent use of vent lines as a waste. Make changes in direction by appropriate use of 45 degree Y’s, 1/2 Y’s, or long sweep 1/4, 1/6, 1/8 or 1/16 bends. Sanitary T’s or short 1/4 bends may be used on vertical stacks or drainage lines where change in direction of flow is from horizontal to vertical; except that long-radius TY’s shall be used when two fixtures are installed back to back with common drain. Straight T’s, Ells and Crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipe or fittings are connected use standard increasers and reducers of proper size. Do not reduce size of drainage piping in direction of flow. Drilling and tapping of house drains, soil, waste or vent pipes, and use of saddle hubs and bands are prohibited. All plumbing vents through the roof shall be located a minimum of 10'-0” away from all outside air.
intakes. Coordinate all plumbing vents locations with the HVAC plans.

3.7. **Hangers and Sway Bracing**: Refer to Section 15010 for requirements. Note special requirements for items in natatorium, pool chemical equipment storage and pool equipment room.

3.8. **Grading**: Uniform and not less than 1/8” PLF for pipe 4” and over, and not less than 1/4” PLF for 2” and 3” piping.

3.9. **Roof Flashing**: Roof penetrations are to be flashed by the roofing contractor, using materials as recommended by the roofing manufacturer and approved by the Architect. Coordinate work with Roofing Contractor. Offset vents as required to clear gravel guards and flashing courses. Extend vents 6” to 8” above roof level.

3.10. **Waste Arms**: Type K copper or IPS brass pipe typical; Schedule 40 PVC or IPS brass pipe at urinals.

3.11. **Test Fittings**: Not shown on the drawings; provide where required for partial tests.

3.12. **Miscellaneous Joints**: Where cast iron pipe joins clay pipe, make joint by caulking with jute and filling (at one pouring) with hot compound meeting FS SS-C-608.

Use slip joints and unions only upstream from a trap seal.

3.13. **Ductile Iron Pipe**: Where noted on the drawings and for pipe sizes not available in hub-and-spigot provide ductile iron pipe and fittings meeting ANSI A21.50 (AWWA C150) Class 2. Install in accordance with pipe and fittings manufacturer’s recommendations.

PART 4. DRAINAGE SPECIALTIES

4.1. **Equivalent Products**: Specialties by J.R. Smith, Josam, Sioux Chief, Zurn, Watts or Wade. Except as noted, catalog numbers are from J.R. Smith.

4.2. **Cleanouts**: Provide in sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 40 feet on straight runs, and elsewhere as shown. Cleanouts shall be full opening type and completely accessible without obstruction. Size same as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with lead-free seals. Provide flashing clamps and flashing flanges in all areas where cleanouts are accessible from floor below or above, as applicable. All cleanouts shall be indicated on the record/as-built drawings.

**In Tile Floors**: 4051, adjustable, cast iron body with bronze plug and satin finished square scoriated Polished bronze top; where soft tile occurs provide 4160 recessed square Polished bronze cover.

**In Concrete Floors (Not Applicable to C100 Natatorium)**: 4237, adjustable head, cast iron head and ferrule with bronze plug, round loose-set scoriated tractor cover.

**In Outside Lines**: 4263L-NB cast iron head and ferrule with bronze plug. Terminate
at grade in 18"x18"x12" deep concrete pad with tooled edges or flush in pavement as applicable.

**In Accessible Unfinished Spaces:** 4400 or 4510 cast iron with bronze plug, as appropriate.

**In Finished Walls:** 4530 cast iron cleanout tee with bronze plug and 16 ga. stainless steel, flat, wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide extension from sanitary tee to bring plug within 4 inches.

**In Terrazzo Floors:** 4185, adjustable cast iron head and ferrule, bronze plug and round brass terrazzo cover and rim.

**In Carpeted Floors:** 4020X, adjustable head, cast iron, round polished bronze top with carpet clamping device.

**Natatorium:** Zurn EZC, Schedule 40 PVC and water tight threaded tapered plug and top assembly with flat nickel bronze round top.

4.3. **Typical Drains:** Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain connected to sanitary sewer shall have cast iron deep seal P-trap. Provide types as scheduled below. Where indicated on the drawings and elsewhere required by local and/or state Codes. Provide trap primer connection on floor drain and trap primer as specified below.

Where drains occur above finished spaces, furnish with clamping collar to secure waterproof membrane.

**Floor Drain (FD):** Series 2010BB two-piece cast iron drains with caulk type outlet and adjustable polished bronze strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6", for 4" drains 8" x 8". Provide trap primer connection as indicated on the plans.

**Shower Drain (SD):** Series 2010BB two-piece cast iron drains with caulk type outlet and adjustable stainless steel strainer and rim. Provide clamping collar to secure waterproofing membrane. Strainer tops for 2" drains shall be 5" round diameter, and for 3" drains, 6" diameter. For Insert type showers, see shower specifications.

**Mechanical Room Drain (MFD):** Series 2230 cast iron drain with caulk outlet, sediment bucket and cast iron grate.

**Area Drain (AD):** Series 2250 cast iron drain with caulk outlet, sediment bucket and cast iron grate.

**Floor Sinks (FS):** Series 3120 with nickel bronze strainer clamp, aluminum dome, acid-resisting enameled inside finish. Provide 3/4 grate for sinks receiving single waste and no grate when under equipment. Provide deep seal cast iron p-trap.

**Floor Drain (PFD) in the Natatorium:** Shall be Zurn Model 2283 with 10" decorative top, solvent weld, with trap primer connection, vandalproof and with all required accessories. If alternate for open air C100 Natatorium is taken, trap primer...
PART 5. WATER PIPING

5.1. **Scope**: Connect to water main as indicated and extend to all plumbing fixtures, hose bibbs, water heaters, etc., as indicated or required. Refer to Section 15010 for hanger rods, hangers, spacing and uni-strut support assembly requirements.

5.2. **General Workmanship**: Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all openings, finished ceilings, etc. All piping and other items which may require maintenance access shall be located no more than 24" above the finished ceiling and no more than 12'-0" in areas without ceilings.

Route all piping through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Make changes in direction and size with fittings. Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to insure unrestricted flow, eliminate air pockets, and to permit complete drainage of the systems. Supply piping to fixtures, faucets, hydrants, shower heads and flush valves shall be anchored to prevent movement. Install all buried piping with at least 36" of earth cover. All piping below slab-on-grade construction shall be installed in plastic jacket equivalent to Plasti-sleeve, as manufactured by Plastic Products Co. of Stanton, California.

5.3. **Freeze Protection**: Do not install piping or any device in spaces subject to freezing. Install piping within building insulation envelope.

5.4. **Grading**: Grade pipe upward from source to facilitate drainage and air relief. Where low points are required because of long runs or where sections may be valved off, provide with 3/4" globe valve and hose nipple for drainage at low point. Make all connections to risers and fixtures from top of mains.

5.5. **Nipples**: Of same material as pipe in which they are installed; provide extra strong when unthreaded portion is less than 1 inch long.

5.6. **Piping and Fittings**: Does not apply to Natatorium C100, Pool Equipment 127, Storage A126 and Chemical Storage A131. See other paragraphs below for requirements.

Typical lines to be of copper tubing meeting ASTM B-88, Type "L" hard above ground and Type "K" soft below ground. Make up joints with sweat fittings of wrought copper, and 95-5 or Harris "BRIDGIT" lead free solder complying with ASTM B-32-89. Surfaces shall be cleaned with steel wool or emery cloth before applying. Do not make joints or branch connections below a slab on grade. **All 90° and 45° elbows and fittings shall be full radius, long sweep, with radius 1.5 times the pipe connections are not required.**

**Acid Resistant (ARFD) in Pool Equipment Room A127, Chemical Storage Room A131 and Storage A126**: Acid resistant floor drains shall be Town and Country Series PP-77, black with welded trap primer connection, grate and all required accessories.
diameter. All offsets of water piping shall be made with 45° fittings in lieu of 90° fittings wherever possible.

5.7. **Domestic Cold Water Piping and Fittings in Natatorium C100, Pool Equipment 127, Storage A126 and Chemical Storage A131:** Pipe shall be manufactured from virgin rigid CPVC (chlorinated polyvinyl chloride) vinyl compounds with a cell class of 24448 as identified in ASTM D 1784. Fittings shall be manufactured from virgin rigid CPVC (chlorinated polyvinyl chloride) vinyl compounds with a cell class of 23447 as identified in ASTM D 1784. Piping shall be FlowGuard Gold CTS CPVC pipe and fittings as manufactured by Charlotte Pipe and Foundry or equivalent. Piping, fittings and solvents shall conform to ASTM D 2846, ASTM F 493, ASTM F 493 solvents, ASTM F 1668. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. Pipe, solvents and fittings shall conform to NSF International Standards 14 and 61. This system is intended for pressure applications where the operating temperature will not exceed 180° F at 100 psi.

Installation shall comply with the latest installation instructions published by the respective manufacturer and shall conform to all applicable plumbing and building code requirements. Buried pipe shall be installed in accordance with ASTM F 1668. Solvent cement joints shall be made using CPVC cement conforming to ASTM F 493. Primer conforming to ASTM F 656 shall be used. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with CPVC compounds. All system components shall be certified by NSF International for use in drinking water application and shall bear the NSF label.

All piping and valves shall be lead free, CPVC construction same as specified piping and meeting temperature and pressure requirements for all valves and appurtenances specified for metal valves as specified below in Part 6.

5.8. **Hangers and Sway Bracing:** Refer to Section 15010 for requirements. Note special requirements for items in natatorium, pool chemical equipment storage and pool equipment room.

5.9. **Outside Underground Piping 3" and Larger:** AWWA Class 150 cement lined cast iron water pipe with Class 250 cement lined mechanical joints. Install per AWWA C600.

5.10. **Utility Connection:** See Division 2. Make water connection as indicated.

5.11. **Water Pressure:** Supply system is designed for static pressure of 50 to 75 psi. Gauge city water supply adjacent to building to verify that pressure is within those limits. Submit report in writing. Provide water pressure reducing valve, if required, to meet designed water pressure. See Water Piping Specialties for pressure reducing valve specification.

5.12. **Disinfection:** New potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority or water purveyor having jurisdiction or, in the absence of a prescribed method, the procedure described in either AWWA C651 or AWWA C652, or as described in this section. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet. The system or part
thereof shall be filled with a water/chlorine solution containing not less than 50 parts per million of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing not less than 200 parts per million of chlorine and allowed to stand for 3 hours. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system. Upon completion of the disinfection procedure, the Plumbing Contractor shall engage the services of the Alabama Department of Public Health Clinical Laboratories or a certified, licensed, testing laboratory to provide a bacteriological water analysis to include a standard heterotrophic plate count (HPC), microbial, bacterial, pathogens and coliform count. Test a minimum of two (2) samples of domestic water from two (2) separate locations within the facility. Where the project has multiple buildings indicated, the requirement shall be two (2) samples for EACH building. If multiple buildings are finalized and turned over for the Owner's use and tested portion of the system is interrupted to plumb in remaining buildings, water shall be re-tested after each building release. Test each sample for Coliform Present, Fecal Present and E. Coli present. Test locations shall be selected by the Architect and shall be noted on the Testing Laboratory's report. In addition to the two (2) locations required for testing, the supply line feeding a food cleaning area sink (if project contains a Kitchen) shall also be tested, thereby requiring a total of three (3) test locations. If the lab results indicate positive results for Total, Fecal, or E. Coli coliform per 100 ml respectively, or an HPC greater than 500 CFU/mL, the Contractor shall disinfect the system in its entirety, as specified above, and obtain new test results as outlined hereinbefore until levels are reached as required by AWWA C651 or AWWA C652.

Prior to the final site visit, the Contractor shall provide to the Architect, certified test results on the testing facility letterhead. The report shall indicate the name of the project, the locations from where the samples were taken, the testing laboratory findings and indication whether the water is safe for consumption. No Certificate of Occupancy will be provided to the Owner without the required lab results indicating the potable water system is safe for consumption.

5.13. **System Drainage:** Provide valves and hose nipple to allow for drainage of all risers and other system low points.

**PART 6. WATER PIPING SPECIALTIES**

6.1. **General:** Seal the opening where the stem, nipple, etc., penetrates the insulation as required to maintain the continuity of the insulation and vapor barrier. All specialties in potable water distribution shall be certified "lead free" as required by Code, Regulations and Standards.

6.2. **Unions:** 150 lb. rated; cast brass ground-joint type in copper pipe, galvanized malleable iron in wrought iron or galvanized pipe. Provide in all sizes of threaded pipe, and in sweat-jointed pipe over 1 inch, to facilitate easy repairs. In such lines install adjacent to water heaters, pumps, tanks, etc. into which piping is terminated; and on at least one side of valves, cocks, strainers, etc. and other devices which occur in piping runs.

6.3. **Dielectric Unions:** Provide dielectric unions between ferrous and non-ferrous piping as required, including piping and water heater stubs where different and stainless
A Proposed Recreation Center
For the City of Boaz

PLUMBING 15400-12

steel water hammer arrestors. Dielectric unions shall be constructed using lead free materials as required by all Governmental Agencies, Codes and Standards and shall comply with ASTM 1545. Dielectric unions shall be Watts Series LF or equivalent by Mueller or Matco Norca. Where dielectric unions are installed, they shall be provided with brass tag, identified same as specified for valves in Section 15010 “Identification”, and indicated on the record drawings. **Contractor shall provide a ball valve on both sides of each dielectric union to allow for proper maintenance of the union.**

6.4. **Valves:** Provide where shown and/or specified, including all fixtures or equipment not furnished with stops. **All valves shall be bronze, lead free** and shall be the product of one American Manufacturer and shall meet the Buy American Act 41, USC 10a-10d as specified hereinbefore. Nibco units as indicated below. All valves shall be rated equivalent to Nibco Figure numbers. Arrange and install valves to be readily accessible for servicing. Where piping is insulated, provide thermal insulating T-handles with preformed holes for identification tags. Coordinate handle height requirement with specified insulation thickness. Provide height as required to clear insulation and properly operate without causing damage to piping insulation. All handles shall comply with UL 2043 and shall be UL listed for installation in air-handling spaces (return air plenums). Handles shall be Nibco Nib Seal, Jomar Long Neck T-Handle, Apollo Thermal seal or Hammond/Milwaukee Valve Insulator MS.

6.5. **Gate Valves 2" and smaller:** #S-134 Class 150 WSP bronze solder-joint #T-134 for threaded pipe. **Over 2":** F-617-0 iron body flanged type with bronze trim, 125 WSP.

6.6. **Globe Valves 2" and Smaller:** #S-235-Y bronze solder-type with replaceable disc, T-235-Y for threaded pipe, 150 WSP. **Over 2":** F-718-Y iron body flanged type with replaceable disk, 125 WSP.

6.7. **Check Valves 2" and Smaller:** T-473-B bronze threaded, Y-Pattern swing check, 200 WSP. **Over 2":** F-918-B iron body flanged type with bronze trim, 125 WSP.

6.8. **Ball Valves for Water Piping in Size 1/2" through 3":** Valve shall be “Lead-Free” forged bronze, 600 PSI CWP, 150 PSI WP, two-piece body, full port, blowout proof stem, stainless steel ball, stainless steel stem, PTFE seats, plastic covered handle. Valve shall meet NSF, ANSI, FM, UL and MSS SP-110 standards. Note that ball valves are also required on both sides of each dielectric union. Approved valve manufacturers are Nibco, Watts, Hammond, Apollo and Kitz.

6.9. **Strainers:** 2" and smaller shall be Crane No. 988-1/2, iron body screwed, Y-Pattern, 125 WSP sediment separators with a 20 mesh model screen. Over 2" shall be Crane No. 989 1/2 of same construction as above. Equivalent strainers by Mueller, Chase, Nibco, Watts or Jenkins will be approved.

6.10. **Thermometers:** “Any angle” type with 7 inch scale and suitable temperature range, as manufactured by Trerice AX7. Thermometers shall be “blue liquid” actuated with Phenol Condensate, and lead free cast aluminum or lead free brass cases and socket with extension neck. Locate for convenient reading. Equivalent product by Blue Ribbon, Weskler, March or Maxwell Moore will be accepted.

6.11. **Pressure Gages:** Bourdon tube type, equivalent to Trerice No. 600, each complete with cast aluminum case, lead free wetted parts, #870 vibration or pulsation snubber,
A Proposed Recreation Center
For the City of Boaz

PLUMBING 15400-13

#735 needle valve. Gage dials shall be not less than 4-1/2” and cases shall be of aluminum alloy. Furnish with suitable pressure ranges for each application. Equivalent products by Blue Ribbon, Weskler, Marsh or Trerice will be accepted. Wetted parts shall be lead free.

6.12. **Wall Hydrants (Typical):** Bronze, nickel plated, quarter turn, self-draining, non-freeze hydrant with hose connection, integral vacuum breaker, loose "T" handle key, stainless steel recessed box, with full 180°, polished bronze face, integral cylinder lock, and "Water" inscribed on the face. Seal all interior joints, seams, gasket seams/closures including around the hydrant box flange with an appropriate sealant recommended by a sealant manufacturer. Wall hydrant shall be JR Smith 5509 QT or approved equivalent. Install approximately 24 inches above finished grade.

6.13. **Wall Hydrants Inside Pool Equipment Room:** JR Smith 5609 QT, or approved equivalent, stainless steel box and cover, bronze nickel plated quarter turn non-freeze hydrant with hose connection, integral vacuum breaker and wheel handle.

6.14. **Wall Hydrants Inside Natatorium:** JR Smith 5519, or approved equivalent, stainless steel box and cover, bronze nickel plated quarter turn non-freeze hydrant with hose connection, integral vacuum breaker and wheel handle.

6.15. **Water Hammer Arrestors:** Certified by the American Society of Sanitary Engineers and in compliance with current edition of ASSE 1010, ANSI A112.26.1M, Plumbing and Drainage Institute Standard PDI-WH201, heavy-duty construction and designed for a minimum 150 PSI working pressure. Arrestors shall consist of a Type 304 stainless steel casing and bellows. The device shall be pre-charged and sealed at the factory. Install on both hot and cold-water branch lines in an upright position as close as possible to the valve or valves being served. Arrestors shall be installed at all solenoid, remote operated or quick closing valves and at each plumbing fixture or battery of plumbing fixtures as recommended by the Manufacturer. Plumbing Contractor shall provide a dielectric union at connection of this device to the copper water piping. Manufacturer shall size and determine location of the arrestors. Furnish for approval a Manufacturer’s approved diagram indicating size, quantity and location for all arrestors required for the project. Arrestors shall be Zurn Z1700, J.R. Smith Hydrotrol Series 5005-5050, Watts Series SS or MIFAB Series WHB.

6.16. **Automatic Drain Trap Primer Units Where Water Closets or Lavatories Occur:** Units shall be provided for all floor drains and indirect drains. Trap primers shall comply with International Plumbing Code and local codes. Allow for required modifications to meet local codes. Units shall be accessible for service. Provide required piping and drainage. Provide trap primer line to every floor drain, hub drain and floor sink. Provide isolation valve for all trap primers. Equivalent to Sloan VBF-72-A1.

6.17. **Automatic Drain Trap Primer Units:** Units shall be provided for all floor drains and indirect drains. Automatic type trap primers shall be provided **ONLY** where there are no water closets or lavatories in the area. Units shall be lead-free and self-contained within a surface mounted panel on a partition wall above the ceiling. Housing shall be a NEMA 1, UL 50, 16 gauge steel enclosure. It shall contain a distribution unit with copper waterway, brass atmospheric vacuum breaker, transformer, brass ball type stop valve, slow closing solenoid valve with integral strainer, anti-scaling copper header, and complete with all required accessories. Where units are mounted on fire
rated wall, it shall be within a fire rated housing. Units shall comply with International Plumbing Code and local codes. Allow for required modifications to meet local codes. Units shall be accessible for service. Provide required piping and drainage. Provide trap primer line to every floor drain, hub drain, floor sink, etc. as shown or required by Code. Provide isolation valve for each trap primer line. Unit shall be Zurn Series Z1020XL, Precision Plumbing Products, Inc. Series MPB-500-24V. Plumbing Contractor shall coordinate all power requirements with Electrician, prior to bid, and provide as required. Provide all required transformers, fittings, wiring, etc as required for a complete and functional installation.

6.18. **Pressure-Reducing Valve and Strainer:** Zurn/Wilkins 500XL-YSBR or equivalent by Apollo or Watts. Provide full size valved bypass around PRV, two pressure gauges, hose bibb and a valve and union on each side of PRV. Provide if required to meet designed water pressure (not to exceed 75 psi).

Pool Equipment Room PRV and strainer shall be chemical resistant type for chlorine and miscellaneous pool chemicals.

6.19. **Stop and Waste Valve:** Nibco Series 700.

6.20. **Backflow Preventer:** Provide in make-up water supply to pool water heater and elsewhere indicated or required by International Plumbing Code.

Units shall be Watts LF009 or equivalent by Apollo or Wilkins complete with strainer, double check valves and ball valves. Backflow preventer in pool equipment room shall be chemical resistant type for chlorine and miscellaneous pool chemicals.

The backflow preventer shall be tested at job site by an individual certified by the American Backflow Prevention Association (ABPA). Testing procedure shall be as published in the Manual of Cross-Connection Control, Tenth Edition by the Foundation for Cross-Connection Control and Hydraulic Research. Furnish test results to the Architect. Testing results shall include the tester’s name, ABPA certificate, certificate number and expiration date.

---

**PART 7. PIPE HANGERS AND SUPPORTS**

7.1. **General:** Refer to Section 15010.

7.2. **Painting & Finishing:** Clean and paint with two coats of black latex paint all exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts (except duct straps/band hangers), piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc. Include black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. **Bare, unprotected/uncoated steel or galvanized hangers, brackets, unistrut, supports, etc., are not allowed.** In lieu of painting, the Contractor may substitute factory painted, powder coated or epoxy coated items to prevent rusting of the items listed above. All paints and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Also, see specification section, "Identification" for additional requirements. **Refer to Section 15010 for requirements in pool equipment room, pool chemical storage room and natatorium.**
PART 8. NATURAL GAS DISTRIBUTION SYSTEM

8.1. **Scope:** Make house supply connection as indicated and extend to all gas fired equipment as well as other locations shown.

8.2. **Utility Connection:** Arrange with local Gas Company for service, with meter to be located as indicated. Meter and all piping upstream of meter/regulator by Gas Company. Pay for all costs in connection with installation. Provide main cut-off valve and dielectric insulating union in service lines to building and identify as specified.

8.3. **Installation Generally:** In accordance with local gas code, requirements of local utility company, AGA, International Fuel Gas Code and NFPA Standard #54. Cut pipe accurately to measurements established at site and work into place without springing or forcing. Avoid runs through solid walls or floors. Route through previously built in sleeves and avoid excessive cutting or other weakening of the structure. Ream all pipes to remove burrs. Make changes in direction and size with fittings. Make take-offs from top or sides of mains, not from bottoms. Cap or plug open pipe ends during installation to keep out foreign material. Lay out and grade work (1/4” in 15 feet min.) to avoid trapped lines; where unavoidable provide 4 inch drip leg with removable cap at low point. Provide complete system testing per NFPA 54. Provide combination stop valve and insulating union at each point piping drops to underground or rises above grade from underground.

Use joint compound sparingly, applying to male threads only.

Provide unions and hangers same as specified under Water Piping Specialties. Refer to Section 15010 for pipe hangers, supports, rods and uni-strut requirements.

8.4. **Interior and Above Grade Piping (All Areas Except A127 Pool Equipment Room):** ASTM A53, Grade B, seamless or ERW, Schedule 40 black steel pipe with black malleable iron screwed fittings for 2” and smaller, 2-1/2” and larger, ANSI-B16.25 butt-weld. Welders shall be American Welding Society (AWS) certified. **Welders shall submit current AWS certificate** and shall affix AWS Certificate number and identification adjacent to each weld made.

8.5. **Gas Piping in A127 Pool Equipment Room:** Piping shall be in compliance with ICC Codes (IFGC, IRC, IMC, IPC), NFPA 54, UPC, CAN/CSA B149.1, NFPA 58 Standards: ANSI LC1/CSA 6.26, ASTM E84 (UL723). Welders shall be American Welding Society (AWS) certified. **Welders shall submit current AWS certificate** and shall affix AWS Certificate number and identification adjacent to each weld made.

Piping shall be TracPipe CounterStrike tubing, 300 series Stainless Steel Strip conforming to ASTM A240 rated for 25 psi and have an elevated pressure rating of 125G. Jacket shall be an extruded fire-retarded engineered polymer designed to enhance the energy dissipating properties of the flexible gas piping. Conductive jacket shall conform to ASTM E-84 (UL723) flame spread rating not to exceed 25 and ASTM-E84 (UL723) smoke density rating shall not exceed 50. Conductive jacket shall be resistant to UV. Fittings shall be made of yellow brass and be tested and listed by CSA International for use in concealed locations. Fittings shall have an integral snap ring requiring no disassembly or reassembly of the fitting for attachment to the tubing. The fittings shall provide a metal-to-metal seal. Brass fittings shall not contain gaskets or O-rings to facilitate the seal between the tubing and the fitting.
Termination Mount fittings are to be used for the tubing at Pool Water Heater and other required stub-out points. The tubing may be run directly to the manual shut-off valve on fixed appliances. Regulators shall be listed to a recognized national standard for pressure regulators as specified below and shall be acceptable to the TracPipe Manufacturer. Striker plates shall be used where necessary and marked with the symbol of the Manufacturer and CSA International. Floppy type RW galvanized steel electrical conduit shall be used for additional protection. Provide a bonding clamp to the brass fitting or to a black pipe component in the same electrically continuous gas piping system. The corrugated stainless steel portion of the gas piping shall NOT be used as a bonding attachment under any circumstance. Each installer must meet applicable state and local requirements established by the Authority Having Jurisdiction (AHJ) and must be successfully trained through the TracPipe CounterStrike manufacturer’s installation program. Contractor shall furnish certificate of successful completion of the Manufacturer’s training with the submittal data. Submittals provided without the Manufacturer’s certificate of successful completion will be cause for automatic rejection.

8.6. **Lines Below Grade and Exposed to Ambient Conditions**: Republic X-Tru-Coat steel pipe with plastic coating

8.7. **Lines Under Slab or in Unvented Spaces**: Install in mill coated vented steel pipe in accordance with International Gas Code. Vent pipe shall be equivalent to Republic X-Tru-Coat steel pipe with plastic coating.

8.8. **Electrical Bonding and Grounding**: The gas piping system shall be bonded to the electrical service grounding electrode system or, when provided, lightning protection grounding electrode system, at the point where the gas service enters the building, all as required by NFPA 54. The bonding jumper shall not be smaller than 4 AWG copper wire and shall be a maximum of 75 feet in length. Devices used for the bonding connection shall be listed for the application in accordance with ANSI/UL 467, Grounding and Bonding Equipment. Bonding of gas piping systems is electrical work and shall be provided by a qualified licensed Electrical Contractor who is recognized by the Authority Having Jurisdiction as capable of doing such work. Point of connection shall comply with the current edition of NFPA 70, National Electric Code. It is the responsibility of the Plumbing Contractor to engage a qualified Electrical Contractor to provide the bonding and grounding as specified.

8.9. **Connections**: Provide AGA listed and approved plug cock and pipe union in supply connection to each piece of equipment, RESUN #1430 semi-steel or equivalent for sizes 2" and smaller and 1431 flanged for sizes over 2". Where final connection is specified under another Section, cap off within 3 feet of input point. Provide flanges for piping 2 1/2" and larger, 150 lb., black forged steel, welding ASTM A181, Grade I, 1/16" raised face. (Use flat face when connected to flat face companion flange). Provide service cut-off valve in each service line to the building. Provide engraved brass valve tag at each cock identifying gas pressure. Tag shall be brass with black lettering and be attached adjacent to each cock with a chain.

8.10. **Gas Pressure Regulators**: Standard service type gas regulators meeting job and Gas Company requirements with automatic safety shut-off valves, cast iron body, regulators meeting job and Gas Company requirements, with automatic safety shut-off valves equal to Security Corp, aluminum orifice and chromate covered casting, e-
coated or primed with enamel topcoat and tamper proof seals. Regulator shall be equivalent to Security Corporation or equivalent by Sensus, Emerson/Fisher, Pietro Firoentini or American as required by job conditions. Verify supply (inlet) pressure prior to selecting regulators. All regulators shall be vented to the outside with copper line (up to 1/2” relief valve discharge outlet) and steel pipe as specified below for gas piping (1/2” and larger relief vent discharge outlet) full size of regulator valve discharge fitting. Where total vent piping exceeds 30’-0” in total equivalent length (each elbow equals 4’-0” equivalent length), vent line shall be increased one nominal pipe size. Terminate vent line with 90º elbow pointing down toward the ground. Termination shall be a minimum of 6’-0” horizontally from any ignition source, window, outside air intake, sidewalk or other opening into the facility and a minimum of 7’-0” above finish grade. Provide insect screen over open end of vent line to prevent the entry of insects and debris. **Internally vented regulators are not allowed.** Provide brass engraved tag at each regulator identifying the contents of the associated piping and the contents entering and leaving gas pressure.

**8.11. Shutoff Valve:** Main gas shutoff valve controlling the gas piping system shall be easily accessible for operation and shall be installed in each service line as indicated, protected from physical damage, and marked with a metal tag to clearly identify the piping system controlled and pressure of the gas line. Tag shall be brass with black lettering and attached to piping with chain adjacent to the shut-off valve.

**PART 9. PIPE INSULATION**

**9.1. General Provisions:** All work by experienced insulation subcontractor whose primary business is the installation of insulating materials in accordance with insulation manufacturers’ recommendations. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit insulated pipe size. **No installation of pipe hangers for insulated piping will be allowed to be in contact with piping or penetrate the piping insulation.** Piping insulation shall be continuous through partitions/sleeves and shall not be cut away for installation of clamps, etc. Refer to details on plans and Section 15010, "Pipe Hangers and Supports" for additional requirements. Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions in hot piping and other specifically named items. Neatly bevel covering edges adjacent to unions and other points of termination and seal ends. All insulation material (including coatings, mastics, jackets and adhesives) shall have a composite flame spread rating not to exceed of 25 (with no fuel contributed and smoke developed) as determined by ASTM E-84, NFPA 255 and UL 723.

**9.2. Scope:** Insulate all hot and cold water piping except that below grade, and excluding plated brass fixture connections. All piping shall be routed within the building insulation envelope to prevent freezing. Insulate rainwater drainage system as noted in that Part. Insulate all p-traps located in return air plenums, horizontal overhead drain lines, including p-traps, from mechanical room floor drains, ice machine drains, cooler drains, condensate drainage piping located in return air platform plenums and other condensate receiving drains, to the respective riser same as cold water piping. Include all overhead floor drain sumps and vertical pipe connection.
9.3. **Insulation:** No installation of pipe hangers for insulated piping will be allowed to be in contact with piping or penetrate the piping insulation. Refer to details on plans for additional requirements. Size hanger loops to fit **over** insulation. Glass fiber insulation, CertainTeed Snap-on, ASJ-SSL with Kraft-foil-laminated jacket, or equivalent by Owens-Corning or JM. Provide 3" wide jacket material butt strips at joints and at mid-points of lengths. Apply by sealing longitudinal jacket flaps and jacket bands (butt strips) with adhesive and with outward clinching insulation staples on 4" centers. Insulation staples shall have a vapor retarder coating, PVDC adhesive tape or greater than 3 ply laminate jacket (less than 0.0001 perms) adhesive tape.

- Cold Water/Domestic Water Insulation thickness: 1"
- Hot Water Insulation thickness: 2"

9.4. **Insulation for Piping Within Concrete Block Walls:** Insulate with 1" or 2" thickness insulation for the respective piping as specified above. Insulation shall be black, flexible foamed, elastomeric, closed cell pipe insulation with a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. It shall be GreenGuard certified tubular insulation with Microban antimicrobial protection. Insulation shall have a k factor of not more than 0.26 at 90°F mean temperature and a water vapor transmission rate of 0.05 perms or less. Slip insulation onto pipe prior to installation. **Longitudinal cutting of the insulation is prohibited. Do not stretch or bend insulation, nor slide insulation over sweat fittings.** Insulate sweat fittings with miter-cut pieces of insulation as recommended in Armaflex installation instructions, the same size as on adjacent piping. Seal all butt joints with Armaflex BLV, Black, low VOC, air drying contact adhesive. After gluing joints, wrap joint with 3" wide, 1/8" thick AP/Armaflex self-adhering tape. Insulation shall be AP Armaflex or equivalent by K-Flex or Aerocel AC EPDM.

9.5. **Fittings:** Insulate with Fiberglas insulation mitered to fit snugly or with PVC covers with integral rigid fiberglass insulation of the same thickness and density as the adjacent pipe insulation. Loose insulation in premolded covers is not allowed. Premolded PVC covers shall have a flame spread index of 0-25 and a smoke developed index of 0-50 when tested in accordance with ASTM E84.

9.6. **Exposed Ends:** Finish open ends of sectional covering by rounding off with cement, and sizing with fiberglass cloth jacket around the pipe and finish with Foster 30-36 mastic cement.

9.7. **Partitions and Floors:** Refer to Section 15010 Pipe Sleeves. In any case, insulation shall extend through floors, partitions and walls and firestopped. Note that Section 15010, Firestopping, requires firestopping of all penetrations, regardless of rating. Refer to Section 15010, Firestopping, for specifics and additional requirements.

9.8. **Aluminum Jacket:** All piping insulation exposed to the elements, all piping in the pool equipment room, all piping in the pool chemical storage room and all piping located in natatorium shall be covered with a preformed, 20 mil (.02”) thick, smooth finish, 3003 and 3105 series aluminum conforming to ASTM B-209 standards. Fittings shall be 20-mil (.02”) thick, die shaped, and smooth finish, Type 1100 aluminum jacket meeting ASTM C585. Provide 1/2" wide, 20-mil (.02”) thick, Type 3003 aluminum bands on maximum 24" centers but not less than two bands per jacket section. Locate longitudinal lap of aluminum jacket on bottom for all horizontal piping. Seal jacket lap...
on bottom and make watertight with silicone caulk. The aluminum jacket shall extend and terminate a minimum of 12" inside the respective indoor space adjacent to the natatorium. Seal the penetration and ends of piping insulation weather tight. **VentureClad or similar product is prohibited.**

9.9. **Underground Hot Water Piping:** Insulate with 2" thickness Armstrong Armaflex or equivalent pipe insulation. Seal all joints with Armaflex 520 sealer and 1/8" thickness, 3" wide Armaflex tape.

9.10. **Electric Water Coolers:** Insulate drain connections and traps with 1/8" thick insulating tape by AP Armaflex, K-Flex or Aerocel AC EPDM.

9.11. **Piping At Hangers and Unistrut:** All piping hangers and unistrut in the pool equipment room, pool chemical storage room and the natatorium shall be aluminum with chlorine resistant epoxy or powder coated finish. For all piping, provide a preformed, pre-insulated 6" long saddle assembly consisting of an integral 22 gauge G-90 metal saddle for piping up to 1 1/2" and, 12" long integral 18 gauge G-90 saddle for piping up to 5". Saddles shall be aluminum for locations specified above. The assembly shall be a 360-degree section of 3.0 pcf density polyisocyanurate pipe insulation with a minimum of 45-psi compressive strength. The assembly shall have a 6-mil thickness, .01 perms rated industrial grade vapor retarder film. The insulation shield shall be 360 degree self-clamping and be integral with the insulation. The assembly shall also be provided with an insulation lock joint longitudinal seam. The assembly shall meet the requirements of ASTM D1622 for insulation density, ASTM C518 for thermal conductivity, ASTM D1621 for 50 PSI compressive resistance, and ASTM D374. The insulation jacket shall have a hazard rating not to exceed 25 flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E-84, NFPA 255 and UL 723. The assembly shall be Tru-Balance/Buckaroo’s, Model 3300E or equivalent by Thermal Pipe Shields, Inc or Pipe Shields, Inc.

9.12. **Painting:** Paint exposed insulation after insulation is completed as specified in Section 15010. Painting of piping with aluminum jacket is not required by the Engineer.

9.13. **Identification:** Refer to Section 15010 for identification of piping systems.

---

**PART 10. GAS FIRED CONDENSING TYPE WATER HEATER**

10.1. **General:** Water heaters shall be Model BTH Series Cyclone Mxi as manufactured by A.O. Smith. Equivalents by Rheem or Lochinvar will be acceptable. Water heaters shall be of the seamless glass lined steel tank construction in which the glass coating is applied to the water-side surfaces of the tank after the tank has been assembled and welded. The condensing flue coil shall be coated on the flue gas side with acid resistant glass lining designed for use in condensing heaters.

The heater shall be furnished with minimum 2" legs and suitable for venting with polypropylene pipe for the job conditions, of sizes recommended by the water heater Manufacturer. The heater shall be suitable for sealed combustion direct venting using a polypropylene air intake pipe and polypropylene exhaust pipe and terminated through the wall or roof as shown on the plans. The heater shall be factory assembled and tested. The power burner shall be of a design that requires no
special calibrations on start-up. The heater shall be approved for 0” clearances to combustibles.

The control shall be an integrated solid state temperature and ignition control device with integral diagnostics, LED fault display capability and digital display of temperature settings.

The tanks shall be foam insulated and equipped with a ASME rated temperature pressure relief valve. The water heater shall bear an ASME stamp, be UL listed and exceed the minimum efficiency requirements of ASHRAE/IES 90.1.b-1991.

Operation of the heater in a closed system where thermal expansion has not been compensated for with a properly sized thermal expansion tank will void the warranty.

10.2. Vent / Combustion Air System: DO NOT USE PVC PIPE. The system and each of its components shall be a zero clearance to combustibles, factory fabricated, single wall, ETL listed to UL 1738 and ULC-S636, flame resistant polypropylene with integrated gaskets. It shall be designed for use in conjunction with Category II, or Category IV condensing gas fired appliances, rated for a maximum continuous flue gas temperature of 230ºF and listed for maximum positive pressure rating of 20” W.C. The vent system shall be continuous from the appliance’s flue outlet and combustion air inlet to the concentric vent termination outside the building. All systems components, to include vent horizontal and vertical supports, roof or wall penetrations, terminations, appliance connectors, fittings, drain fittings, etc. required shall be UL/cUL listed and provided by the vent manufacturer. All systems components shall include a factory-installed gasket in their female-end to render the vent air and watertight when the male/female ends are pushed together as per manufacturer’s instructions. Provide a test port section immediately above the appliance for testing of the flue gases, horizontal drain tee at location specified by the assembly Manufacturer, stainless steel flashing with PPs-gray UV protected end pipe, bird screen. All items furnished that extend thru the roof shall adhere to roofing manufacturer's requirements so as not to void the roofing warranty. Vent systems requiring field installed sealants or compounds are not be acceptable.

The vent layout shall be designed and installed in compliance with assembly manufacturer’s installation instructions, its UL/cUL listing and all applicable local codes. The assembly and its required components shall be selected by the vent manufacturer. Furnish for approval a Manufacturer approved diagram for each venting system required for this project. The appliance submittal will not be reviewed without the vent Manufacturer’s approved diagram. The venting system shall be approved for use by the appliance Manufacturer. The system shall be Centrotherm Commercial SW or approved equivalent.

10.3. Relief Valves: Install (in accordance with USA Standard Z21.22) properly sized AGA and ASME approved temperature and pressure relief valves with copper overflow lines to floor drain as indicated and factory made manifold.

10.4. Expansion Tank: Provide diaphragm type designed for 150 psig working pressure and shall bear an ASME stamp. Tank shall have a minimum acceptance as recommended by heater manufacturer. Expansion tank shall be supported and securely attached to the wall by an angle iron frame.
10.5. **Circulating Pump**: Furnish and install, as shown on the plans an all lead-free bronze (0.25% or less lead content of all wetted surfaces) or stainless steel construction, pipe-mounted centrifugal pump with high efficiency ECM motor in eight (8) modes of control and stainless steel flanges. Pump shall be ETL or UL listed and be NSF 372 compliant. Provide a strap-on aquastat and wire to control the pump through a 7-day program clock which shall be programmed to the Owner’s requested operating schedule. Clock shall be equivalent to Grasslin digital 2-72 with 24 hour minimum battery back-up power. Provide required control wiring. Pump power shall be as shown on the electrical plans. Pump shall be Armstrong Compass series or equivalent by Taco or Grundfos.

10.6. **Miscellaneous**: Heaters shall be placed on 4” concrete housekeeping pad with rounded corners. Condensate piping from the combustion chamber of condensing type heater shall be Schedule 80 PVC solid wall piping and fittings meeting ASTM Standard D2665 and 1785 unless Manufacturer recommends otherwise.

**PART 11. ACID NEUTRALIZING TANK**

11.1. **General**: Contractor shall furnish and install high-density polyethylene neutralization tank. Tank shall be rotationally molded seamless construction, with flanged top and bolt-down cover, as supplied by Ensfield Industrial Corporation. Tank shall be equivalent to Ensfield Neutrack #T0055, having 55 gallon capacity, complete with 4” inlet and outlet, and 2” vent connection. Tank to be 22” diameter x 36” high. Tank shall be installed in accordance with manufacturer’s recommendations. Provide heavy-duty manhole (full size) extension to finished grade and set in 6” thick concrete pad.

Contractor shall furnish and fill the tank prior to operation with approved neutralization agent such as limestone or marble chips, one to three inches in size, to a level just below the tank outlet. Water should be added to the tank after placement of neutralization agent.

Provide required anchors to prevent flotation.

**PART 12. FIXTURES SUPPORTS, CONNECTIONS AND MOUNTING HEIGHTS**

12.1. **General**: Verify exact size and location of water, vents, waste and supply connections from approved rough-in drawings and/or catalog data sheets. Allow for modifications required by the shop drawings without additional cost to the Owner or the Owner’s Project Design Professionals.

All fixtures including lavatories, urinals, water closets, electric water coolers, etc., must be securely fastened to the walls or floor. **Coordinate all mounting heights with Architectural plans prior to rough-in.**

12.2. **Wall Mounted Fixtures**: Support all wall mounted fixtures that are specified without carriers using 1/4” thick 6” high plates full length and with of fixture, mounted behind wall. Where fixtures are back to back on a solid wall, mount with bolts from fixture hanger to fixture hanger. Do not use toggle bolts or expansion bolts except unless noted.
Where fixtures are mounted on solid (single wythe) walls finished both sides, install fixtures with plated toggle bolts.

Where fixtures are mounted on wood or light gauge steel studs, employ pressure treated blocking of 2” x 12” nominal size well secured into stud line with non-corrosive, dielectric separation fasteners. Fit behind stud flanges, using especially placed studs as required.

Provide wall carriers where specified or required by the fixture Manufacturer.

12.3. **Floor Connections**: Provide cast iron or galvanized malleable iron floor flanges at least 3/16” thick, screwed or caulked to drainage pipe. Bolt the connection and make tight to fixture with plumbing fixture setting compound, wax setting ring or polyethylene gasket flange. Offset flanges for water closets are not allowed.

12.4. **Water Supply Connections**: Provide rigid, lead-free brass nipple from water riser to fixture stop valve threaded connections. Steel pipe is unacceptable. Exposed portion of nipple shall be chromium plated. **Stops' risers shall be lead-free, threaded with chrome over copper pipe. Quick connect fittings are not allowed.**

12.5. **Waste Arms to Fixtures**: As specified hereinbefore. Where copper or brass pipe is specified, all joints downstream from the trap shall be soldered joints.

12.6. **General Mounting Heights - Coordinate With Architectural Plans Prior to Roughing in Fixtures**:

- Urinals (unless indicated otherwise) – 24” to lip
- Urinals for ADA adults – 17” to lip
- EWC for ADA adults – 34” to spout
- Lavatories (unless indicated otherwise) – 31” to rim
- Lavatories designed for men – 32” to rim
- Lavatories for ADA – 34” to rim
- EWC (unless indicated otherwise) – 40” to rim
- Water closets (ADA) 17” to 19” to top of seat

**PART 13. SCHEDULED FIXTURES AND MISCELLANEOUS ITEMS**

13.1. **Acceptable Manufacturers**: Fixtures listed are from American Standard (AS) and Elkay Catalogs. Equivalent products by Toto, Kohler, Zurn, Beneke, Just or Sloan will be accepted. Where three (3) Manufacturers are listed for fixtures below, use only those Manufacturers. Manufacturers not listed require 7-day prior approval.

13.2. **Fixture Trim**: Exposed metal parts to be of heavy weight polished brass, heavily chromium plated, of best quality as regularly furnished by the plumbing fixture manufacturer. Provide stop valve in supply to all fixtures and equipment.
13.3. **Compliance with Americans Disabilities Act:** All ADA fixtures, faucets, flush valves, clearances, and installation shall comply with requirements of the Americans Disabilities Act.

13.4. **Guarantee:** Guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of acceptance of the project unless specified otherwise. Provide free maintenance and service during the guarantee period. **Additionally, all sensor operated devices shall be provided with a total of five (5) years, complete replacement device and labor guarantees.**

**Scheduled Items:**

**P – 1 Water Closet:** American Standard New Madera 2234.015, 1.6 GPF vitreous china, siphon jet, elongated bowl with 1-1/2" top spud, fully glazed trapway, china bolt caps, Zurn Z6000AV-WS1 flush valve and Bemis 1655SSCT white open-front seat with self sustaining stainless steel check hinge. Provide chrome plated split-ring wall bracket for supply pipe.

**P – 2 ADA Water Closet:** American Standard Madera #3043.102, 1.6 GPF 17" high vitreous china, siphon jet, fully glazed trapway, elongated bowl with 1-1/2" top spud, china bolt caps, Zurn Z6000-AV-WS1 flush valve and Bemis 1655SSCT white open-front seat with self sustaining stainless steel check hinge. Provide chrome plated split-ring wall bracket for supply pipe. Coordinate flush valve installation with grab bar. Flush valve control/handle shall be mounted for use from the wide side of the toilet stall. Finished floor to top of seat shall be 17" to 19”.

**P – 3 Urinal:** American Standard Allbrook 6550.001, 1.0GPF, vitreous china siphon jet, 3/4" top spud, flushing rim urinal, Zurn Z6003-AV-WS1 flush valve with vacuum breaker and Zurn series Z-1222 carrier. Provide chrome plated split-ring wall bracket for supply pipe.

**P – 4 ADA Lavatory:** American Standard Regalyn 4869.012, 20" x 18", wall hung acid resisting enameled cast iron lavatory complete with Delta 523LF-HDF faucet and drain, McGuire #LF2167, 1/2" supplies with stops, McGuire #155WC offset drains, McGuire 8872 p-trap. Supplies shall be lead-free, AB1953 certified by recognized authority and bear manufacturer and testing mark. Provide lead-free mixing valve (ASSE 1070) with tempered water line to faucet. Mixing valve shall be provided with wall bracket, dual check valves and 40-mesh stainless steel screen. Mixing valve shall be Watts Series LFUSG-B-SC-M2 or approved equivalent. Provide heavy-duty floor support equivalent to J.R. Smith 0710 chair carrier with concealed arms. Insulate supplies, trap and drain with premolded ADA compliant protectors with internal fasteners as Manufactured by Truebro Lav Guard 2, Oatey/Dearborn or McGuire Pro-Wrap only. Mounting height to rim shall be 34”. The entire assembly shall comply with ADA and ANSI standards.

**P – 5 Mop Basin:** American Standard 7741.000 Florwell, acid resisting enameled cast iron corner model floor type service sink, complete with 8354.112 wall mounted faucet with offset shanks with integral stops, vacuum breaker, integral check valves, adjustable wall brace, pail hook, 3/4"hose thread on spout, four foot rubber hose, hose bracket, 7745.811 rim guard, strainer for 3” screw connection, 304
A Proposed Recreation Center
For the City of Boaz

PLUMBING 15400-24

stainless steel wall guards and silicone sealant at all points where basin meets wall and floor.

P – 6 Bi-Level Indoor Electric Water Cooler With Bottle Filler: Elkay #LZSTLG8WSKK, filtered, bi-level, wall mounted, front and side bubbler push bar, electronic bottle filler sensor on lower unit, ADA and ICC A117.1 compliant with stainless steel cane apron, stainless steel cabinet and receptor, safety bubbler and 5-year warranty. It shall provide 8 gal/hr of filtered water at 50°F based on 80°F inlet water and 90°F ambient temperature, per ASHRAE 18 testing. Unit shall be certified to UL 399 and CAN/CSA C22.2 No. 120 and NSF/ANSI 61 & 372 for lead free design. Furnish with 1-1/4" rough brass p-trap, 17 gauge brass tailpiece and waste with wheelless stop valve, concealed J.R. Smith 0834 floor mounted support, related 70085-86-6 support plates and base as required for applicable wall construction. Refer to Architectural plans for wall type. Provide three (3) 51300C WaterSentry Plus Replacement Filters, certified to NSF 42, NSF 53 and NSF 372 (Lead free) for each set of water coolers provided. Upon completion of the project, turn over replacement filters to Architect for transfer to Owner. Equivalent units by Halsey Taylor, Oasis or Murdock will be considered.

P – 7 ADA Shower Unit: Shower enclosure shall be equivalent to Comfort Designs model XSS 3637 BF RRF -1-CVS-CRS-DR "Acrylx" finish, ADA compliant transfer shower with fold up seat, Stainless L-Bar and vertical bar. Outside dimensions shall be 40.25" x 38.5" x 77.65" with pre leveled easy base. Verify all dimensions with Architectural plans prior to ordering shower. Furnish no caulk drain and curtain rod. Furnish Zurn Z7120 LH MT SS HW pressure balanced shower valve with stainless steel center guided piston and brass body. Supply Z 7000 GBH grab bar hand wall shower head holder, Z7000 GB24 stainless steel grab bar in lieu of slide bar, Z7000 H9 head, 60" metal shower hose with integral vacuum breaker and integral soap holder. Furnish Manufacturer’s Color Chart to Architect for color selection. Equal units by Symmons or Leonard will be considered.

P – 8 Shower Unit: Comfort Designs model XSS 3636 SH 4.0-1 shower with sanitary grade applied acrylic. Unit shall meet CSA B43.5-11 and HUD-UM73. Shower to have molded leg ledge, soap dish and 4.0" threshold. Outside dimensions 35.75" x 37.25" x 77.5". Verify all dimensions with Architectural plan prior to ordering shower. Provide curtain rod and no caulk drain. Equal units by Hamilton or Aquarius will be considered. Furnish Zurn Tempgard model Z 7100-MT-SS-I2 pressure balanced shower valve with metal trim, service stops, institutional wall mounted brass head. Valve shall have stainless steel center guided piston and bronze body. Equal units by Symmons BP 56 1X B L with 4-385 head or Leonard 4501S-H-06.

P – 9 Kitchen Hand Sink: American Standard Lucerne 0355.012, 20" x 18", wall hung vitreous china lavatory complete with Delta 501LF-HDF faucet, McGuire #2167, ½" supplies with stops, McGuire #155WC offset drain, McGuire 8872 p-trap and heavy-duty floor supported JR Smith Series 0710 chair carrier with concealed arms. The entire assembly shall comply with ADA and ANSI standards. Provide lead-free mixing valve (ASSE 1070) with tempered water line to faucet. Mixing valve shall be provided with wall bracket, dual check valves and 40-mesh stainless steel screen. Mixing valve shall be Watts Series LFUSG-B-SC-M2 or approved equivalent. Insulate supplies, trap and drain with premolded, ADA compliant, protectors as
Manufactured by Truebro Lav Guard 2 or McGuire Pro-Wrap only. Mounting height to rim shall be 34”.

P – 10  **Sink**: Elkay LR-2222, 22” x 22” single compartment 18 gauge self rimming, stainless steel sink complete with Zurn Z826B1 with swing spout faucet, LK-35 crumb cup strainer and tail piece, McGuire 89121-1/2” trap and Brasscraft XR1720A stops. Provide lead-free mixing valve (ASSE 1070) with tempered water line to faucet. Mixing valve shall be provided with wall bracket, dual check valves and 40-mesh stainless steel screen. Mixing valve shall be Watts Series LFUSG-B-SC-M2 or approved equivalent.

P – 11  **Undercounter Ice Maker**: Furnished by Others. Installed by the Plumbing Contractor. Provide cold water supply with stop and PDI Symbol “A” shock absorber. Provide drain line to hub drain and insulate with 3/4” thick “Armaflex” by Armstrong. Seal all joints.

P – 12  **Refrigerator Icemaker Water Connection Box**: Unit shall be NSF-372 compliant; IAMPO listed and accommodate supply line from above. Supply box shall include a 1/4-turn; chrome plated, forged brass, lead-free, ASME A112.18.1 ball valve with stainless steel water hammer arrester and inlet water sweat fitting. Valve shall accommodate all common industry inlet connections. Box shall be ABS plastic, fire rated frame, and outlet connection shall be 1/4”. Every unit shall include frame and a debris cover for protection during rough-in.

P – 13  **Sink**: Elkay PSMR4322, 43” x 22” x 7-1/8”, triple bowl, drop in sink, 20 gauge, self rimming, stainless steel sink complete with lever handle Elkay LKGT-2041 chrome faucet, pull out hose kit with aerator and weight, crumb cup strainers, tailpiece, McGuire 8912 1-1/2” trap and Brasscraft XR1720 stops.

P – 14  **Ice Machine**: Furnished by others. Installed by the Plumbing Contractor. Provide cold water supply with stop and PDI Symbol “A” shock absorber. Provide drain line to floor sink and insulate with 3/4” thick “Armaflex” by Armstrong. Seal all joints.

P – 15  **Ice Machine**: Furnished by others. Provide cold water supply with ASSE 1022 backflow preventer.

P – 16  **Bi-Level Outdoor Electric Water Cooler**: Elkay # VRC7LFR8SCL, unfiltered, wall mounted, frost resistant heating element, vandal resistant front pushbutton activation, ADA compliant with stainless steel cane apron, stainless steel cabinet and receptor, heavy duty one-piece vandal resistant bubbler, rated for outdoor use and 5-year warranty. It shall provide 8 gal/hr of unfiltered water at 50°F based on 80°F inlet water and 90°F ambient temperature, per ASHRAE 18 testing. Unit shall be certified to UL 399 and CAN/CSA C22.2 No. 120 and NSF/ANSI 61 & 372 for lead free design. Furnish with 1-1/4” rough brass p-trap, 17 gauge brass tailpiece and waste with wheelless stop valve, concealed J.R. Smith 0834 floor mounted support, related support plates and base for applicable wall construction. Refer to Architectural plans for wall type. Equivalent units by Halsey Taylor, Oasis or Murdock will be considered.

PART 14. MISCELLANEOUS EQUIPMENT FURNISHED UNDER OTHER SECTIONS
14.1. **General:** Equipment that is to be furnished and set in place under another Section of the Specifications (or is to be so provided under a separate contract). Verify exact size and location of water, vents, waste and supply connections from approved rough-in drawings and/or catalog data sheets. Allow for modifications required by the shop drawings without additional cost to the Owner or the Owner’s Project Design Professionals.

All water and gas connections are to be complete with stop valves.

14.2. **Miscellaneous Concession Stand Kitchen Equipment:** Rough in, provide fittings and make connections as required for a complete installation ready for operation.
SECTION 15700
HEATING, VENTILATING AND AIR CONDITIONING

PART 1. GENERAL

1.1. **General Provisions:** Section 15010 is applicable in full hereto. **No materials or products that contain asbestos, formaldehyde, lead or mercury, in excess of limits mandated and defined by OSHA, LEED and the EPA, shall be utilized.**

Manufacturers not named in the specifications require prior approval, seven (7) days prior to bid date. Follow procedures set forth in Division 1 of the specifications.

1.2. **Qualifications of Subcontractor:** Shall be properly licensed and established as a Heating and Air Conditioning Contractor at location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least six (6) systems of this type, size and scope.

1.3. **Scope:** Include all equipment, material, and labor required for complete and proper operation of HVAC systems, even though not every item involved is indicated. Do not attach any items to other trades’ assemblies. Items shall be attached to building structural system. Advisory provisions listed in all Codes referenced in the Contract Documents are mandatory. Where conflicts occur between a Code, Standard, the contract drawings or specifications, the most stringent requirements shall govern and be applied. Refer to other sections of this specification and Section 15010 for additional information and requirements.

1.4. **Site Visits / Inspections:** It is the contractor’s responsibility to have the job ready for inspections when they are scheduled. If the project is not ready for the requested inspection and the Architect, any governmental agency or any other entity requires a re-inspection, the contractor shall pay Zgouvas, Eiring & Associates a re-inspection fee of $1,500. The payment shall be made directly to Zgouvas, Eiring & Associates 5 days prior to the scheduled re-inspection.

The Contractor is cautioned to carefully review the extensive requirements of Paragraph “Identification” in Section 15010 of the specifications and note that identification is required to be completed before certain inspections. Failure to comply with this provision will be cause for cancellation of the inspection with all costs of the re-inspection to be borne by the Contractor responsible.

1.5. **Miscellaneous:** The Contractor shall carefully examine the contract documents during the bidding phase. Any missing information in the contract documents that is required for obtaining accurate pricing shall be brought to the attention of the Architect, prior to bid date, so all may be clarified and/or corrected. Failure to identify and resolve the issues prior to bid shall require the Contractor to provide said items, complete, without additional cost to the Owner or the Owner’s Project Design Professionals, using materials and methods specified by, and as directed by, the Owner’s Design Professionals.

1.6. **Painting and Colors:** Furnish to the Architect, color cards for standard and premium colors available. **The Architect shall select color where choices exist.** Refer to Architectural Painting Section of the specifications for additional requirements.

1.7. **Safety Provisions:** Provide covers or guards on all hot, moving and projecting items
that may be deemed by the Engineer, Architect or Owner to be a hazard to occupants of the building or to service personnel.

1.8. **Spare Parts:** Manufacturer of any equipment specified shall have a wholesale outlet for readily available replacement parts in the nearest major USA city.

1.9. **Submittals:** Refer to Section 15010 for strict requirements especially as it applies to Project cost constraints, addendums or Value Engineering (VE) items.

1.10. **Identification:** Refer to Section 15010 for identification requirements. There are specific requirements prior to the above ceiling and final inspections, respectively, that are mandatory. The identification section of the specification is extensive. The Contractor shall refer to Section 15010, review and provide all identification requirements specified. Failure to comply with this provision will be cause for cancellation of the inspection with all costs of the re-inspection to be borne by the respective Contractor responsible.

1.11. **Firestopping:** Refer to Section 15010 for requirements. Note that Division 15 firestopping specifications require firestopping of all penetrations regardless of wall/ceiling/floor construction. Refer to Division 1 for additional requirements. Where there is a conflict between Division 1 specifications and Division 15 specifications, the most stringent requirements shall govern, be applicable and shall be provided.

1.12. **Service, Charges, Grease, Filters, etc.:** Furnish complete first charges of refrigerant, grease, oils, etc., and be responsible for such full charges for the guarantee period. Provide service and maintenance for all equipment and systems during the guarantee period. As a minimum, quarterly service calls and reports are required. Make last service call two weeks prior to year-end inspection. All quarterly service shall include lubrication of all motors, bearings, calibration and adjustment of all controls and equipment, full refrigerant charge, new filters, belts, etc. The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters’ casing the date filters were installed/replaced. The Contractor shall furnish to the Architect and the Owner individual written service reports for all work done under this warranty. Failure to provide the Architect with the Owner’s written acknowledgement of service calls shall be construed to mean that the service calls have not been accomplished and are still required.

1.13. **Field Instructions:** The Contractor shall operate all systems for a period of six (6) days after completion of the work. During this time, provide competent personnel to thoroughly instruct representatives of the Owner in the proper operation and care of all equipment and control systems. Secure written acknowledgement of such training from the Owner. Failure to provide the Architect with the Owner’s written acknowledgement of this training shall be construed to mean that the instructions have not been accomplished and are still required.

1.14. **Operating / Maintenance Manual and Framed Instructions:** Two weeks before final inspection, furnish three complete sets of operating and maintenance instructions, bound in hard cover, indexed and tabbed. The first sheet in the bound instructions shall be a list with each product, name, address and telephone number of:

   a. Subcontractor and installer
b. Table of Contents listing all products in the order that they appear in the specifications. Label each tab accordingly. Each item (HP-A, AHU-1, EF-A, etc.), individually, shall be included.

c. Provide a summary page that lists each item with its respective warranty listed.

d. Local source of supply for parts and replacement.

e. Provide wiring and control diagrams with explanatory data; control sequence describing start-up, operation and shutdown; operating and maintenance instructions for each piece of equipment; manufacturer’s bulletins and catalog data; parts list and recommended spare parts. Fold in large sheets of drawings.

f. A general maintenance section shall be included. Provide a list indicating all routine maintenance procedures based on the respective manufacturer’s recommended intervals. As a minimum, maintenance shall be grouped and individually tabbed to indicate maintenance operations required:

   1. Once a month
   2. Quarterly
   3. Once every six months
   4. Once a year

g. Provide drawings of system control and wiring diagrams, condensed operating instructions, and lubricating schedule and include in binder. All components shall be numbered and identified on diagram. Submit for approval. After approval, place in the binder. Also, frame under glass or plastic and mount in each mechanical room in an optimally viewed location.

h. Record drawings of the HVAC drawings in hard copy and PDF format and in ACAD *.dwg* format, on CD.

i. Copy of Test and Balance Report to include testing of fire dampers, etc. as specified.

j. Copies of all Site Visit/Inspection Reports including Contractor’s written response that items listed were corrected.

k. Provide copy of results of all tests specified.

l. Provide copy of all start-up reports specified.

m. Provide Owner’s letter certifying training of Owner’s personnel in the operations of the HVAC systems has been accomplished.

Additionally, the Contractor shall provide all of the aforementioned information, in digital Adobe Acrobat PDF format, on a CD-R CD. The PDF file shall be provided with an embedded index for each item specified. It shall appear in the left hand window of the opened document so that the Owner or his maintenance personnel can “click” on the indexed item and move immediately to that specific item.

1.15. **Warranty**: Guarantee work as set forth in Section 15010 and Division 1. Guarantee in writing to make good without cost any defects in materials and workmanship for one year following the date of substantial completion of the project, as determined by the Architect, and unless specified otherwise a 5-year warranty on all air conditioning compressors. Provide free maintenance and service during the guarantee period to include furnishing and replacing of filters. Refer to other parts for additional requirements and extended warranty requirements.

**PART 2. ELECTRICAL WORK AND EQUIPMENT**

2.1. **Power**: All power wiring required for installation of equipment is specified under Electrical Division. Electrical equipment shall be compatible with the current shown
Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.

2.2. **Motors**: All motors furnished shall be designed, manufactured, and tested in accordance with the current applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the current applicable sections of NEMA Standard No. MG-1. Motors must meet or exceed The Consortium for Energy Efficiency (CEE) Premium Efficiency™ full load efficiencies. All motors shall be listed under UL recognized component file as applicable. All motors shall be suitable for installation according to the requirements of NEC. Motors shall be wound for the specified voltage and a 1.5 service factor, 1750-RPM open drip proof construction unless otherwise shown or specified. The bearings shall have a rated fatigue life of B-10 of 150,000 hours for direct-coupled applications and 50,000 hours for belted applications minimum. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG 1. Load on motors shall not exceed 100% nominal horsepower. Routine factory testing shall be conducted in accordance with Method B of IEEE 112 (current edition), Standard Test Procedure for Polyphase Induction Motors and Generators and shall be as described in Article 12.55 of NEMA MG1, Motors and Generators. **Premium efficient motors shall be warranted for 36 months from date of acceptance of the project.**

Where shown, specified or required, furnish increment wound motors for two-step starting. All motors shall be provided with overload protection and phase protection on all legs. Do not run motors until correct overload elements are installed in starters. Trading overload elements for elements of correct size for motors actually furnished shall be included in this Section. Motors shall be by Allis Chalmers, General Electric Goulds, Louis Allis, Westinghouse or approved equivalent. All motors serving outdoor equipment exposed to weather shall have TEFC motors meeting the requirements set forth previously.

2.3. **Variable Frequency/Speed Drives**: Where shown or specified, variable frequency drives shall be equipped with integral disconnect switch and a serial interface to allow bidirectional communication with a future BAS. At a minimum, the following points shall be made available to the controls system: Set Point, Drive Speed (RPM), Frequency (Hz), Current (A), Power (KW), Energy (KWH), Last Fault Number, OK/Faulted Status, Stop/Run Status, and Hand/Off/Auto Status. Drives shall be installed in accordance with NEC requirements for electrical panels. Drives enclosure shall be minimum NEMA 4x for outdoor installation and NEMA 12 for indoor locations unless specified otherwise.

2.4. **Fusing**: Provide factory installed fuses in all equipment requiring fusing for branch circuit protection.

2.5. **Motor Starters**: To be furnished under this Section; installation thereof is specified under Electrical Division, except for those which are specified to be factory assembled. Starters shall be Cutler-Hammer, Allen-Bradley, Square D or General Electric. Starters shall be U.L. and NEMA approved. Where required for interlocks provide built-in step down transformer. Motors for VFD drives shall be designed for NEMA MG-1, Part 30.

Provide for each motor or group of motors requiring a single control (and not controlled from a motor-control center), a suitable controller and devices that will function as specified for the respective motors.

Provide overload protection for each ungrounded conductor to each motor 1/8 HP or
larger (manual reset type unless indicated otherwise). The overload-protection device shall be integral with the motor or controller. Unless indicated otherwise, furnish pilot lights with all remote starters. Where auxiliary control devices are connected into control circuit, these devices shall not bypass safety controls (motor-overload protective devices, high-pressure cutouts, low pressure cutouts, etc.). Provide "Hand - Off - Auto" switches, auxiliary contacts, etc. for all starters.

2.6. **Phase Protection:** All fan motors, indoor units, outdoor units, condensing units, packaged units, etc., shall be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3-phase equipment utilizing ICM Controls Model 450 or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities. Phase protection is not required on equipment being controlled via a variable speed frequency drive; if the specified protection is inherent with the variable speed drive furnished.

2.7. **Controls:** HAC Contractor shall be responsible for the furnishing and installation of all controls, and control and interlock wiring, as specified or required to properly complete the installation. Control conduit is specified in Electrical Division of the specifications and/or shown on electrical drawings. Minimum control conduit size shall be 3/4". All control conduit, power wiring, relays, contactors, etc. for controls, which are not shown on the electrical drawings or specified in the Electrical Division of the specifications, shall be provided under this HVAC Section. Coordinate all requirements with the Electrical Sub-Contractor prior to bid. All thermostat and humidistat boxes shall be mounted 46" A.F.F. to the center of the box (ADA height). Where wall mounted CO2 Sensors are indicated, they shall be mounted 58" A.F.F. to the center of the box. Electrical work performed under this Section shall conform to requirements set forth in the Electrical Division of the specifications. All wall mounted devices shall be provided with hinged, locking metal covers with rounded edges. All work shall be done by an approved, independent HVAC Controls Subcontractor whose primary business is the installation and servicing of HVAC controls systems.

2.8. **Controls and Instrumentation Cable:** Instrumentation cable shall be minimum AWG as recommended by the equipment Manufacturer or the HVAC controls system Manufacturer. The most stringent shall be provided. In absence of those requirements, cable shall be stranded copper, single or multiple twisted, minimum 2 inch lay of twist, 100 percent shielded pairs and shall have 300-volt insulation and as required by the NEC, Current Edition. Each pair shall have a tinned copper drain wire and individual overall pair insulation. Cables shall have an overall aluminum polyester or tinned copper cable shield tape. All wiring, cabling, conduit, connections, etc., shall be plenum rated and rated for use at temperatures and conditions expected in the location of mounting.

All wiring and cable shall be in EMT conduit except conduit is not required above lift-out (lay-in) ceilings. "Whips" are unacceptable. Minimum conduit size shall be 3/4". Provide independent, minimum 2" wide, aluminum or rust resistant coated steel J-hook supports for all wiring not in conduit. Wiring supports shall be attached to the building structural system (not other trades’ supports, piping, duct, ceiling suspension system, etc). Wiring, cabling, etc., shall be neatly bundled together and supported at no more than four (4) feet on center.
2.9. **Wiring Diagrams**: Furnish to the Electrical Contractor for the specific makes and models of electric-motor operated equipment to be installed. **Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.**

2.10. **Modifications**: The cost of any modifications of the electrical power wiring and/or control wiring conduit required by heating, air conditioning or ventilation equipment or controls having electrical power requirements differing from that shown on the electrical drawings and/or as specified, shall be the responsibility of the Mechanical Contractor. **Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.**

PART 3. **PLUMBING WORK**

3.1. **Floor Drains**: By Plumbing Contractor. HAC Contractor shall provide drains from all air conditioning equipment drains to the floor drains or to outside as indicated on the plans or, in absence of the previous requirements, as directed by the Architect.

3.2. **Gas**: Valved supplies to within 2 feet of equipment are specified under Plumbing Section. Final rigid connections to equipment by HAC Contractor, with work meeting requirements established in Plumbing Section. Provide 6” dirt leg for gas fired equipment. No flexible piping shall be used unless specified otherwise.

PART 4. **VIBRATION AND NOISE CONTROL**

4.1. **General**: Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, air chambers, curbs, etc. required thereby. Pay special attention to vibration problems at year end inspection and correct all deficiencies noted.

All items of mechanical equipment including air handling equipment, condensing units, pumps, piping, indoor cassette units and fans shall be properly isolated from the structure by means of the Engineer’s approved vibration absorbing accessories, foundations or supports.

Manufacturer shall be TR Finn and Co., Inc. “Finnflex” steel spring vibration mountings or equal product by Amber-Booth, Consolidated Kinetics, Korfund Dynamics, Mason Industries or Vibro-Acoustics.

4.2. **Vibration Isolation Pads - Indoor Heat Pump Units**: One layer of 3/4” thick, fire retardant, continuous neoprene pad.

4.3. **Sound Levels**: Sound levels caused by operation of pumps, fans, air handling systems, etc., whether generated within rooms or transmitted to rooms through ducts, walls or floors, pipes, etc., shall not exceed specified NC rating at any point within room not more than 6 feet from an air outlet in accordance with ASHRAE octave band method. Offices, classrooms, conference rooms and similar spaces shall have maximum NC-32; corridors, and lobbies, NC-40; toilets, NC-45.
PART 5. TESTING, START-UP, BALANCING, ETC.

5.1. **General:** Conduct tests upon completion of the heating, ventilation and air conditioning installations, and at times as designated by the Architect. Furnish written reports to the Architect of all tests results. Provide copies of all test results in the Bound and Framed Instructions specified hereinbefore. Furnish all necessary personnel, test instruments, power, fuel, etc., as required to complete the specified requirements.

5.2. **Refrigerant Piping:** Test with CO2 gas and prove tight. Test high and low side of system at 500 psi. After evacuating the system and charging with refrigerant, test piping with a halide torch and prove tight under actual operating conditions.

5.3. **Ductwork for Systems Less Than 2,000 CFM:** Test all supply, return and exhaust ducts, plenums and casings and make substantially airtight before covering with external insulation or concealing masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable to the senses of touch or sound at joints.

5.4. **Ductwork for Systems 2,000 CFM or Greater:** Test all supply, return and exhaust ducts, plenums and casings and make airtight before covering with external insulation or concealing in masonry. Test supply ductwork under the positive pressure for the respective system. Test return and exhaust ducts, plenum and casing under a positive pressure of 0.75"WG. Maximum allowable leakage shall be 5%. Vacuum clean ducts, plenums, casings and coils. Demonstrate operation of fire dampers before testing and starting. Check that flexible connections are installed in folds (not pulled tight) and not transmitting vibration.

5.5. **Testing of all Fire Dampers:** The Mechanical Contractor and the Testing and Balancing Contractor shall test all fire dampers and verify installation of access panels to each damper. Test all fire dampers by releasing holding mechanism. Certify in writing that all dampers have been checked and perform correctly. Notify the Architect one week prior to final testing.

5.6. **Performance Tests:** After cleaning, balancing, and testing are completed as specified, test each system as a whole to see that all items perform as integral parts of the system and that temperatures and conditions are evenly controlled throughout the building. Make corrections and adjustments as necessary to produce the indicated conditions. All work shall be performed by an independent test and balancing agency whose primary business is the testing and balancing of heating and air conditioning systems and its related components. The test and balancing contractor shall hold a current NEBB, NBC or AABC certification. The test shall cover a period of not less than three days and shall demonstrate that the entire system is functioning properly. As a minimum provide the following:

- Date of testing, space temperature and humidity, outdoor air temperature (DB & WB), air temperature entering condenser coil; refrigerant suction temperature and pressure at compressor evaporator coil; condensing temperature and pressure and load amperes for all motors. Also, provide CFM readings at all grilles, registers and diffusers and entering and leaving air temperatures at each evaporator coil.

After building is occupied, make adjustments as requested by Owner.

5.7. **Balancing:** Check airflow at all supply, return and exhaust grilles, all diffusers and outside air intakes with a recently calibrated direct-reading velocity instrument. Adjust systems to deliver, supply air, return air or exhaust air quantities to within 5 percent of
the indicated amounts. Provide instruments and otherwise assist Architect in checking balancing at final inspection.

5.8. **Phase Protection Verification:** The Test and Balance Contractor, with cooperation from the Mechanical Contractor, shall verify that all phase protection specified has been installed where specified, and installed per the Manufacturer's requirements. The verification of this requirement shall be furnished in tabular form with findings included in the test and balance report. The summary shall list all equipment specified to have the protection, verification that the device is installed per the Manufacturer's recommendation and has been programmed to the Owner's requirements.

5.9. **Test Data:** Submit typewritten schedules of readings taken during the testing and balancing operations and a line diagram or plan of the system indicating specified quantities and final balanced quantities two weeks prior to final inspection. **No final inspection will be made without this data.** Report the required or specified reading, the first reading taken, and final balanced reading for the following items:

**Fans:** Size, type, speeding rpm, outlet velocity in fpm, static pressure inches water, air quantity in cfm, and motor load in amperes.

**Air Handling Equipment:** Size, type, fan speed in rpm, outlet velocity in fpm, external static pressure inches water, total static pressure inches water, air quantity cfm, and motor load in amperes.

**All Air Outlets and Inlets:** Size, velocity in fpm, and air quantity in cfm.

**Coils:** CFM, size, face velocity in fpm; air temperature entering coil and air temperature leaving coil, wet-bulb and dry-bulb degrees F.

**Refrigerant Hot Gas Reheat Coil:** Adjust humidistat so that valve opens. Verify modulation of the coil valve. Provide coil size, face velocity in fpm; air temperature entering coil and air temperature leaving coil, wet-bulb and dry-bulb degrees F.

**Ducts:** Size, velocity in fpm, and air quantity in cfm.

**Electric Duct Heaters:** Size, face velocity in fpm, air temperature entering and leaving load amperes. Provide verification that SCR control is properly set up and is operating correctly.

**Air Cooled Condensing Units:** Air temperature entering condenser coil; refrigerant suction temperature and pressure at compressor and evaporator coil; condensing temperature and pressure and load amperes for all motors.

5.10. **Control Settings:** Provide typed list indicating job setting of all automatic controls. Include settings of thermostats, humidity controls, CO2 sensors, safety controls, minimum damper settings, fire-safety thermostats, pressure controls, temperature controls, and other similar items. Tabulate to show type of control, location, setting and function. Verify that all safety settings and limits are appropriate and comply with current safety Codes and Regulations for the respective system.

5.11. **Notification:** Notify the Architect one week prior to all testing. The Contractor shall provide all testing equipment and shall furnish written reports to Architect of all tests results. Additionally, provide copies in the Bound and Framed Instructions specified herebefore.
PART 6. SHEET METAL DUCT WORK (LOW VELOCITY 2" S.P.)

6.1. **Scope:** Provide as shown and as required for the air conditioning, heating and ventilation systems. Make changes in dimensions, offsets or crossovers as necessary to clear piping, lights and structural members, and to maintain scheduled headroom. Provide all accessories required. Refer to architectural drawings and specifications. Refer to Architectural section “Painting” for painting of exposed ductwork. In case of the absence of painting requirements in the aforementioned Specification Section(s), the interior and exterior of ductwork visible from any finished space shall be cleaned, primed and painted as directed by the Architect. Ductwork visible through all grilles, registers, diffusers, ceilings, etc. shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. **Metal manufacturer’s duct material stamp shall be visible on duct exterior surfaces.** Any ductwork without the manufacturer’s material stamp indicating sheet metal gauge thickness, material, etc., shall be cause for immediate rejection of the effected installation.

6.2. **Protection of Interior of Duct from Debris:** All open portions of ductwork shall be covered with a self-adhesive film or airtight sheet metal caps to prevent the intrusion of contaminates. All duct taps, duct take-offs, etc., shall be protected immediately after the tap, take-off, etc. has been fabricated in the field. When sections of sheet metal are delivered to the facility for fabrication in the field, which cannot be protected with the specified material, the sheet metal shall be covered with visquein. Prior to erecting same, ductwork shall be manually cleaned to remove all dust, dirt and construction debris. All ductwork shall be erected clean. After each section of ductwork is erected, immediately protect all openings as specified herein before. In effect, there shall be no ductwork opening that is exposed to the ambient air. The material shall be a minimum of 3-mil thickness and have a minimum tensile strength of 10 psi. It shall be UV resistant, waterproof and recyclable. Material shall be DuroDyne Dyn-O-Wrap or approved equivalent. **Any ductwork discovered to be unprotected as specified is subject to immediate rejection for use on this project.**

6.3. **Protection of Interior of Ductwork When Any Air Moving Equipment is Operating During Construction and Prior to Owner’s Occupancy:** If air moving equipment must be used during construction, temporary filtration media with a Minimum Efficiency Reporting Value (MERV) of 8, as determined by ASHRAE 52.2 and shall be installed at each return air grille, return air register, exhaust grille, exhaust register, and unit return air inlet. The General Contractor shall provide a written request to the Architect for permission to temporarily operate any HVAC equipment during construction. The request shall be provided a minimum of seven (7) days prior to the desired date of the interruption. Do not operate any equipment without the Architect’s written approval.

6.4. **Sizes:** Take measurements at job and fit work into available space. Report to the Architect any unworkable conditions encountered and alter layout or duct sizes as directed without additional cost to the Owner or the Owner’s Project Design Professionals. Unless otherwise approved, conform to dimensions indicated. Duct dimensions shown indicate NET FREE AREA after installation of duct liner; increase sizes indicated to allow therefore.

6.5. **Sheet Metal:** ARMCO, or equal, prime quality, G-90 galvanized sheet steel for areas **NOT** within the Natatorium C100. Unless indicated otherwise on the plans, gauges
shall be as recommended in the current edition of current SMACNA "Duct Construction Standards" but in no case shall be less than listed in the table below for the respective duct largest dimension or diameter as applicable.

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Galvanized G-90</th>
<th>Aluminum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 30 inches</td>
<td>24 ga.</td>
<td>16 ga.</td>
</tr>
<tr>
<td>31 to 54 inches</td>
<td>22 ga.</td>
<td>14 ga.</td>
</tr>
<tr>
<td>55 to 84 inches</td>
<td>20 ga.</td>
<td>14 ga.</td>
</tr>
<tr>
<td>85 to 96 inches</td>
<td>18 ga.</td>
<td>--</td>
</tr>
</tbody>
</table>

Where galvanized metal joins aluminum or copper, separate sheets with lead or chromate impregnated felt gaskets or as required for areas within the Natatorium C100.

6.6. All Ductwork Associated With NDU-A and Natatorium C100: Shall be double wall, factory fabricated and insulated round duct, fittings and accessories as specified and shown on the plans. Ductwork and fittings shall have solid 3003-H14 aluminum inner (no perforations) and outer shell, 2” thickness insulation and shall be rated for 2” W.C. static pressure. Aluminum duct, fittings, etc., shall comply with ASTM B209, Alloy 3003, temper H14. Ductwork shall be installed in accordance with current SMACNA Low Pressure Duct Construction Standards and Manufacturer’s instructions for corrosive duty. Refer to Table above for minimum required duct gauges. All ductwork shall be provided with factory mounted dual wall flanges to attach to both the inner and outer wall of the duct. Number of screws shall be as required by the Manufacturer and shall be as specified below. Gasket shall be as required for a chlorine environment. Flanges shall be Eastern Dual Wall Flanges. Basis of design is Eastern Sheet Metal

Supporting devices including, but not limited to, angles used for support and bracing, base plates, rods, hangers, straps, screws, bolts shall be aluminum as specified above and shall be sized as required for three (3) times the anticipated load. Provide dielectric separation as required between all aluminum connections and all non-aluminum building structural elements.

All supply air and return air ductwork from the Natatorium Dehumidification Units (NDU) to point inside the building shall be double wall, preinsulated duct with a 1,000 micron, weatherproof outdoor, exterior vinyl shell, containing closed cell R-20, zero fiber insulation. System shall pass UL 181 mold growth test, have aluminum foil vapor barrier and all aluminum connectors, flanges, bolts etc. as required for a Natatorium/Pool environment. The system shall be as Manufactured by ThermaDuct or approved equivalent. Installation shall be in strict accordance with the Manufacturer’s requirements.

6.5. General Fabrication: Construct and erect in a skillful manner, meeting requirement of the current SMACNA "Duct Construction Standards" for 2” static pressure unless noted or specified otherwise. Where conflicts occur between current SMACNA and the contract drawings or specifications, the most stringent requirements shall apply and the heaviest gauge metal shall be provided. Form straight and smooth on the inside, with joints neatly finished. Make up in sections of such length that mechanic can reach thru open end to seal insulation at previous joint. Assemble and anchor to be completely free from vibration and drumming under all conditions of
operation. Make takeoffs at round ducts with prefabricated round-to-rectangular and rectangular-to-round transitions. Break so that manufacturer’s quality stamp is exposed to view.

Where ductwork penetrates rated or non-rated partitions above the ceiling or insulation support/attic air barriers, openings shall be sized as required for duct and insulation, plus 1”. Provide duct supports as specified within 12” of each side of the partition penetrated. DO NOT ALLOW DUCT TO REST ON PARTITION WALLS. Openings shall be saw cut or properly blocked out and present a neat appearance. Where penetration occurs at rated assemblies, provide appropriate fire damper and install as specified and detailed. Where penetration occurs at non-rated assemblies, fill void between assembly and duct with fire retardant mineral wool insulation and seal with fire stopping material to prevent the passage of smoke and fire. After closing and filling the annular space, provide 4” wide, 16 gauge galvanized steel closure plates around the penetration, completely covering the opening. Closure plates shall fit snugly to duct, shall be secured to assembly and sealed air tight.

Provide additional supports to raise ductwork off any metallic piping. Wherever any bare metallic piping is in contact with externally insulated duct or bare sheet metal duct, there shall be dielectric separation provided. The Contractor shall provide 1” thickness, unslit AP Armaflex insulation of sufficient inside tubular diameter to snugly and completely cover the respective piping. The insulation shall extend the full length of the affected area plus 6” on both sides. Refer to Part “Pipe and Miscellaneous Insulation Work” in this division for AP Armaflex material specification. The use of Rubatex insulation between piping and the ductwork shall only be allowed when providing supports is not an option.

6.6. **Exposed Ductwork**: Install tight against the wall and/or ceiling with drive slip joints. Provide 4” wide, 16 gauge galvanized steel closure plates, except at grilles and registers, where exposed ducts pass through walls and partitions. Fill void between wall penetration and duct with fire retardant mineral wool insulation and seal with fire stopping prior to installing closure plate. Closure plates shall fit snugly to duct and shall be secured to wall. All ductwork and closure plates that are exposed to view in finished areas shall be primed and painted as directed by the Architect.

All exposed rectangular ductwork traverse joints shall be made with all metal Ductmate joints system as manufactured by Ductmate Industries, Inc., Quikduc Transverse Duct Connection Systems, Duro Dyne Dyn-O-Mate or approved equivalent. Ductmate system shall be installed in strict accordance with current SMACNA and manufacturer’s recommendations and instructions.

**Provide ASTM B209, Alloy 3003, temper H14 aluminum closure plates and appurtenances where aluminum duct is specified.**

Refer to Architectural section “Painting” for painting of exposed ductwork. In the absence of painting requirements in the aforementioned Specification Section(s), the exterior of ductwork visible from any finished space shall be cleaned, primed and painted as directed by the Architect. Ductwork visible through all grilles, registers, diffusers, ceilings, etc. shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Note that painting does not apply to the aluminum duct.

6.7. **Branch Ducts to Diffusers**: Round runouts to diffusers, up to and including 14” round, shall be 24 ga., G-60 galvanized, Ductmate Series GreenSeam +Snap Lock pipe with factory sealed longitudinal and transverse gaskets. Gasket for GreenSeam
A Proposed Recreation Center For the City of Boaz

HEATING, VENTILATING AND AIR CONDITIONING

15700-12

+Snap Lock pipe shall contain antioxidants, fungicides, adhesion promoters, zero VOCs and shall meet or exceed ASTM E-84 test requirements. 16” round to 20” round runouts shall be 24 ga. and equal to Ductmate Series Reeves Lock Pipe, G-60 galvanized pipe.

6.8. **Return Air Platforms:** Return air platforms shall be constructed with 1-1/2”x1-1/2”x1/4” steel angle iron frame and 18 ga. G-90 galvanized steel. Insulate all sides, top and bottoms with 2” thickness, 1.5 lb. density duct liner. Provide angle iron supplemental supports and pedestal type pipe columns to support the units and allow individuals to stand on the platform without platform deformation or failure. Platforms shall be a minimum of 24” tall, or as space permits.

6.9. **Cross-Joints, Seams and Stiffening:** Join and stiffen with combination of joint types and structural angles as recommended in current SMACNA “Duct Construction Standards”. **Cross break all flat areas over 24 inches wide.** Install internal ends of slip joints in the direction of flow. Non-galvanized pieces must be painted before assembling with Rust-Oleum metal primer. All transverse joints with long dimension over 24” shall be made with all metal Ductmate joints system as manufactured by Ductmate Industries, Inc., Quikduc Transverse Duct Connection Systems or Dyn-O-Mate. System used shall be installed in strict accordance with current SMACNA and manufacturer's recommendations and instructions.

Make all cross joints and all branch, grille and diffuser take-offs, except Ductmate joints, air tight by applying fibrated, low VOC, LEED IEQ 4.1 compliant duct sealer. Sealer shall meet and pass ASTM D-2202, ASTM C-731 and EPA regulations. Sealer shall meet the requirements for the pressure classification of the ductwork installed. Sealer shall be Hardcast Duct Seal 321, Foster 32-17 or Childers CP-148.

6.10. **Turns and Transitions:** Fabricate turns with an inside radius equal to width of duct. At 90-degree turns, Contractor may substitute square elbows, with standard factory-made, multiple, double-blade constructed vanes. Vanes shall be a double wall, true airfoil contour with smoothly rounded entry nose with extended trailing edge. Vanes shall be formed from a single piece of 26 ga., hot dipped galvanized steel and shall be 3” radiused vanes on 2.4” centers. Vanes shall be provided with two (2) tie rods and continuous internal tubes for stiffening and rigidity. Maximum pressure drop shall be .06” W.G. at 1500 FPM. Generated sound power level shall not exceed 54 decibels in band 4 at 2000 FPM (24”x24” duct size). **Single wall turning vanes are not allowed and will be replaced when discovered.** Vanes shall be as manufactured by Aero/Dyne Series HEP, Duro Dyne HTV/DHV or approved equivalent by DuctMate. Avoid abrupt changes in shape, with a slope of 4:1 the minimum allowed.

6.11. **Branch Duct Take-Off:** Provide at all points where branch ducts take off from trunks, and where ducts divide. Refer to details on the drawings. Damper shall be minimum 22 Ga., G-90 Galvanized steel with 2” build out. Body shall be a minimum of 24 Ga., G-90, galvanized steel with 4”W.G. construction. Fitting shall have 1” flange with corner clips, pre-punched mounting holes and adhesive coated gasket. Take-off shall be Flexmaster LDS, BO3, GSI HETO (high efficiency take-off) HTS2 or approved equivalent.

6.12. **Fire Dampers:** Provide as shown on drawings and in each duct passing through firewalls, floors, and other fire barriers in accordance with NFPA Code 90A. Install in such manner that fusible links can be replaced. Employ links rated at 165 degrees F (212 degrees where within 10 feet of a heating coil).
Typical dampers shall be UL labeled, minimum 1-1/2 hour rated, (higher where required), equal to Prefco #5500-E6-BC, with Type B low resistance frame and 16 ga. factory sleeve. Equivalent products by Air Balance, Ruskin or Airstream Products will be accepted. Where damper is installed behind wall grilles or registers use No. 5500-E6-LPB.

Install in accordance with all applicable conditions of the UL listing, for which data sheets must be submitted for approval. At typical ducts, provide 16 ga. sleeves secured in opening with 1-1/2” x 1-1/2” x 14 ga. (min.) angles; bolt angles and damper sleeve with galvanized bolts. **Fire dampers indicated for use in storm/tornado/safe areas shall have 10 ga. sleeves and angles. Fire dampers at floor penetrations shall have 12 ga. sleeves and angles.** Size structural openings so that space between sleeve and masonry is not less than 1/8” per linear foot of duct or more than 1/2”. Secure ducts to sleeve per detail and current SMACNA requirements. After installation release holding mechanism and verify proper closure of each damper.

Ductwork in fire-rated floor-ceiling or roof-ceiling assembly system with air ducts that pierce the ceiling of the assembly shall be constructed in conformance with designs in UL Fire Resistance Directory. In general, ducts shall be encased in fire rated material.

At internally insulated ducts, size dampers for gross duct size, so that liner butts into damper frame surround.

6.13. **Volume Dampers Used with Automatic Controls:** See Controls at end of Section 15700.

6.14. **Volume Dampers:** For round ducts less than 12” diameter and rectangular ducts less than 12” in height in either dimension: Single leaf, constructed with 18 gauge galvanized metal with locking type control quadrant, single center u-bolt and pivot rod extending through opposite side of duct with brass bushing at both ends.

6.15. **Volume Dampers:** For round ducts greater than or equal to 12” diameter or rectangular ducts greater than or equal to 12” height in either direction, provide opposed blade, airfoil blades of 16 ga.-galvanized steel mounted in steel frames by 3/8” steel trunions riding in brass bushing with dual u-bolts. Blade width shall not exceed 10 inches and individual blade length shall not exceed 48 inches. Extend one trunion to permit operation from outside the duct. Provide manually operated dampers with cadmium plated steel locking quadrant. Dampers opening to the outside shall have felted edges.

6.16. **Stand-Off Mounting Brackets:** Locking-type quadrant operators for dampers, when installed on ducts to be externally insulated, shall be provided with stand off mounting brackets, bases or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand off mounting items shall be integral with the operator or standard accessory of the damper manufacturer.

6.17. **Access Panels/Doors:** Provide in duct wall at each splitter, fire and motorized damper, at each of coil and strip heaters, smoke detectors, in plenums at outside air louvers and elsewhere indicated, specified or required for proper maintenance. Size and position to provide maximum access to bearings, fusible links, louvers, etc. Typical doors shall be double metal faced, 20 ga. Steel, internally insulated same as duct, provided with gasket seal, and with minimum of two-sash locks equivalent to Ruskin Model ADC12 for rectangular ductwork. Access doors for round ductwork.
shall be similar except with two large hand knobs and equivalent to Ruskin Model ADR2 for round ducts 10” round, up to and including, 16” round duct. Doors shall be rated for the anticipated duct pressure, plus 1”. For ducts, 8” round and smaller, provide a removable section of duct to provide required access. Refer to other sections for access doors required in kitchen hood exhaust ducts, moisture-laden ductwork, etc. Refer to Section 15010 for additional access door/panel requirements including identification.

All access panels/doors located in ducts serving the Natatorium C100 shall be ASTM B209, Alloy 3003, temper H14 aluminum where aluminum duct is specified.

6.18. **Duct Instrument Test Holes:** Provide for each system four test holes (two in supply duct and two in return air plenum) at opposite ends near air handling units with screwed caps. In addition, at duct mounted coils and electric duct heaters provide one on either side of the coil or duct heater.

6.19. **Flexible Connections:** Install so that the cloth is in folds (not drawn tight). Connect all ducts to air handling units and fans excepting dome type fans with preassembled flexible connection. Install so that the connector is in folds (not drawn tight). Fabric width shall be 6” for all air handling equipment. Ceiling mounted exhaust fans whose total scheduled CFM is less than or equal to 1,200 CFM may be 4” width.

Connectors for all air handling equipment shall be a factory fabricated and assembled unit with 6” dual fabric, heavy duty, 20 oz/sq. yd polyester/polyester fabric with flame resistant coating and mildew resistant per ASTM G-21. The assembly shall comply with NFPA 701, NFPA 90A, NFPA 90B and ASTM E-84. The unit shall be constructed of minimum 24 ga. galvanized steel meeting ASTM A-653-94-G60. Metal to fabric connectors shall be double locked, airtight and waterproof to 10” W.C. positive pressure and 10” W.C. negative pressure. Assembly shall be DuctMate PROflex or equivalent. Assembly for ductwork serving the Natatorium C100 shall be ASTM B209, Alloy 3003, temper H14 aluminum. Provide dielectric separation as required and specified.

Flexible connections for ceiling exhaust fans of capacity specified above shall be preassembled flexible connection of 29 ounce fire-resistant, neoprene coated glass fiber cloth equal to Ventfabrics “Ventglas” (4” fabric width), as manufactured by Ventfabrics, Wiremold or Thermaflex.

Provide preassembled flexible connections for all ducts that cross building expansion joints. Flexible connections shall be 6” in width as specified hereinbefore. Coordinate requirement with Architectural plans and provide as required.

Externally insulate all flexible connectors to prevent condensation with 2” thickness external insulation of type specified elsewhere in this section.

Provide copper jumpers across all flexible connectors taking care that jumpers do not bind flexible connections. Provide compression lug and grounding connector screwed into the duct with two (2) screws, on both side of the flexible connector. Bonding wire shall be shielded 4 AWG.

6.20. **Register and Grille Connections:** Where take-offs are in side of a duct, clinch lock short tee sections onto trunk. Install collars with slip joints and 3/4” flange at outlet end. At sheetrock and other hard surfaces, set collars exactly flush with surface (mechanic must be on job to make adjustments during installation). Set flange face to receive register gasket, and be concealed by register flange. Collars may be deleted.
where mounting frames are furnished with registers.

Install boots above lay-in ceilings simultaneously with ceiling work; mechanic must be on job during this phase of construction work.

At return air, relief air and exhaust air grilles 48” or more in either dimension, collars shall be 1” x 2” x 1/8 inch steel angle frames with corners mitered, welded and ground smooth. Frames in ceiling shall be independently suspended from the ceiling structure, or the duct shall have special reinforcing to prevent sagging of the boot. Interior of ductwork visible through grilles and diffusers shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

6.21. **Hangers and Supports:** Duct hangers shall NOT penetrate the external insulation vapor barrier. Where ducts are required to have external insulation with a vapor sealed facing, support duct on trapeze hangers consisting of a unistrut assembly with threaded rods. All duct hanger materials shall be external of the insulation materials, insulation jacket and vapor barriers. All vapor barriers shall be continuous. See paragraph 6.6 for aluminum ductwork supports, assemblies, etc., required.

“Sammy” bolts are prohibited. Contractor shall provide supplemental steel between structural purlins, bar joists, etc., for duct support as required to meet support spacing specified. Supplemental steel shall be welded in place as directed and specified by the Structural Engineer. Support small (less than 40 unites (w+h) inches) horizontal ducts without external insulation with 1-1/4” x 20 ga. band hangers. Provide in pairs close to each transverse joint and in no case more than six feet apart. Bands shall be turned 3” under the lower corner of ductwork and fastened with two (2) self-tapping screws into the bottom of the duct surface. Bands shall be attached up the sides of the ductwork at a maximum of 6” intervals and in the bottom of the duct.

Wherever any duct hanger support exceed 36” length from the top of the supported duct to the structure above, Contractor shall provide a uni-strut support assembly and provide bracing of the assembly with minimum 1”x1”x1/4” angle iron, or as required for the weight of the particular duct. Weld angle iron to the unistrut and attach to the overhead structure, as specified and directed by the structural engineer, to prevent swaying.

All 14” or less concealed round ducts with external insulation shall be provided with band hangers and saddles. Suspend ducts, at six (6) foot intervals with 8” long, 3” wide, 22 gauge galvanized metal saddles hung from structure with 22 gauge 1” wide straps. Bands shall pass completely under and around round ducts. Loop strap under duct and attach to strap with two (2) galvanized bolts. Thereafter, loop top end of hanger over steel structural members above and fasten with two (2) galvanized bolts. Where concrete joists occur overhead, secure straps to side of joist with galvanized expansion or ramset bolts. Where flat concrete surface occurs overhead, secure with ramset or expansion bolt fasteners. See other Specification Sections in the Contract Documents for limitations on use of power driven fasteners.

**Concealed rigid round metal ducts greater than or equal to 16”, all rectangular, all square and all flat oval ductwork ducts that are specified to have external insulation with a vapor sealed facing** shall be supported with trapeze hangers consisting of unistrut, threaded rods and inserts or clamps as required to accommodate overhead construction. Threaded rods shall be of size required to
provide support of three (3) times the anticipated load of the assembly. Trapeze hanger assembly spacing shall not exceed 8 feet.

On externally insulated ducts, install 1-1/2" thickness, unslit AP Armaflex insulation of sufficient inside tubular diameter to slide over, completely cover and snugly fit to the bottom horizontal unistrut duct support. The insulation shall extend the full width of the duct plus a minimum of 6", each side. Where channel shapes are used, orient the open side, down. Refer to Part Pipe and Miscellaneous Insulation Work for AP Armaflex material specification. Space hangers a minimum of 6" (maximum of 12") from the sides of the duct to permit the duct to be placed within the trapeze hangers.

All concealed internally insulated round ducts shall be supported as specified above for externally insulated ductwork except without saddle. Coordinate exposed duct support requirements with plan details.

Support all non-externally insulated horizontal ducts larger than or equal to 50 united (w + h) inches on trapeze type hanger assembly same as specified above for externally insulated duct except without Armaflex surround on the unistrut. Install inserts or clamps as required to accommodate overhead construction. Spacing shall not exceed 6 feet.

Support small vertical runs with 1/8" steel bands screwed to 3 sides of duct and expansion bolted to adjacent structural elements; spacing shall not exceed 10 feet. Support vertical runs larger than 40 united (w + h) inches with structural brackets with welded joints.

Where ducts pass through floors, seal as specified hereinbefore, support duct and close opening with minimum 2"x2"x1/8" steel angles on all sides and, secured to both floor and duct. At plenums and risers just above the floor, provide suitable chair assemblies of welded structural shapes.

Where horizontal ducts with standing joints exceed 72 inches in width they shall be provided with additional hangers at the mid-point of their width, consisting of a support bolted to an interior 1/8 x 1-1/2 inch strap that shall, in turn, be bolted to the duct. Internal straps and hangers shall be spaced one for each duct section.

Where trapeze type hangers or Ductmate is used to support exposed ductwork in finished areas, the width of the support shall not exceed the duct width by more than six (6) inches on either side of the duct.

6.22. **Roof Intake and Relief Hoods:** Greenheck Model FGI/FGR or approved equivalent by Loren-Cook, aluminum or galvanized steel construction unit with welded joints, complete with 1/2" aluminum bird screen, rain gutter, weather baffle, 10" high (exhaust/relief) or 14" high (intake) height NRCA approved roof curb (outside air) with built-in cant strip, integral fiberglass insulation and wood nailer. Hood sizes smaller than 24"x24" shall be hinged type. All intakes, relief or exhaust vents greater than or equal to 12x12 shall be 125 MPH rated. Maximum intake throat velocity of 250/500 FPM and .05" WC maximum pressure drop. Maximum relief throat velocity of 600 FPM and .05" WC maximum pressure drop. Hood, throat and curb cap shall be minimum 18ga.

Roof curbs shall be painted with two coats of non-reflective paint. Paint type and color as selected by Architect. All roof curbs furnished shall adhere to the roofing manufacturer's requirements so as not to void the roofing warranty. The top of all roof curbs shall be level with pitch built into curb when deck slopes 3/8 of an inch per foot
or more. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by code or as required by Architect. Refer to architectural specification and plans for additional requirements.

6.23. **Roof Exhaust Caps:** For exhaust ducts up to 10x10, shall be low profile, sloped, galvanized steel construction with built-in bird screen, integral flashing flange and all accessories required for a complete installation. Cap shall be Greenheck Series RJ, Cook Series RJ or PennBarry SL as required for sloped shingle roofs. Provide similar device for standing seam metal roofs as required by the roofing manufacturer. All items furnished shall adhere to roofing manufacturer’s requirements so as not to void the roofing warranty. Hoods shall be factory primed for painting in the field or factory baked enamel finish. Coordinate finish and color requirement with Architect prior to ordering.

6.24. **Coil and Strip Heater Enclosures:** Unless otherwise detailed on drawings shall be in accordance with current SMACNA “Duct Construction Standards”.

6.25. **Ductwork Serving Storage A126, Pool Equipment A127 and Chemical Storage A131:** Shall be PVC plastisol coated galvanized steel with PVC coating on interior and exterior surfaces. Ductwork shall be installed, as indicated, in accordance with current SMACNA Low Pressure Duct Construction Standards and manufacturer’s instructions for corrosive duty.

6.26. **Flexible Air Ducts:** Flexible duct for connections shall be Thermaflex M-KE, GreenGuard Level 4 certified, or approved equivalent, air duct rated for a maximum pressure of 16” (4-10 in. ID) or 10” (12-16 in. ID) water column positive and 2” water column maximum negative pressure and 5000 FPM maximum velocity and Listed by Underwriters Laboratories, Inc., under UL Standard 181 as a Class 1 air duct and complying with NFPA Standards 90A and 90B. Duct shall have a maximum flame spread of 25 and a maximum smoke developed rating of 50. Flexible air duct shall be factory made and composed of an inner duct of woven and coated fiberglass insulating blanket and low permeability outer vapor barrier of fiberglass reinforced metallized film laminate. R-value shall be a minimum R=8 per ASTM C-518.

Flexible duct length shall not exceed six (6) feet. Supply each duct with **stainless steel worm gear driver and stainless steel band** at take-off fitting and supply fixture connections. Suspend ducts, at three (3) foot intervals with 8” long, 3” wide, 22 gauge galvanized metal saddles hung from structure with 22 gauge 1” wide straps. Loop strap under duct and attach to strap with two (2) galvanized bolts. Thereafter, loop top end of hanger over steel structural members above and fasten with two (2) galvanized bolts. Branch duct connectors for connecting round low velocity branches to rectangular low velocity trunks shall be rectangular to round take-off fittings as detailed on the drawings with damper and standoff mounting bracket. Provide additional supports to raise ductwork off any piping or as a minimum, provide Rubatex insulation between ductwork and piping. The use of Rubatex insulation between piping and the ductwork shall only be allowed when providing supports is not an option. **Provide a full size radiused, galvanized sheet metal elbow transition piece from flexible duct connection to each diffuser boot.** Elbow gauge shall be as specified hereinbefore in Part, “Sheet Metal Ductwork” for respective duct size.

6.27. **Factory Fabricated Duct and Fittings Gymnasium B108 (PHAC-A):** All supply air ducts and fittings shall be factory fabricated and insulated duct and fittings shall be
equal to United McGill Acousti-K27 and rated for 2” static pressure. The insulation thickness shall be 2” thickness. Ductwork shall comply with NFPA 90A. Construction and installation shall comply with current SMACNA Standards. Where conflicts occur between current SMACNA and the contract drawings or specifications, the most stringent requirements shall apply and the heaviest gauge metal shall be provided. Duct shall be provided with factory installed heavy-duty Mylar jacket on the airside. All duct-to-duct connections or duct to fitting connections for exposed double wall ductwork, regardless of size, shall be provided with factory-fabricated couplings to provide a neat, smooth appearance. Any ductwork installed, which is damaged, shall be replaced at no cost to the Owner, at the discretion of the Architect. Provide as shown and as required for the air conditioning, heating and ventilation systems. Make changes in dimensions, offsets or crossovers as necessary to clear piping, lights and structural members, and to maintain scheduled headroom. Provide all accessories required. Provide additional supports to raise ductwork off any piping or as a minimum, provide Rubatex insulation between ductwork and piping. The use of Rubatex insulation between piping and the ductwork shall only be allowed when providing supports is not an option. Refer to architectural drawings and specifications. Refer to Architectural section “Painting” for painting of exposed ductwork. In case of the absence of painting requirements in the aforementioned Specification Section(s), the interior and exterior of ductwork visible from any finished space shall be cleaned, primed and painted as directed by the Architect. Ductwork visible through all grilles, registers, diffusers, ceilings, etc. shall be painted flat black with paint having a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

PART 7. DUCT INSULATION WORK (EXTERNAL)

7.1. General: All work by Insulating Sub-Contractor whose primary business is the installation of insulation materials with experienced applicators in accordance with manufacturer's recommendations. Duct must be clean, dry and pressure tested before covering is applied. Cover flexible connections with insulation material as hereinafter specified to same thickness as adjacent duct. All insulation materials (coatings and mastics) shall be fire resistive per NFPA Pamphlet No. 90, ASTM C 411, shall be UL listed and shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84, NFPA No. 255 or UL 723. Finished insulation system shall provide complete thermal barrier throughout the equipment and air distribution system, including effective and durable vapor barriers and vapor stops for any system or condition potentially subject to condensation. Insulation system shall be provided to prevent condensation or potential thereof, to prevent transmission of water vapor into the insulation system (vapor barriers), and to prevent transmission of water vapor within the insulation system should vapor barrier compromises occur during operation and/or maintenance of the building (vapor stops).

Refer to Section Sheet Metal Ductwork, Paragraph Hangers and Supports, for miscellaneous insulating requirements.

7.2. Material: Provide GreenGuard certified glass fiber duct insulation with reinforced foilkraft laminate jacket, formaldehyde-free.

All supply air ducts located in the attic, mechanical mezzanine or outside the building insulation envelope shall be provided with a total of 3.5” thickness external insulation, in addition to the specified acoustical liner. The first layer shall be 1.5” thickness, 0.75 lb. density, without reinforced foilkraft laminate jacket and with
characteristics specified above. The second layer shall be shall be 2” thickness, 1.5 lb. density, with reinforced foilkraft laminate jacket and with characteristics specified above.

All return air ducts located in the attic, mechanical mezzanine or outside the building insulation envelope shall be provided with a total of 3.5” thickness insulation, in addition to the specified internal insulation. The first layer shall be internal insulation as specified below. The second layer shall be 2” thickness, 1.5 lb. density, with reinforced foilkraft laminate jacket and with characteristics specified above.

All supply air ductwork located within the building insulation envelope shall be provided with 2” thickness, 1.5lb. density, with reinforced foilkraft laminate jacket as specified above. Note that this requirement does not apply to ductwork that is exposed to view in finished areas. Refer to internal duct insulation requirements for duct exposed to view in finished areas.

Thermal conductivity per ASTM C-518, at its rated thickness, and 0.75 lb. density shall be not less than \( k = 0.27 \text{ BTU} \cdot \text{in} / (\text{hr} \cdot \text{ft}^2 \cdot \circ \text{F}) \) and minimum installed \( R = 4.2 \) at 75°F mean temperature with test based on material thickness compressed 25%.

Thermal conductivity per ASTM C-518, at its rated thickness, and 1.5 lb. density shall be not less than \( k = 0.24 \text{ BTU} \cdot \text{in} / (\text{hr} \cdot \text{ft}^2 \cdot \circ \text{F}) \) and minimum installed \( R = 6.3 \) at 75°F mean temperature with test based on material thickness compressed 25%.

See “Duct Insulation (Internal)” for internal acoustical insulation required in addition to the external insulation specified hereinbefore.

Supply air, return air and outside air ducts within the mechanical rooms do not require flexible, external, duct insulation. Instead, supply, return air and outside air ducts in all mechanical rooms shall be insulated with 2” thickness, 3.0 lb. density, rigid glass fiber duct insulation to a point above the ceiling of the adjacent conditioned space. Facing shall be aluminum foil reinforced with fiberglass yarn and laminated with fire resistant adhesive to Kraft paper. Thermal conductivity value shall be per ASTM C-612, Type 1B, at its specified thickness, shall be not less than \( k = 0.24 \text{ BTU} \cdot \text{in} / (\text{hr} \cdot \text{ft}^2 \cdot \circ \text{F}) \) at 75°F mean temperature. Insulation shall meet or exceed the requirements of ASTM E 84, UL 723, ASTM C 1136-Type II, NFPA 90A, NFPA 90B, FHC 25/50 and ASTM C 795. Moisture sorption shall be less than 5% by weight and maximum moisture vapor transmission of 0.02 perms. Insulation shall be Owens-Corning Series 1400 FR Spin-Glas® Board or equal material by Knauf, Schuller, Owens-Corning or CertainTeed.

7.3. Thickness: Toilet and janitor closet/housekeeping exhaust ducts: 1.0” thickness with reinforced foilkraft laminate jacket. All other locations: Minimum 2.0” thickness with reinforced foilkraft laminate jacket. Coordinate with variations specified above for additional layers and provide as required. Where internal acoustical insulation is specified, external insulation may be reduced to 1” thickness. See limits of acoustical insulation in Part Duct Insulation Work (Internal) below. Where duct board is specified within the mechanical rooms, external duct wrap insulation is not required.

7.4. Manufacturer: Johns-Manville Micro-Lite EQ, Type 150 or Type 75 with thickness and density as specified above. Equivalent material by Knauf, Schuller, Owens Corning or CertainTeed will be accepted.

7.5. Ducts to be Insulated Externally: Concealed supply air ducts including ducts with liner, round outside air ducts, toilet/shower/housekeeping/janitor closet areas exhaust
ducts, short branch duct collar connections to grilles, registers and diffusers, 24" upstream and downstream of each electric duct heater, all flexible connectors and exterior rim/cone of all ceiling diffusers. See Part “Duct Insulation Work (Internal)” for sound attenuating insulation requirements of externally insulated ductwork.

**NOTE:** External duct insulation is not required for factory fabricated and insulated rectangular and round ducts located outside mechanical rooms.

### 7.6. Application

Sheet metal duct shall be clean, dry and tightly sealed at all joints and seams before applying duct wrap. Adhere insulation to metal with 4" strips of Foster 85-60, ITW Miracle-Kingco M595 Ultratack or Childers CP-127, low VOC insulation bonding adhesive meeting ASTM C916 at 8" on center on circumferential joints. Wrap insulation tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". The 2" flange of the facing shall be secured using 9/16" flare-door staples applied 6" on center and taped as specified hereinafter. On longitudinal joints, the overlap shall be secured using 9/16" flare-door staples applied 6" on center and taped as specified hereinafter. For rectangular ducts wider than 23", additionally support insulation with weld pins and speed clips 18" on center. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping. Insulate standing seams and stiffeners that protrude through the insulation with 2" thick, faced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating. Vapor seal all seams, joints, pin penetrations, other breaks, circumferential and longitudinal joints with reinforcing mesh and coat with vapor barrier facing. Mesh shall be 4" wide pre-sized glass cloth adhered and finished with two (2) coats of a white vapor barrier coating, Foster 30-33, Vimasco 749 or Childers Chil Glas #10 glass mesh, Foster Mast-A-Fab polyester mesh or equivalent product by 3M.

Any externally insulated duct with metallic vapor barrier that is in contact with sprinkler piping shall be provided with a section of Rubatex insulation between ductwork and piping. Rubatex shall be shall be 3/4" thickness, AP Armaflex insulation of sufficient inside tubular diameter to slide over, completely cover and snugly fit the contacted pipe. The insulation shall extend the full width of the duct plus a minimum of 6", each side of the duct. Refer to Part Pipe and Miscellaneous Insulation Work for AP Armaflex material specification. Slit Armaflex may be used in lieu of unslit. If slit Armaflex is used, glue the joint with Armaflex glue. The use of Rubatex insulation between piping and the ductwork shall only be allowed when raising the effected duct is not an option.

### 7.7. Insulation Pins and Washers

The use of adhesives for attaching pins and washers to the ductwork is prohibited. Pins shall be cupped-head, capacitor-discharge-weld pins, zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135 inch diameter shank, length to suit depth of insulation specified with integral 1-1/2 inch galvanized carbon-steel washer. Insulation retaining washers shall be self-locking type formed from 0.016-inch thick galvanized steel with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

### 7.8. Hot Gas Reheat Coil and Cabinet

Where hot gas reheat coils are specified and the coil is not within the insulated Heat Pump or Air Handling Unit equipment cabinet, externally insulate the hot gas reheat coil cabinet with 1.5" thickness duct board equal to Owens Corning 800 FR. Protect external insulation with open weave glass or polyester cloth by Johns-Manville Duramesh, Childers Chil Glas #10 or Foster
7.9. **Ducts From Outdoor Packaged Equipment to Point Inside Building (PHAC-A):**

Shall be insulated externally (in addition to duct liner) with 2" thickness duct board equal to Owens Corning 1400 FR. Protect external insulation with open weave glass or polyester cloth by Johns-Manville Duramesh, Childers Chil Glas #10 or Foster Mast-A-Fab, embedded between two 1/8" coats of Foster 60-91 (gray) Monolar Mastic or Childers Encacel X-1 (gray). After insulating, cover all ductwork with 24 ga. prefinished Kynar 500 sheet metal. Sheet metal cover shall be cross-broken to provide additional strength. **The Architect shall select color.**

**PART 8. INTERNAL DUCT INSULATION WORK (DOES NOT APPLY TO NDU-A OR PHAC-A UNITS)**

8.1. **General:** All work by experienced applicators in accordance with manufacturer’s recommendations. Duct liner, mastics and materials shall comply with all requirements and other building code requirements. All insulation materials (coatings and mastics) shall be fire resistive per NFPA Pamphlet No. 90A and 90B and shall be UL listed and shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. Liner materials shall conform to the performance based ASTM C1071, which includes ASTM C518 Thermal Conductivity, ASTM C411 Temperature Resistance, ASTM C665 Corrosiveness, ASTM E84 Surface Burning Characteristics, ASTM C1338 Fungi Resistance, ASTM C1304 Odor Emissions and ASTM C1104 Moisture Vapor Sorption.

8.2. **Material:** Liner shall be a GreenGuard certified, low VOC, Type I liner as defined by ASTM C1071 and characteristics complying with ASTM E 84, UL 723, NFPA 255, NFPA 259 and ASHRAE 62. It shall have an acrylic coating formulated with an immobilized, EPA registered, protective agent to protect against growth of fungi and bacteria as required by ASTM C1071 and tests conducted in accordance with ASTM C 1338, ASTM G21 and ASTM G 22. It shall support microbial growth and have glass fibers bonded with a thermosetting resin. The airstream surface shall be protected with a reinforced coating with flexible glass cloth reinforcement. The liner shall have a reinforced factory applied edge coating and operate in an environment of a maximum of 250°F and maximum of 6,000 fpm air velocity. Thermal conductivity per ASTM C-518, at its rated thickness, shall be not less than k=0.16 BTU·in/ (hr ft²·°F) and R=6.3 at 75 F mean temperature in accordance with ASTM C18. Sound absorption coefficients for the liner shall be per ASTM C 423 and ASTM E 795 test methods and the table below. Furnish sound characteristics for approval with the material submittal.

### Sound Absorption Coefficient at Frequency

<table>
<thead>
<tr>
<th>Thickness (In)</th>
<th>125</th>
<th>250</th>
<th>500</th>
<th>1000</th>
<th>2000</th>
<th>4000</th>
<th>NRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>0.10</td>
<td>0.47</td>
<td>0.85</td>
<td>1.01</td>
<td>1.02</td>
<td>0.99</td>
<td>0.85</td>
</tr>
<tr>
<td>2.0</td>
<td>0.25</td>
<td>0.66</td>
<td>1.00</td>
<td>1.05</td>
<td>1.02</td>
<td>1.01</td>
<td>0.95</td>
</tr>
</tbody>
</table>

8.3. **Manufacturer:** Shall be Johns Manville Linacoustic RC or equivalent material by Schuller, Knauf, Pittsburgh, CSG, Owens Corning or CertainTeed.
8.4. **Thickness:** 1.5 inches thickness.

8.5. **Ducts and Equipment to be Insulated Internally:** Exposed supply air ducts in areas without ceilings, rectangular outside air ducts, make-up air ducts, return air ducts, return air plenums, transfer air (jumper) ducts and relief air ducts.

8.6. **Acoustical Duct Lining:** Line the first twelve (12) linear feet of all single wall, supply and return air ducts downstream of all heat pumps, air handling units, packaged units and transfer air (jumper) ducts with insulation equal to Johns Manville Linacoustic RC and **2.0” thickness**. Sound absorption characteristics shall be as specified above.

8.7. **Application:** Adhere insulation to the entire surface of the sheet metal with fire resistive, low VOC, UL labeled, fire resistive, water based, ASTM C 916, Type II compliant adhesive before the metal is broken. Adhesive shall be Foster 85-60 or Childers CP-127. Secure all sheets wider than 24 inches with sheet metal screws and washers or stud pins and clips 16 inches on center, each way. Joints shall be straight and smooth and shall be buttered with adhesive to prevent erosion and improve airflow. Product shall have factory applied edge coating to assure sealing of transverse edges per current SMACNA and NAIMA installation standards.

Damage to the liner shall be repaired using Johns Manville SuperSeal products as required or equivalent materials by other manufacturers with their specific equivalent products.

8.8. **Metal Nosings:** All exposed leading and trailing edges shall be secured with **sheet metal nosings to protect insulation edges**. Metal nosings shall be securely installed over all transversely oriented liner edges facing the airstream at forward and rear discharge towards coils, dampers, ducts, plenums, changes of insulation thicknesses of adjoining insulation, any exposed insulation ends and at any point where lined duct is preceded by unlined duct. See detail on the plans. All remaining miscellaneous exposed edges shall be sealed/coated. There shall be no exposed fiberglass ends in the airstream.

**PART 9. REGISTERS, GRILLES AND DIFFUSERS**

9.1. **General:** All grilles, registers and diffusers shall be product of a single manufacturer; shall be constructed of extruded aluminum with baked enamel finish with color as selected by the Architect. Architect may require painting of the diffusers, grilles, registers, etc., in the field. Where field painting is required, diffusers, grilles and registers shall be factory primed for painting in the field. Refer to Architectural Section “Painting”, coordinate requirements and provide finish as required. Where lay-in type panels and frames are specified, check ceiling suspension system and coordinate interfacing. All grilles, registers and diffusers not in integral lay-in metal panels shall be mounted with aluminum-countersunk screws with finish to match respective items. All grilles, registers and diffusers shall be ADC or approved equivalent Agency certified.

9.2. **Square Ceiling Diffusers with Round Neck:** Titus Model TMSA-AA, Price ASCDA, removable core type, aluminum construction, with baked enamel finish color selected by the Architect, designed for four-way diffusion complete with Titus AG-85, Price VCR8E steel butterfly blade damper. Diffuser face shall be 24” x 24” with type frame to interface with ceiling system. Use lay-in type frame where lay-in ceilings occur. Do
not furnish with 1" thickness insulated blanket for back of diffuser. Specifications require 2" thickness insulation.

9.3. **Square and Rectangular Neck Ceiling Diffusers:** Titus Model TDCA, surface mounted, removable core type, extruded aluminum construction, with baked enamel finish color selected by the Architect, designed for one, two, three and four-way diffusion as indicated on plans, complete with AG-95 aluminum opposed blade damper, AG-125 Dua-Trol and adjustable vanes.

9.4. **Wall Supply Air Registers:** Titus Model 300 FS-5-D-65, Price 620DAL-F-S-D-A-SW all aluminum adjustable 4-way deflection type. Provide with AG 35B aluminum opposed blade damper with worm gear, Allen Key operators and AG-225 extractors with No. 1 operator, auxiliary mounting frame and baked enamel finish color selected by the Architect.

9.5. **Wall Supply Air Registers in Natatorium:** Titus Model 272FL, **all aluminum construction**, surface mounted, zero degrees 1-way adjustable deflection type. Provide with AG 35B aluminum opposed blade damper with worm gear, Allen Key operators and AG-225 extractors with No. 1 operator, auxiliary mounting frame and baked enamel finish color selected by the Architect.

9.6. **Drum Louvers:** Titus Series US-DL-SV, high capacity, long throw, **all aluminum construction**, 01 aluminum finish, curved frame for round duct, split vane, extruded aluminum louver with adjustable horizontal and vertical blades, rotating drum, felt seal between drum and border, foam gasket seal and aluminum AG-15-HD opposed blade damper.

9.7. **Wall Return Air Registers:** Titus Model 33R-PF, Price Model 91-L-D-A-VCS3 gymnasium heavy duty steel register with 38 degree deflection 14 ga. blades, support bars on 6" centers Allen key operated aluminum opposed blade damper and auxiliary mounting frame all finished with baked enamel finish color to be selected by the Architect.

9.8. **Wall Return Air Registers (Natatorium C100):** Same as specified above except with all aluminum construction and aluminum finish.

9.9. **Wall Return Air / Wall Exhaust Air & Double Face Wall Grilles:** Same as wall return air registers except without dampers.

9.10. **Ceiling Mounted Exhaust Air and Return Air Registers:** Titus Model 50-F-0-5-D-25, Price Model 80DAL-F-SW-A all aluminum fabricated egg-crate type with baked enamel finish color to be selected by the Architect, Allen key operated aluminum opposed blade damper and lay-in type frame. Where lay-in ceilings occur, each register shall have integral 2’ x 2’ or 2’ x 4’ aluminum modular lay-in ceiling panel with finish to match diffuser.

9.11. **Ceiling Mounted Return Air or Relief Air Grilles and Air Transfer (Jumper Duct) Grilles:** Same as return air registers except without dampers.

9.12. **Brick Vents for Exhaust Fan Discharge:** Extruded aluminum, Reliable #RBV brick and block vent with #4 mesh removable aluminum screen and integral water stop. Finish shall be factory paint color to be selected by the Architect.

9.13. **Wall Louvers for Fresh Air Intake:** Specified (together with screen) under Division 10 of specifications.
9.14. **Expanded Metal Grilles:** Provide metal grille equal to McNichols Co., flattened expanded metal, galvanized, hot dipped, 3/4, #16 flattened, minimum 70% open (free) area with U-Edging to protect occupants from injury. Grille shall be factory primed for painting in the field as directed by the Architect.

9.15. **Equal Products:** By Titus, Price, Krueger and Metalaire will be accepted.

**PART 10. CONDENSATE DRAINAGE PIPING**

10.1. **General Workmanship:** Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all building features. Route through previously built-in sleeves and avoid cutting or other weakening of the structure. Make changes in direction and size with fittings (no bushings will be allowed). Cap or plug open pipe ends during installation to keep out foreign material.

Make connections carefully to insure unrestricted circulation, eliminate air pockets, and to permit complete drainage of the systems. Grade all piping not less than 1" in 40 feet.

Make all connections to equipment using screwed unions in sizes 2" and smaller and flanged unions in sizes 2-1/2" and larger. Install unions in all piping connections to each piece of equipment, including traps, pumps, coils, etc.

10.2. **Condensate Drain Piping and Drain Pipe from Drip Pans to Floor Drains:** Type M hard copper tubing with wrot copper solder joint fittings for all indoor equipment. All 90° and 45° elbows and fittings shall be full radius, long sweep, with radius 1.5 times the pipe diameter. All offsets of piping shall be made with 45° fittings in lieu of 90° fittings wherever possible.

Outdoor packaged units shall be provided with Schedule 80 solid wall PVC pipe and fittings meeting ASTM Standard D2665 and 1785 with UV protective coating or painted on UV protection.

Outdoor packaged units serving the Natatorium C100 shall be provided with solvent welded Schedule 40 solid wall CPVC pipe and fittings, Type IV Grade 1, with a Cell Classification of 23447 as defined in ASTM D1784.

Provide a trap in each drain line with capped or plugged cleanout tees. Trap depth shall be as required by the equipment Manufacturer. In absence of the equipment Manufacturer’s trap requirements, traps shall be equal to the total system pressure plus one inch. Provide an electric switch, conforming to UL 508, to shut down the unit should the line become obstructed.

10.3. **Auxiliary Drain Piping from Auxiliary Drain Pans under Equipment Located in Concealed Areas:** Provide an electric switch, conforming to UL 508, to shut down the unit should moisture prove present in the auxiliary drain pan. Contractor shall provide a 3/4" drain line in the bottom of drain pan with ball valve and 3/4" hose end connection to provide manual, gravity draining of the pan after shutdown switch has been reset. See detail on plans for additional information. Sensor shall be Aqua-Guard AG-1200 or approved equivalent.

10.4. **Copper Joints:** Make assemblies with tin-antimony (95-5) solder and non-corrosive flux (this does not apply to refrigerant piping). Clean and polish the tube and the
inside of the fittings, using No. 60 steel wool. Apply flux and place fitting on the tube. Heat joint evenly, but take care not to overhead fitting. Apply solder until a solder line shows completely around the joint. Remove surplus solder and allow joint to cool.

10.5. **Escutcheons:** Provide all pipes passing through the floors, walls or ceilings of finished rooms with chrome plated brass escutcheon plates securely fastened in place with round head set screws.

10.6. **Unions:** Unions shall be of the following types:

**Copper Lines:** Ground joint, copper to copper.

**Schedule 80 PVC:** Solid wall PVC schedule 80 DWV pipe and fittings meeting ASTM Standard D2665 and 1785 for above ground service and underground service.

**Schedule 40 CPVC:** Type IV Grade 1, with a Cell Classification of 23447 as defined in ASTM D1784

**Dielectric Unions:** Provide where copper pipe joins to steel pipe, or aluminum meets non-aluminum pipe, EPCO or approved equivalent. Contractor shall provide a globe valve on each side of each dielectric union to allow for replacement of the union.

**Gaskets for flanged joints:** Best grade compressed material approved for the temperature and pressure of the system.

10.7. **Expansion:** Provide for expansion and contraction of all piping and make proper provisions so that there will be no undue strain on any pipe or equipment.

10.8. **Sleeves:** Refer to Section 15010, Para. B. 4. Pipe Sleeves.

**PART 11. REFRIGERANT PIPING AND ACCESSORIES**

11.1. **General:** Refrigerant piping shall be Type L hard drawn, ACR copper refrigerant tubing with wrot copper solder joint fittings. All offsets and changes in direction shall be made with 90° or 45° elbows as required. All fittings shall be full radius, long sweep type with radius 1.5 times the pipe diameter. System shall be complete and sized to conform to current ACRMA standards, except that refrigerant suction risers shall be sized for a gas velocity not less than 2000 fpm. **Pre-charged refrigerant line sets are NOT allowed.**

Where refrigerant piping is shown rising in the wall cavity and requires modifications to the block wall due to the size of the piping and insulated assembly, the block shall be neatly saw cut. Provide reinforcing to the affected portions of the wall as indicated on the structural drawings and details, the same as required at window and door openings. See the structural drawings for specifics. Extreme coordination is required prior to the erection of the structural slab and wall. Coordinate with the General Contractor.

Refer to Section 15010 and provide wall sleeves and escutcheons as specified for typical piping. Sleeves for pipe passing through exterior walls that contain refrigerant piping shall be Schedule 80 PVC pipe, 1/2" larger in diameter than piping and piping covering. Refer to Section 15010, Sleeves and Firestopping for additional requirements. Taping or nylon pull tying of liquid lines to suction lines is not allowed. Refer to Section 15010 and below for requirements. Coordinate wall sleeve sizes
required for refrigerant piping with insulation and aluminum jacket requirements. Piping within wall cavities shall be seamless type with no joints.

11.2. **VRF Systems Piping**: VRF systems refrigerant piping shall be Type L hard drawn, as specified above, from outdoor units to the respective indoor units. Refrigerant piping downstream of the VRF Branch Controllers boxes may be Type L, soft copper, as recommended by the Manufacturer. All piping downstream of the branch selector boxes shall be provided with manual isolation valves to isolate each individual unit for maintenance reasons. Coordinate with VRF Manufacturer and provide as required. Locate valve adjacent to each branch controller. All connections to the VRF Branch Selector Boxes shall be as specified in Section 15710. Refrigerant piping supports and anchoring shall be as specified below.

11.3. **Joints**: Brazed or soldered joints only. Flare joints are not allowed. Make up with high temperature silver solder suitable for twice (2x) the working pressure, at maximum capacity, of the system. Pass dry nitrogen gas through pipe while joints are soldered. No joints shall be allowed within any masonry walls or any other inaccessible area. Solder shall be Sil-Fos 15 or approved equivalent. All soldering or brazing, materials and methods used shall be as recommended by the unit manufacturer. Piping within wall cavities and other inaccessible areas shall be seamless type with no joints.

11.4. **Piping Diagram**: Various manufacturers of heat pump, VRF and DX systems have different reasons for the use of loops, traps, accumulators, receivers, etc., in piping arrangements, therefore, submit for approval, the air conditioning equipment Manufacturer’s recommended, dimensioned plan view and isometric piping diagram proposed for use for each system, showing all valves, loops, pipe sizes and all appurtenances, required for the proper operation of the respective system. Secure approval of compressor and air conditioning unit manufacturer before submitting. No diagram will be reviewed without the respective air conditioning Manufacturer's written acceptance and approval. Submit catalog data and manufacturer’s ratings for all valves, catch-alls, etc. with diagram for each system. Identify all items for respective system and list capacities, pressure drops, etc.

11.5. **Solenoid Valves (Where Required)**: Install in liquid refrigerant connection to the evaporators. Valves shall be designed for the operating pressure and capacity as listed in manufacturer’s catalog with a pressure drop not exceeding 2 psi, and shall be sufficient for the requirements of the installation. Install in horizontal runs with body vertical.

11.6. **Expansion Valves (Where Required)**: Properly sized diaphragm or bellows type, with external superheat adjustment set for 10 degrees F. superheat. Install in the liquid refrigerant supply lines to the evaporators. Expansion valves up to and including 7-1/2 tons capacity shall be Sporlan Type “S” or approved equivalent. Expansion valves over 7-1/2 ton capacity shall be Sporlan Type “O” or approved equivalent. Install Sporlan full size catch-all filter-drier ahead of valve.

11.7. **Refrigerant Service Valves**: Provide for the proper servicing of the equipment. All refrigerant circuit access ports located outdoors shall be fitted with color coated, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.
11.8. **Refrigerant Filter Drier (Catch-all):** Install in refrigerant line on the inlet side of each thermostatic expansion valve a Sporlan, three desiccants type filter drier. Filter driers up to and including 10 ton capacity shall be sealed type. Filter driers over 10 ton capacity shall be replaceable core type. Units shall have minimum surface filtering area and capacity not less than that shown in Sporlan Valve Company Bulletin 40 10 under sizes for “field replacement or field built up sizes”. Careful attention must be given to providing the correct type of filter drier as it pertains to type of refrigerant used in the respective system.

11.9. **Pipe Sleeves:** See Section 15010 for requirements.

11.10. **Pipe Supports:** Provide an insulated piping clamp assembly at each unistrut hanger, including the liquid line and any bare copper line attached to the assembly. The insulated clamp shall provide a crush resistant airtight seal and shall consist of a rigid, closed cell, foam insulation to support tubing and absorb vibration. The outer cover shall consist of a rubber coating that seals the cushion completely after installation to prevent condensation. **Plastic inserts/connectors between insulation joints are prohibited.** Clamps shall be steel with electrodichromate finish. Rated assembly temperature range shall be -50°F to +250°F. It shall be self-extinguishing as tested under ASTM D 635. Insulated lines shall use ZSi Series Cush-A-Therm or approved equivalent.

For units on concrete pad, support piping on concrete pad with rustproof coated 1-1/2” x 1-1/2” x 1/8” galvanized steel angle supports anchored to pad with steel base plate and bolts. See Part “Hangers and Supports” for coating requirements of unistrut assembly.

PART 12. PIPE HANGERS AND SUPPORTS

12.1. **General:** Refer to Section 15010. Note requirements for items located in the Natatorium C100 and Pool Equipment Rm. A127

12.2. **Painting of Hangers and Supports:** All exposed ferrous metal parts of hangers, unistrut and other assemblies used for supporting of ducts, piping and plumbing related items in mechanical rooms, crawl space, above ceilings, etc., including black steel pipe, uncoated cast iron pipe, hangers, brackets, etc. shall be painted with two coats of black latex paint. Paint shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84. In lieu of painting, the contractor may substitute factory painted or coated items. All paints and coatings shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E84.

PART 13. PIPE AND MISCELLANEOUS INSULATION WORK

13.1. **General Provisions:** All work by experienced applicators in accordance with manufacturer’s recommendations. Installation shall be as recommended by the Manufacturer. Where specified installation is in conflict with the Manufacturers recommendations, the strictest application shall be provided. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers to fit over insulated pipe size. **Hangers shall not be in contact with bare pipe.** See hangers and supports. Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering except screwed unions in hot piping and other specifically named items. Neatly bevel covering edges adjacent to
unions and other points of termination. All insulation materials including coatings and mastics shall have a composite rating for insulation, jacket or facing, including adhesives, not to exceed 25 flame spread and 50 for fuel contributed and smoke developed as determined by ASTM E-84, NFPA 255 and UL 723.

13.2. **Refrigerant Suction Lines and All Hot Gas Reheat Coils Hot Gas and Liquid Lines**: All insulated piping shall be continuous without cutting at clamp/support assemblies. All refrigerant liquid lines which are not associated with a hot gas reheat coil are not required to be insulated except, they shall be provided with insulated insert at clamps to unistrut assembly. See Part Refrigerant Piping and Accessories for refrigerant piping support and clamp assembly required. Various Manufacturers of “min-split” systems require the insulating of refrigerant liquid lines. When required by the Manufacturer, they shall be insulated using materials specified below and in thickness required by the respective Manufacturer.

Refrigerant Suction and liquid refrigerant lines associated with DHP-A located in Electrical A132 are required to be insulated individually from the outdoor unit to its related indoor unit.

Insulate with UL fire and smoke rated nominal 1” thickness, black, flexible foamed, elastomeric, closed cell pipe insulation by AP Armaflex or equivalent by K-Flex or Aerocel AC EPDM. It shall be GreenGuard certified tubular insulation with Microban antmicrobial protection. Insulation shall have a ‘k’ factor of not more than 0.256 at 90°F mean temperature, water absorption percent by volume of 0.2 and a water vapor transmission rate of 0.05 perm-inches or less. Where the VRF System Manufacturer requires less than 1” insulation, install thickness recommended with materials specified above and methods specified below. **Preinsulated piping from the Manufacturer is not allowed unless it meets the requirements specified above.**

Slip insulation onto pipe prior to erecting. **Longitudinal cutting of the insulation is prohibited. Do not stretch or bend insulation at any turn, nor slide insulation over sweat fittings.** Insulate sweat fittings and elbows with miter-cut pieces of insulation as recommended in Armaflex installation instructions, the same size as on adjacent piping. Fitting cover shall be long enough to overlap the pipe insulation by a minimum of one inch on each side. Glue the 1” overlap and seal to the adjacent pipe insulation with same adhesive and tape specified hereinbefore. Seal all butt joints with Armaflex BLV, Black, low VOC, air drying contact adhesive. After gluing joints, wrap joint with 3” wide, 1/8” thick AP/Armaflex self-adhering tape.

Paint all insulation in mechanical rooms (not in the attic) with two coats of Rubatex 374 white.

13.3. **Exterior Refrigerant Piping and Condensate Drainage Piping Aluminum Jacket**: All insulated exterior refrigerant piping, insulated exterior hot gas reheat coils hot gas piping and all insulated condensate drainage piping terminating in janitor sink, floor sink, hub drains in finished areas or any location that would subject the piping insulation to damage shall be covered with an aluminum jacket.

Where refrigerant piping rises within the wall cavity to above the ceiling, attic or similar space, the aluminum jacket shall terminate within the exterior wall cavity and sealed weather tight to the sleeve in the wall. Where the refrigerant piping extends from the outside, directly into the mechanical room, the aluminum jacket shall
terminate a minimum of 8" into the space and sealed weather tight on both sides of the wall and sleeve.

Refrigerant Suction and liquid refrigerant lines associated with DHP-A located in Electrical A132 are required to be individually covered from the outdoor unit to its related indoor unit. Refrigerant piping support assembly shall be aluminum with aluminum threaded rods, nuts, etc., as specified in Section 15010 for chlorine environment. Anchor piping to supports with aluminum clamp assembly. Seal the entire aluminum jacket joints watertight with a chlorine resistant sealant.

The aluminum jacket shall be 20 mil (.02") thick, smooth finish, 3003 and 3105 series aluminum conforming to ASTM B-209 standards. Fittings shall be 20-mil (.02") thick, die shaped, and smooth finish, Type 1100 aluminum jacket meeting ASTM C585. Provide 1/2" wide, 20-mil (.02") thick, Type 3003 aluminum bands on maximum 24" centers but not less than two bands per jacket section. **VentureClad or similar product is prohibited.**

13.4. **Condensate Drain Lines:** To include discharge lines on all equipment specified with or provided with air conditioning condensate drainage pumps. Same as refrigerant piping except 1/2" thickness.

13.5. **Painting and Identifying:** Paint and identify after installation is completed as specified in Section 15010.

13.6. **Submittal Data:** Submit for approval complete data on materials and application methods proposed.

**PART 14. VENTILATION**

14.1. **General:** Provide all fans complete with ducts, grilles, curbs and required accessories. All roof mounted fans, curbs and related assemblies shall be tested and certified by an independent, recognized third party testing agency and shall comply with all three Miami-Dade test protocols for static loading, missile impact and cyclic loading. Installation shall be as required by the Manufacturer to comply with the aforementioned test protocols. Roof fans and curbs shall be painted with two coats of non-reflective paint. Paint type and color as selected by Architect. All roof curbs, etc., furnished shall adhere to the roofing manufacturer's requirements so as not to void the roofing warranty. The top of all roof curbs shall be level with pitch built into curb when deck slopes 3/8 of an inch per foot or more. Coordinate with architectural and structural plans for required slope. Coordinate roof curb and interface in the building roofing system and verify minimum net height to be as required by code or as required by Architect. Refer to architectural specification. Furnish sound absorbing curbs required to obtain noise levels specified. See Part "Vibration and Noise Control" for additional requirements. Provide for all fans to be interlocked with air handling units a "hand" – “auto” – “off” switch. All fans shall be AMCA certified in accordance with Standards #210 and 300. Fans wheels shall be balanced in accordance with AMCA Standard 204-05. Fans shall be UL 705 listed and shall bear the UL Label. Furnish for approval capacity and sound power ratings. All motors 1/2 HP and smaller shall have built-in overload protection. All belt driven fans shall have v-belt drive sized for 150% of the installed motor horsepower, adjustable pitch cast iron sleeves for motor and adjustable motor base. All motors shall also be premium efficiency type. Refer to Section Motors for additional requirements. Scheduled static pressures are external to sound curbs.
14.2. **Wall Mounted Propeller Type Fans:** Wall propeller type with minimum capacities and characteristics as shown. Each unit shall include standard NEMA design, heavy duty sealed permanently lubricated ball bearing induction type drip proof motor, adjustable motor mount, permanently lubricated pillow block type ball bearings, motor operated heavy duty extruded aluminum damper, equal to Ruskin Series CD-40 and drainable blade type wall louver, equal to Airolite Louvers, Inc. Model No. K6744 with flanged frame, 1/2” aluminum bird screen and color by Architect. Submit louver to Architect for review. Coordinate louver requirements with Architectural specifications prior to ordering. Provide motor side fan guards, fan wall housing collar and variable pitch belt drive. Motor for discharge louver shall be designed for same power as fan motor. Where required provide transformer and control wiring for a complete and functional installation. All items shall be readily accessible for servicing and maintenance. Furnish for approval complete installation Shop Drawings. Belt-driven fans shall be equivalent to Loren-Cook Series XL/XM-W heavy duty.

14.3. **Pool Equipment Room A127 and Storage A126 Wall Mounted Propeller Fans:** Wall propeller type with minimum capacities and characteristics as shown. Each unit shall include standard NEMA design, heavy duty sealed permanently lubricated ball bearing induction type drip proof motor, adjustable motor mount, permanently lubricated pillow block type ball bearings, motor operated heavy duty extruded aluminum damper, equal to Ruskin Series all aluminum CD-40 and aluminum drainable blade type wall louver, equal to Airolite Louvers, Inc. Model No. K6744 with flanged frame, 1/2” aluminum bird screen and color by Architect. Submit louver to Architect for review. Provide aluminum motor side fan guards, aluminum fan wall housing collar and variable pitch belt drive. Motor for discharge louver shall be designed for same power as fan motor. Where required provide transformer and control wiring for a complete and functional installation. All items shall be readily accessible for servicing and maintenance. Where items are not furnished in aluminum, entire assembly may be provided with a powder coated chlorine resistant coating. Furnish for approval complete installation Shop Drawings. Fans shall be equivalent to Loren-Cook Series AWB.

14.4. **Roof Centrifugal Exhaust Fan:** Fan shall be centrifugal power roof ventilators with AMCA certified air and sound ratings and acid resistant coating. Fan shall be belt driven shall have permanently lubricated and sealed flanged bearings rated for L50 life in excess of 200,000 hours at maximum cataloged operating speed. All aluminum wheels statically and dynamically balanced backward curved blade wheels and spun aluminum housing with curb cap; disconnect switches, backdraft damper and outlet bird screen. For each fan furnish an acid resistant coated insulated prefabricated curb with integral cant and continuous welded joints. Fans shall be equal to Cook Series “ACRUB”.

14.5. **Ceiling Mounted Cabinet Fans:** Penn Ventilator Company Model Zephyr, Series Z-3 thru Z-15, or approved equivalent, complete with all accessories, including unit mounted solid state speed control switch, factory baked enamel white aluminum ceiling grille, metal flanged inlet and outlet connections, acoustically insulated metal housing, direct driven, internally isolated centrifugal fan, integral backdraft damper and terminal cap, cast aluminum brick vent or soffit grille as shown on the plans. Fan wheel shall be steel. Provide aluminum wheel where fan exhausts shower areas. Fan shall be supported from the structure with 1/4” hanger rods, rubber in shear vibration isolators and Manufacturer furnished bracket for attaching rods to the fan and structure above.

14.6. **Cabinet In-Line Centrifugal Fans:** Loren-Cook Series “SQ”, in-line centrifugal type fan as shown on the fans schedule. Fan shall have 18 ga. galvanized steel cabinet
with integral duct collars, moisture resistant coating, bolted access doors on 3-sides which are sealed with closed cell neoprene gasketing, disconnect switch, centrifugal, backward inclined extruded aluminum fan wheel and cast aluminum hub, supports for ceiling suspension, permanently lubricated drip proof motor, and gravity type discharge damper and Manufacturer furnished VFD if indicated or specified. Bearings shall be heavy duty, L50 life in excess of 200,000 hours at maximum cataloged operating speed. Bearings shall be regreaseable ball type with extended fittings in a pillow block cast iron housing. Coordinate fan arrangement required (top, side and bottom) at the site, prior to ordering fan. Where fan is used a supply air fan, Contractor shall provide fan with filter frame and 1” thick metal washable filters if access to filter section requires removal of the fan housing panel. Do not provide Manufacturer provided filter frame unless it is external to the unit and is provided with thumbscrew access. **Filter access requiring the removal of the fan housing is prohibited. The Contractor is responsible for quarterly filter cleaning during the guarantee period.**

14.7. **Acceptable Manufacturers:** Cook, Acme, Greenheck, PennBarry.

**PART 15. SPLIT SYSTEM HEAT PUMP UNITS**

15.1. **General:** Furnish and install split system heat pump systems as manufactured by the Trane Company, or approved equivalent by Carrier, or Lennox. Each unit shall be completely factory assembled and tested, and shall include hermetic compressor, outdoor (condenser & evap) coil, condensate switch to shut unit down should condensate drain line become obstructed, fan and ECM motors, interconnecting wiring, low voltage control transformer, prewired control panel and other necessary components mounted in weather resistant steel cabinet with baked on enamel finish. The unit shall be UL or ARL (Applied Research Labs) listed and labeled accordingly. The heat pump shall be sound rated per ARI Standard 270 and operation sound level shall not exceed acceptable limits. Heating and cooling capacities shall not be less than those indicated on the drawings. Indoor unit shall be provided with single point power connections (fan and heater). **Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.**

15.2. **Special Considerations:** The equipment manufacturer shall size the refrigerant piping for all the units and shall furnish all accessories and auxiliaries required for a complete and proper installation for the specific application shown on the drawings and the specified sequence of operation. Refer to Section Refrigerant Piping and Accessories for additional requirements.

15.3. **Cabinet:** Heavy gauge galvanized steel cabinet with weather resistant baked enamel finish. Access to the electrical controls and compressor shall be made by removing two service panels.

15.4. **Compressor System:** The unit shall contain a hermetic compressor. The compressor shall have high and low pressure protection, sump heat and compressor overload protection. Refrigerant circuit shall include service valves, pressure tap ports, check valves, switch over valve, refrigerant line filter-driers, and factory furnished holding charge of R-410a. All units with scheduled cooling capacity greater than 60 MBH shall be provided with multiple compressors as required by ASHRAE 90.1.

All refrigerant circuit access ports located outdoors shall be fitted with color coated, all brass locking type tamper resistant caps. The locking caps shall be color coded for
the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

Compressor shall be designed, manufactured and warranted for five years by the air conditioning unit manufacturer.

15.5. **Outdoor Coil:** The outdoor coils shall be constructed of aluminum fins or Spine Fin mechanically bonded to seamless aluminum or copper tube and shall be protected by a unit manufacturer furnished, heavy-duty metal hail guard. The outdoor coil shall have expansion valve refrigerant control during heating operation, and automatic time and temperature actuated defrost control system. Unit shall, as factory shipped, cycle fan motor on outdoor thermostat for low ambient cooling down to 45°F outdoor temperature. Provide heavy duty metal condenser coil hail guard.

15.6. **Controls:** Controls shall be factory wired and readily accessible. Compressor shall have overload protection; high and low pressure cutouts, 24-volt control transformer and magnetic contactor.

15.7. **Air Handler:** Air handler cabinet shall be constructed of heavy gauge steel with baked enamel finish and be internally lined with foil laced fiberglass insulation. The indoor coil shall be constructed of aluminum plate fins mechanically bonded to seamless copper tubes. The indoor (evaporator) coil shall have expansion valve control and be equipped with defrost control. Indoor blower shall be of the centrifugal type, forward curved and shall be driven by a direct drive or a belt drive motor with variable pitch pulley, high static drives as required to meet specified static pressures and permanently lubricated ball bearing motor. Air handler shall be provided with low voltage terminal board and fan motor relay. Refer to drawings for specific drive requirements.

15.8. **Electric Heaters:** Provide electric heater with a total heating output not less than indicated on the drawings. Heater assembly shall include power supply fusing, automatic resetting limit switches and heat limiters for thermal protection. Heater shall be provided with factory disconnect switch and fusing all per National Electrical Code and UL. Additionally, the auxiliary heater cabinet shall be factory sealed air tight and insulated to prevent condensation.

15.9. **Hot Gas Reheat Coil:** Each unit with scheduled cooling capacity greater than or equal to 40 MBH shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. The coil shall be of sufficient size to reheat all of the supply air. Provide, complete, with all necessary valves, controls, etc., as required for a complete and properly functioning installation. Provide manual isolation valves for each hot gas and liquid lines. Furnish for approval air conditioning equipment manufacturer approved refrigerant piping and controls diagram, and statement by the air conditioning manufacturer on company letterhead that use of the hot gas reheat coil with the equipment is acceptable to the manufacturer and does not affect any warranty or guarantee. **Equipment submittal will not be reviewed without a manufacturers' approved diagram and referenced statement.** Minimum reheat capacity for supply air shall be 10°F. Maximum coil pressure drop is 0.10” static pressure.

15.10. **Indoor Thermostat:** Provide a combination 7-day programmable, two-stage heating manual changeover heat pump thermostat. Thermostat shall have outdoor thermistor to compensate for thermostat droop, emergency heat switch with indicator light and
A Proposed Recreation Center For the City of Boaz

HEATING, VENTILATING AND AIR CONDITIONING 15700-33

auxiliary heat light. Thermostat shall have sub-base fan switch for “On-Auto” selection and manual “Heat-Cool” switch. Thermostat shall be hardwired and be provided with battery back-up. Provide hinged metal guard with rounded corners, lock and key for each thermostat. Refer to Section 15920 for additional requirements.

15.11. **Outdoor Thermostat:** Provide mounting box. Provide one outdoor thermostat for control of second stage of electrical heaters.

15.12. **Factory Start-up Service:** The Contractor shall provide for a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment provided with a hot gas reheat coil and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance including the range of the refrigerant hot gas reheat coil as applicable.

15.13. **Power Wiring:** Unit shall be factory wired for power supply indicated on the electrical drawings. Any variation will be the responsibility of the contractor.

15.14. **Filter Frame and Filters:** Provide 2” thick, MERV 8, pleated filters equal to 30/30/ Farr Series. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. Where indoor section sits on R.A. platform or is horizontally mounted in an attic space and the manufacturer does not provide a filter access with thumbscrew access in the bottom of the unit, provide a filter frame that is designed to mount to the bottom (R.A. inlet) of the air unit. Frame shall be hinged and have thumbscrews or wing nuts to open the access door. Filter frame shall be as manufactured by E-Z Filter Base Mfg., Inc. or approved equivalent. The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters' casing the date filters were installed/replaced.

15.15. **Phase Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3 phase equipment utilizing ICM Controls Model 450 or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device can not be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities.

15.16. **Roof/Pad Mounted Supports:** Units shown on finished grade shall be anchored to the concrete pad. Concrete pads are specified under Division 2. Where concrete pads are not specified or not shown elsewhere, the Mechanical Contractor shall be provide a minimum 4” thickness, 3,000 psi concrete pad with rounded edges and corners. Pad shall extend a minimum of 12” around three (3) sides of the unit and terminate at the building outside wall. Provide a strip of asphalt expansion joint between the concrete pad and the building exterior wall. Expansion joint shall be full width by full depth of concrete pad, 1” thickness, non-absorbing, self-sealing, ASTM D 994 compliant as manufactured by W.R. Meadows Inc. or approved equivalent.
15.17. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor shall provide a non-prorated, total of five year parts and labor, Manufacturer's warranty on outdoor unit compressor(s). The manufacturer's warranty shall provide for the repair and/or replacement of the compressor(s) that become inoperative because of defects in material or workmanship. The warranty period shall begin on the same date as final acceptance of the installation and shall continue for the full product warranty period specified above. The warranty shall include refrigerant and all other costs associated with the compressor(s) shipment to the Contractor or Facility, compressor(s) replacement, installation and returning the unit to its proper operating condition. The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician on site to evaluate the extent of the needed repairs and ordering of all items required for repair.

**PART 16. PACKAGED PAD MOUNTED HEATING AND AIR CONDITIONING UNITS (PHAC)**

16.1. **General Description:** One-piece, high efficiency, combination air-to-air DX mechanical cooling system and natural gas fired heating system, premium efficiency motors, 2-speed operation, powered exhaust/relief, complete with automatic controls and GFI convenience power outlet. Unit shall be provided with color touchscreen interface with USB port to indicate data trending, historical alarm messages, real-time sensor measurements, on board system setpoints and customized reports. The unit shall be designed for direct, side handling of the conditioned air as shown on the plans. Units with curbs installed beneath them to modify the discharge/inlet arrangements are prohibited. The equipment shall be shipped completely assembled, pre-charged, piped and wired internally ready for field connections. The manufacturer shall test operate the unit before shipment. Units shall have heavy duty metal condenser coil hail guards. The entire unit shall be factory wired for single point power connection. **Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.**

16.2. **Pad Mounted Supports:** Units shown on finished grade shall be anchored to the concrete pad. Concrete pads are specified under Division 2. Where concrete pads are not specified or not shown elsewhere, the Mechanical Contractor shall be provide a minimum 4" thickness, 3,000 psi concrete pad with rounded edges and corners. Pad shall extend a minimum of 12" around three (3) sides of the unit and terminate at the building outside wall. Provide a strip of asphalt expansion joint between the concrete pad and the building exterior wall. Expansion joint shall be full width by full depth of concrete pad, 1” thickness, non-absorbing, self-sealing, ASTM D 994 compliant as manufactured by W.R. Meadows Inc. or approved equivalent.

16.3. **Economizer Package:** All units whose scheduled cooling capacity is 54 MBH or greater shall be provided with a 100% outside air economizer. The economizer shall be provided complete with all controls, powered exhaust/relief, air mixing damper assembly consisting of an enthalpy controller, fresh air, recirculated air and exhaust air dampers. **The entire assembly shall mount within the confines of the unit casing.** The fresh air section shall be equipped with 1” thick disposable air filters. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. The system shall be interlocked so that when room thermostat calls for cooling or heating the outside air dampers will return to minimum position. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters’ casing the date filters were installed/replaced.**
16.4. **Cooling System:** Total certified cooling capacity not less than indicated. Coils shall be of non-ferrous construction with aluminum fins mechanically bonded to seamless copper tubes. Condenser coils shall have sub-cooling rows. The compressors shall be resiliently mounted - have built-in three mode crankshaft lubrication, crankcase heater, discharge temperature limiter, current and temperature sensing motor overloads, and 5-year guarantee. The system shall be protected by high and low pressure switches, a five minute compressor timed off cycle controller, freezestat, lockable refrigerant charging valves, and head pressure controls down to 45°F ambient. All units with scheduled cooling capacity greater than 60 MBH shall be provided with multiple compressors as required by ASHRAE 90.1. Compressors over 10-ton capacity shall have oil failure switches. Compressors shall operate with R-410a refrigerant.

All refrigerant circuit access ports located outdoors shall be fitted with color coded, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

16.5. **Gas Heating System:** Output capacity as indicated. Automatic controls furnished shall give 5:1 turndown operation. Heat exchanger shall be constructed of aluminized steel. Heat exchanger shall be capable of handling 100 percent outdoor air and any temperature and have a 10-year warranty when handling uncontaminated air. Stainless steel power burner shall use 100 percent secondary air and have intermittent spark ignition and 100 percent safety shutoff electronic flame sensing controls. Visual inspection of burner flame shall be possible without removing casing panels.

16.6. **Fans and Motors:** Conditioned air blowers shall be premium efficiency, twin centrifugal type with permanently lubricated ball bearings, adjustable belt or direct drive high static drives as required to meet specified static pressures, and cfm capacity as indicated. Condenser fans shall be direct driven. All motors shall have inherent protection devices on all legs.

16.7. **Frame and Casing:** The frame shall be of welded construction. The casing shall be of galvanized panels with a baked on outdoor acrylic finish. The cabinet bottom shall be insulated with Styrofoam; cabinet panels shall be insulated with 1” fiberglass. All components, wiring and inspection areas shall be completely accessible through hinged panels with quarter turn latching handles.

16.8. **Filters:** Provide 2" thick, MERV 8, disposable type filters for each filter location. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. **The Contractor is responsible for quarterly filter changes during the guarantee period and shall inscribe onto the filters’ casing the date filters were installed/replaced.**

16.9. **Smoke Detectors:** See Controls.

16.10. **Hot Gas Reheat Coil:** Each unit with scheduled cooling capacity greater than or equal to 40 MBH shall be provided with a refrigerant hot gas heating coil in the reheat position for humidity control. The coil shall be of sufficient size to reheat all of the supply air. Provide, complete, with all necessary valves, controls, etc., as required for
A Proposed Recreation Center For the City of Boaz

HEATING, VENTILATING AND AIR CONDITIONING

15700-36

a complete and properly functioning installation. Provide manual isolation valves for each hot gas and liquid lines. Furnish for approval air conditioning equipment manufacturer approved refrigerant piping and controls diagram, and statement by the air conditioning manufacturer on company letterhead that use of the hot gas reheat coil with the equipment is acceptable to the manufacturer and does not affect any warranty or guarantee. **Equipment submittal will not be reviewed without a manufacturers' approved diagram and referenced statement.** Minimum reheat capacity for supply air shall be 10ºF. Maximum coil pressure drop is 0.10” static pressure.

16.11. **Temperature Controls:** Control for each system shall consist of a 7-day programmable, low voltage combination heating and cooling, with sub-base equipped with “Heat” “Cool” and “Off” switch and fan “on” and “auto” switch. Also, provide an adjustable outdoor thermostat to control the second stage of the electric heaters through this thermostat. Thermostat shall be hardwired and provided with battery back-up. Provide hinged metal guard with rounded corners, lock and key for each thermostat.

16.12. **Phase Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3 phase equipment utilizing ICM Controls Model 450 or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device can not be mounted within the respective equipment, provide a NEMA 3R or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities. Phase protection is not required on equipment being controlled via a variable speed frequency drive.

16.13. **Factory Start-up Service:** The Contractor shall provide for a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance including the range of the refrigerant hot gas reheat coil.

16.14. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor shall provide a non-prorated, total of five year parts and labor, Manufacturer's warranty on outdoor unit compressor(s). The manufacturer's warranty shall provide for the repair and/or replacement of the compressor(s) that become inoperative because of defects in material or workmanship. The warranty period shall begin on the same date as final acceptance of the installation and shall continue for the full product warranty period specified above. The warranty shall include refrigerant and all other costs associated with the compressor(s) shipment to the Contractor or Facility, compressor(s) replacement, installation and returning the unit to its proper operating condition. The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician on site to evaluate the extent of the needed repairs and ordering of all items required for repair.

16.15. **Acceptable Manufacturers:** Trane, Carrier or Lennox.
A Proposed Recreation Center For the City of Boaz

HEATING, VENTILATING AND AIR CONDITIONING 15700-37

PART 17. WALL MOUNTED DUCTLESS SPLIT HEAT PUMP SYSTEM UNIT (DHP)

17.1. **General:** Provide ductless, wall mounted, split system type heat pump unit, equal to Mitsubishi Electric Series MSZ/MUZ for units with specified cooling capacity up to 9 MBH and PKA/PUZ units with specified cooling capacity of 12 MBH to 36 MBH complete with all accessories including wall hung evaporator blower unit, pad mounted outdoor condensing unit with lockable refrigerant charging valves, filter frame, filter, fixed, wall mounted, 7-day programmable, microprocessor electronic thermostat and control module, adjustable discharge louvers, factory installed heavy duty condensate pump (if drainage indicated on plumbing and HVAC plan is not gravity type), alarm for obstructed condensate line, low ambient indoor coil thermistor, low ambient control to 0º F, outdoor microprocessor control, heavy duty metal condenser coil hail guard and other accessories required for a complete functional installation. Unit shall be provided with sensor to shutdown unit and sound alarm if condensate line becomes obstructed. If BAS system is part of the project, provide output contacts to show alarm at BAS system Operator Console. Coordinate with BAS Contractor and provide as required for proper interface. Refrigerant shall be R-410a. Compressors shall be warranted for 5 years.

All refrigerant circuit access ports located outdoors shall be fitted with color-coded, all brass, locking type tamper resistant caps. The locking caps shall be color coded for the refrigerant used. Caps shall be Novent Series 8668 for R-410 refrigerant with 86698 NV Multikey unlocking mechanism for R-410 refrigerant or equivalent by JB Industries Series Shield and DiversiTech Series Sentry. Provide owner with minimum of six (6) spare keys.

17.2. **Refrigerant Piping:** The equipment manufacturer shall size the refrigerant piping for all the units and shall furnish all accessories and auxiliaries required for a complete and proper installation for the specific application shown on the drawings and the specified sequence of operation. Refer to Section Refrigerant Piping and Accessories for additional requirements.

17.3. **Condensate Pump (As Required):** Condensate pumps for all indoor units shall be Blue Diamond, Series MaxiBlue or approved equivalent. Pump shall be thermally protected, up to 3.7 GPH flow rate, 23 ft. head, 15 ft. suction, self-priming, powered by the indoor unit and maximum 21-db sound level. Pump shall be provided with mounting feet, extension cables and multi-tank configuration as required. Mechanical Contractor to coordinate power requirements for pump, prior to bid, and provide as required.

17.4. **Roof/Pad Mounted Supports:** Concrete pad is specified under Division 2 for all units mounted on grade. Where concrete pads are not specified or shown, the Mechanical Contractor shall be provide a minimum 4” thickness, 3,000 psi concrete pad with rounded edges and corners. Pad shall extend a minimum of 12” around three (3) sides of the unit and terminate at the building outside wall. Provide a strip of asphalt expansion joint between the concrete pad and the building exterior wall. Expansion joint shall be 1” thickness, non-absorbing, self-sealing, ASTM D 994compliant and manufactured by W.R. Meadows Inc or equivalent.

17.5. **Phase Protection:** All indoor and outdoor equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3 phase equipment utilizing ICM Controls Model 450 or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM...
492 or equivalent. Where phase protection device can not be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities.

17.6. **Warranty:** General warranties are specified in Section "General Mechanical Provisions". The Contractor shall provide a non-prorated, total of five year parts and labor, Manufacturer's warranty on outdoor unit compressor(s). The manufacturer's warranty shall provide for the repair and/or replacement of the compressor(s) that become inoperative because of defects in material or workmanship. The warranty period shall begin on the same date as final acceptance of the installation and shall continue for the full product warranty period specified above. The warranty shall include refrigerant and all other costs associated with the compressor(s) shipment to the Contractor or Facility, compressor(s) replacement, installation and returning the unit to its proper operating condition. The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty. “Respond” shall mean having a Manufacturer certified technician on site to evaluate the extent of the needed repairs and ordering of all items required for repair.

17.7. **Manufacturers:** Mitsubishi or equivalent by Trane, Lennox, Samsung or Carrier. *Mitsubishi is the basis of Design.*

### PART 18. ELECTRIC UNIT HEATERS

18.1. **General:** Provide electric unit heaters, complete with thermostats, controls, low voltage thermostat, wiring and all accessories. All heaters shall be installed in accordance with manufacturer’s recommendations. Heaters shall be securely mounted to building structure. Provide any additional structural framing necessary for proper heater installation. Unit heaters shall be provided with single point power connections (fan and heater). **Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.** Heaters shall be Q Mark, Markel, Trane, Electromode, or approved equivalent.

18.2. **Propeller Type:** Heater shall be horizontal discharge type, complete with integral controls, remote low voltage thermostat, control transformer, and circuit breaker. Basis of design is Trane model UHEC.

### PART 19. PACKAGED INDOOR ELECTRIC MAKE-UP AIR HEATING AND VENTILATING UNIT

19.1. **General:** Provide Markel MFH Series as shown on the plans. Unit shall be provided with factory assembled fan package, complete with integral electric heat, factory mounted control panel, fan and heater power wiring as required for a single point field connection.

Provide a factory mounted disconnect switch furnished and prewired to disconnect all electrical components in the fan package. The unit shall be provided with single point power connections (fan and heater). **Verify voltage and power requirements with Electrical Contractor and Electrical plans prior to ordering equipment.** Units shall be provided with phase protection.
19.2. **Fan Package:** Must be labeled and listed by a nationally recognized and locally accepted testing laboratory, such as U.L or ETL Testing Laboratories, Inc. Fan packages must be tested for safety and in accordance with current National Electric Code.

19.3. **Casing:** Shall be a minimum of 20 gauge galvanized steel and acoustically insulated with 1 inch fiberglass, UL listed and meeting NFPA and NBFU90A requirements.

19.4. **Blower Casing:** Shall be constructed of heavy gauge steel and baked enamel finish. Fan wheel shall be forward curved centrifugal type, dynamically balanced and be driven by direct drive, single speed Permanent Split Capacitor motors.

19.5. **Motors:** Shall be 1050 RPM. Fan assembly shall be mounted on a 16 gauge steel sub-base, but shall be internally isolated with rubber-in-shear isolators to prevent vibration transfer to the sub-base.

Motors shall also be isolated with rubber-in-shear isolators between the motor mounting legs and the blower casing.

Fan motor assembly shall be accessible through access panels from both sides and rear of the cabinet. Bottom or top access is not acceptable. Access panels shall be gasketed to prevent leakage and vibration transmission.

19.6. **An Electric Heater:** Shall be part of the total listed package, shall be approved as a component part of the fan package and shall have SCR control. The heater shall be controlled by electric controls enclosed in a Nema-1 enclosure on the side of the cabinet. The panel shall be gasketed and sealed to prevent air leakage.

19.7. **Filter Frame and Filters:** Unit shall be provide with factory fabricated external filter frame and 1” thickness, MERV 8 disposable pleated filter(s) equal to 30/30/ Farr Series. All filters shall be common industry standard size filters that are readily available and do not have to be fabricated. Cutting and taping of filter segments to make a proper filter is prohibited. Filter frame shall be located on the inlet side of the unit. Filters shall be accessible via hinged door with thumbscrew or wing nut removal to open the access door. Magnetic type closers are prohibited.

**PART 20. AUTOMATIC CONTROLS**

20.1. **General:** Furnish and install a complete system of automatic temperature controls, as specified herein, as shown on the Drawings and as required for a complete installation. All temperature control equipment shall be of the electric type.

20.2. **Submittals:** The temperature control contractor shall submit 5 copies of complete temperature control diagrams with written “sequence of operation” and factory-printed specification data sheets covering each control device proposed to be used for Engineer’s approval prior to installation of any equipment or part of system. Submittal data shall include a schedule of all devices to be installed.

20.3. **Installation:** By trained and experienced mechanics. All work shall be done by an approved, independent HVAC Controls Subcontractor whose primary business is the installation and servicing of HVAC controls systems.

20.4. **Identification:** Provide permanent nameplates for all control components and for all motor starters. Nameplates shall be engraved laminated plastic with letters
20.5. **Conduit, Controls Wiring and Instrumentation Cable:** The HVAC Controls Contractor shall be responsible for the furnishing and installation of a complete and fully functional system as specified, shown on the plans and as required to accomplish the specified sequences of operation.

All control wiring and cables routed through the Natatorium C100, Pool Equipment A127, Chemical Storage A131 and Storage A126 shall be in sealed, EMT, aluminum conduit. Control cables and wiring in the remaining parts of the facility shall be in EMT conduit (no “whips”) except conduit is not required above lift-out (lay-in) ceilings. EMT control conduit is specified in the Electrical Division of the specifications and/or shown on electrical drawings. Minimum HVAC Controls conduit size shall be 3/4” in size. All control conduit, power wiring, relays, contactors and incidental wiring required for a complete and completely functional system as specified, shown on the plans, or as required to accomplish the specified sequences of operation, which is not shown or specified by the Electrical Division, shall be furnished and installed by the HVAC Controls Contractor. This shall include all interlock control wiring between the various components of the air conditioning system and all smoke detection system electrical wiring. Electrical work performed under this Section shall conform to requirements set forth in the Electrical Division of the specifications. All wiring shall be in accordance with the National Electrical Code, and all State and local codes. Coordinate all requirements with the Electrical Sub-Contractor prior to bid and provide all as required.

All wiring, cabling, etc., shall be plenum rated and rated for use at temperatures expected in the location of mounting. Instrumentation cable shall be minimum 18 AWG stranded copper, single or multiple twisted, minimum 2 inch lay of twist, 100 percent shielded pairs and shall have a 300 volt insulation. Each pair shall have a minimum 20 AWG tinned copper drain wire and individual overall pair insulation. Cables shall have an overall aluminum polyester or tinned copper cable shield tape, overall 20 AWG tinned copper cable drain wire and overall cable insulation. Instrumentation cable shall be minimum AWG as specified or heavier AWG as recommended by the controls system manufacturer.

Provide independent, minimum 1”, aluminum or rust resistant coated steel J-hook supports for all wiring not in conduit. Wiring supports shall be attached to the building structural system (not other trades’ supports, piping, duct, ceiling suspension system, etc). Wiring, cabling, etc., shall be neatly bundled together and supported at no more than six (6) feet on center.

All thermostat and humidistat boxes shall be mounted 46” A.F.F. to the center of the box (ADA height). Where wall mounted CO2 Sensors are indicated, they shall be mounted 58” A.F.F to the center of the box.

20.6. **Carbon Dioxide Sensors:** Shall be of the non-dispersive infrared type (NDIR) diffusion sampling, repeatable to +/- 8 PPM with a measurement range 0 – 2000 PPM and be user adjustable. It shall have the following accuracy; from 0-1500 PPM +/- 75 PPM; +/- 5% with an operating range of 32 degrees F to 130 degrees F with a response time of less than 90 seconds.

The duct mounted and/or wall mounted sensor as shown on the plans, shall be provided with a duct sampling option and all required inputs and outputs required to control the motorized damper and as required to analyze readings. Duct mounted
sensors shall be Veris Industries Series CDE or approved equivalent by Johnson Controls or Honeywell. Wall mounted sensors shall be Veris Industries Series CWE or approved equivalent by Johnson Controls or Honeywell.

20.7. **Humidistats:** Heavy duty industrial type. Provide metal guard as specified for thermostats. All humidistat boxes shall be mounted 46” A.F.F. to the center of the box (ADA height). All humidistat/sensor boxes in walls or partitions shall be sealed/caulked to prevent the passage of air and smoke thru the device.

20.8. **Smoke Detectors:** Smoke detectors operating on the ionization principles shall be furnished by the Electrical Contractor and installed where shown on the plans by the Mechanical Subcontractor. Wire the detectors to stop the unit upon smoke detection. Provide required relays, wiring, etc. Coordinate work with Electrical Subcontractor. Contractor shall provide an access door/panel adjacent to each smoke detector to allow for maintenance and visual inspection.

20.9. **Motorized Dampers:** Equal to Ruskin Series CD-40 with heavy duty Belimo actuator. Provide weatherproof construction for outdoor installation.

20.10. **Space Thermostats:** Space thermostats shall be 7-day microprocessor programmable, low voltage with “Summer-Winter” and fan On-Off-Auto switches sub-base. Coordinate thermostat options and provide as required to accomplish specified sequence of operation. Each thermostat shall have building power supply with transformer and battery back-up power. Provide hinged metal guard with rounded corners, lock and key for each thermostat. All thermostat and humidistat boxes shall be mounted 46” A.F.F. to the center of the box (ADA height). Where wall mounted CO2 sensors are indicated, CO2 Sensors shall be mounted 58” A.F.F to the center of the box. All thermostat/sensor boxes in walls or partitions shall be sealed/caulked to prevent the passage of air and smoke thru the device.

20.11. **Typical Split System HP-A, HP-B, HP-C and HP-D Heat Pump Unit Sequence of Operation:** The control circuit for each unit will be energized by its respective 7-day programmable thermostat. On unit start-up, the outside air damper shall open to its minimum scheduled outside air setpoint. On unit shutdown, the motorized outside air damper shall close. During the unoccupied schedule, the outside air damper shall remain closed upon unit start-up. Unit manufacturer furnished thermostat will be used to control heating and cooling. Provide hinged metal guard with rounded corners, lock and key for each thermostat. Provide all required smoke detector interlocks including relays and wiring.

Provide for each heat pump unit an adjustable outdoor thermostat and wire to control second stage of auxiliary electric resistance heater.

Where specified or indicated on the drawings, provide a space humidistat to override the cooling thermostat to provide for dehumidification. During dehumidification, the heat pump unit reversing valve shall be locked out to prevent switching to the heating mode. The space thermostat shall then modulate the refrigerant hot gas reheat coil valve as required to maintain space temperature. Furnish for approval detailed wiring diagram and sequence of operation.

20.12. **HP-A, HP-C and HP-D Economizer Cycle:** HP-A, HP-C and HP-D shall be arranged for economizer cycle. Upon a call for the economizer to operate based on the outdoor air thermostat setpoint of 54°F (adj.), the motorized outside air damper shall open to its 100% open position, the motorized return air damper shall close, the
respective outdoor heat pump unit compressors shall be locked out and the respective indoor unit shall run.

Upon a rise of the outside air temperature to above 63°F (adj) or the space temperature and humidity setpoint can not be maintained by the economizer cycle for a period greater than 10 minutes (adj.), the economizer cycle shall be disabled. The motorized outside air and return air dampers shall then return to their minimum scheduled setpoints, the outdoor heat pump units’ compressors shall be energized and the system shall return to its normal sequence of operation as specified hereinbefore.

20.13. **Typical Packaged Heating and Air Conditioning Unit (PHAC) Systems with CO₂ Sequence of Operation:** The control circuit for all units will be energized by the respective 7-day programmable thermostat.

Thermostat and fan switches sub-base will be used to control heating and cooling. On unit start-up, the outside air damper shall open. On unit shutdown, motorized damper shall close. During unoccupied periods, the outside air damper shall remain closed upon unit start-up. Provide smoke detector interlocks to stop the unit upon smoke detection per NFPA 90A requirements.

Provide for each heat pump unit an adjustable outdoor thermostat and wire to control second stage of auxiliary electric resistance heater.

A wall mounted or duct mounted CO₂ sensor (as shown on the plans) monitoring CO₂ levels in the space shall modulate the outside air and return air dampers in sequence as required to maintain CO₂ levels in the air space at a maximum of 700 PPM (field adjustable). Minimum outside air setpoint shall be as scheduled. Motorized outside air and return air dampers shall modulate between the minimum outside air setting and the scheduled outside air setting. Upon satisfaction of the CO₂ sensor, dampers shall return to their minimum setpoint.

Where specified or indicated, provide a space humidistat to override the cooling thermostat to provide for dehumidification. During dehumidification, the heat pump unit reversing valve shall be locked out to prevent switching to the heating mode. The space thermostat shall then modulate the refrigerant hot gas reheat coil valve as required to maintain space temperature.

Provide hinged metal guard with rounded corners, lock and key for each thermostat. Provide building power supply to each thermostat with transformer. Each thermostat shall be provided with battery standby power.

21.14. **Make-Up Air Unit (MAU) / Exhaust Fan Sequence of Operation:** The MAU and respective exhaust fan shall run continuously. Upon reaching the low limit setpoint of 50 degrees F (adj.), the room thermostat heater contactors shall energize the respective SCR heater as required to maintain space setpoint temperature. Upon satisfaction of the space setpoint temperature, the heaters contactors shall de-energize the respective SCR heater, the respective exhaust fan and MAU shall then return to it continuous operation. Provide and outdoor thermostat to lockout the heater contactors when the outdoor temperature is 60 degrees F (adj.)

Provide hinged, clear, plastic guard, lock and key for each thermostat. Provide building power supply to each thermostat with transformer. Each thermostat shall be provided with battery standby power.
20.15. **Time Delay Controls:** Provide time delay control systems as required to stage units starting and to prevent more than two units from starting at the same time.

20.16. **Exhaust Fan Controls:** Provide interlocks for certain fans as noted on fan schedule.

20.17. **Typical Unit Heaters:** Each unit shall be started by the respective program clock, “Hand/Off/Auto” switch and 4-hour mark time switch located on the central control panel. Room thermostat shall control heater contactors and fan as required to maintain space temperature.

20.18. **Miscellaneous Control:** Provide other miscellaneous controls as required for a complete functional control system.

21.19. **Service and Guarantee:** After completion of the installation, adjust all control equipment and place the complete system in operation subject to the approval of the Engineer. Guarantee the control system to be free of defects and adequate to provide required control functions for a period of one year after acceptance of project. Provide free service and maintenance during the guarantee period.

END OF SECTION
SECTION 15710

VARIABLE REFRIGERANT FLOW (VRF) SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Variable refrigerant volume HVAC system includes:
   1. Outdoor/condensing unit(s).
   2. Indoor/evaporator units.
   3. Branch selector units.
   4. Refrigerant piping.
   5. Control panels.
   6. Control wiring.

1.02 REFERENCES
C. ITS (DIR) - Directory of Listed Products; current edition.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. Specification Sections 15010 and 15700 are applicable in full. Refer to those Sections for additional requirements.

1.03 SUBMITTALS
A. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings shown in the contract documents:

   1. Outdoor/Central Units:
      a. Refrigerant Type and Size of Charge.
      b. Cooling Capacity: Btu/h.
      c. Heating Capacity: Btu/h.
      d. Cooling Input Power: Btu/h.
      e. Heating Input Power: Btu/h.
      f. Operating Temperature Range, Cooling and Heating.
      g. Air Flow: Cubic feet per minute.
      h. Fan Curves.
      i. External Static Pressure (ESP): Inches WG.
j. Sound Pressure Level: dB(A).
k. Electrical Data:
   1) Maximum Circuit Amps (MCA).
   2) Maximum Fuse Amps (MFA).
   3) Maximum Starting Current (MSC).
   4) Full Load Amps (FLA).
   5) Total Over Current Amps (TOCA).
   6) Fan Motor: HP.
l. Weight and Dimensions.
m. Maximum number of indoor units that can be served.
n. Maximum refrigerant piping run from outdoor/condenser unit to indoor/evaporator unit.
o. Maximum height difference between outdoor/condenser unit to indoor/evaporator unit, both above and below.
p. Control Options.

2. Indoor/Evaporator Units:
a. Cooling Capacity: Btu/h.
b. Heating Capacity: Btu/h.
c. Cooling Input Power: Btu/h.
d. Heating Input Power: Btu/h.
e. Air Flow: Cubic feet per minute.
f. Fan Curves.
g. External Static Pressure (ESP): Inches WG.
h. Sound Pressure level: dB(A).
i. Electrical Data:
   1) Maximum Circuit Amps (MCA).
   2) Maximum Fuse Amps (MFA).
   3) Maximum Starting Current (MSC).
   4) Full Load Amps (FLA).
   5) Total Over Current Amps (TOCA).
   6) Fan Motor: HP.
 j. Maximum Lift of Built-in Condensate Pump.
k. Weight and Dimensions.
l. Control Options.

3. Control Panels: Complete description of options, control points, zones/groups.

B. Shop Drawings: Installation drawings custom-made for this project; include as-
designed HVAC layouts, locations of equipment items, refrigerant piping sizes and
locations, condensate piping sizes and locations, remote sensing devices, control
components, electrical connections, control wiring connections. Shop drawings shall
include:
1. Detailed piping diagrams, indicating sizes, valves, individual isolation valves to
each indoor unit, all appurtenances and all branch balancing devices.
2. Condensate piping routing, size, and pump connections.
3. Detailed power wiring diagrams.
4. Detailed control wiring diagrams.
5. Locations of required access through fixed construction.
6. Drawings required by manufacturer for 10 year warranty.
7. Submit shop drawings as PDF’s.
C. Design Data:
1. Provide design calculations showing that system will achieve performance specified
2. Provide design data required by ASHRAE Std 90.1 I-P.

D. Operating and Maintenance Data:
1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
3. Identification of replaceable parts and local source of supply.

E. Project Record Documents: Record the following:
1. As-installed routing of refrigerant piping and condensate piping.
2. Locations of access panels.
3. Locations of control panels.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: The system design shown in the contract documents is based on equipment and system designed by Mitsubishi Electric Trane HVAC. Equivalent systems by LG, Carrier or Daikin will be acceptable.

2.02 HVAC SYSTEM DESIGN

A. System Operation: Heating and cooling, simultaneously.
1. Zoning: Provide capability for temperature control for each individual indoor/evaporator unit independently of all other units.
2. Zoning: Provide heating/cooling selection for each individual indoor/evaporator unit independently of all other units.
3. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.
4. Conditioned spaces are shown on the drawings.
5. Outdoor/Condenser unit locations are shown on the drawings.
6. Indoor/Evaporator unit locations are shown on the drawings.
7. Branch selector unit locations are shown on the drawings.
8. Required equipment unit capacities are shown on the drawings.
9. Connect equipment to condensate piping; condensate piping is shown on the drawings.

B. Energy Design Wind Speed: 25 mph.

C. Operating Temperature Ranges:
   1. Simultaneous Heating and Cooling Operating Range: minus 4 degrees F to 60 degrees F dry bulb.
   2. Cooling Mode Operating Range: minus 10 degrees F to 126 degrees F dry bulb.
   3. Heating Mode Operating Range: 0 degrees F to 77 degrees F dry bulb; minus 4 degrees F to 60 degrees F wet bulb; without low ambient controls or auxiliary heat source.

D. Refrigerant Piping Lengths: Provide equipment capable of serving system with following piping lengths without any oil traps:
   1. Maximum Piping Length from Outdoor/Central Unit(s) to Furthest Terminal Unit: 540 feet, actual; 620 feet, equivalent.
   2. Total Combined Liquid Line Length: 3280 feet, minimum.
   3. Maximum Vertical Distance Between Outdoor/Central Unit(s) and Terminal Units: 30 feet.
   4. Maximum Piping Length Between Indoor Units: 49 feet.

E. Control Wiring Lengths:
   1. Between Outdoor/Condenser Unit and Indoor/Evaporator Unit: 6,665 feet, maximum.
   2. Between Outdoor/Condenser Unit and Central Controller: 3,330 feet, maximum.

F. Controls: Provide the following control interfaces:
   1. For Each Indoor/Evaporator Unit: One wall-mounted wired "local" controller, with temperature sensor; locate where indicated.
   2. Mitsubishi AE-200A and required sub-panels located in Mechanical Room 155.

G. Local Controllers: Wall-mounted, wired, containing temperature sensor and occupancy sensor.

2.03 EQUIPMENT

A. All Units: Factory assembled, wired, and piped and factory tested for function and safety.
   1. Refrigerant: R-410A.
   3. Safety Certification: Tested to UL 1995 by UL or Intertek-ETL, listed in ITS (DIR), and bearing the certification label.
   4. Provide outdoor/condensing units capable of serving indoor unit capacity up to 200 percent of the capacity of the outdoor/condensing unit.
   5. Provide units capable of serving the zones indicated.
   6. Thermal Performance: Provide heating and cooling capacity as indicated, based on the operating conditions shown on the plans.

B. System Controls:
   1. Include self diagnostic, auto-check functions to detect malfunctions and display the type and location.
2. All thermostats and any wall mounted adjustable device shall be installed at ADA height, 46” to the bottom of the box (48” to the center).

C. Wiring:
   2. Control Wiring Configuration: Daisy chain.

D. Refrigerant Piping:
   1. Provide two-pipe refrigerant system. Refrigerant piping and supports shall be as specified in Section 15700, Part 11.
   2. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.
   3. Insulate each refrigerant line individually between the condensing and indoor units. Refer to Section 15700, Part 13 for required insulation materials and methods.

2.04 OUTDOOR/CONDENSING UNITS

A. Outdoor/Condensing Units: Air-cooled DX refrigeration units, designed specifically for use with indoor/evaporator units; factory assembled and wired with all necessary electronic and refrigerant controls; modular design for ganging multiple units.
   1. The model nomenclature and unit requirements are shown below. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s).

2. Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated in accordance with the installation manual using materials and methods specified in Section 15700, Part 11 and Part 13.

3. There shall be no more than 4 branch circuit controllers connected to any one outdoor unit.

4. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.

5. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.

6. The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

7. The outdoor unit shall have the ability to operate with a maximum height difference of 295 feet and have total refrigerant tubing length of 1804-3936 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.

8. The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperatures or cooling mode down to 23°F ambient temperatures, without additional low ambient controls.

9. The outdoor unit shall be capable of operating in cooling mode down to -10°F with manufacturer supplied low ambient kit.
10. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.

11. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

12. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.

13. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

14. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow/hail guard.

15. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.

16. Equipment must be labeled “Assembled in USA” on equipment nameplate. Manufacturer must provide documentation from U.S. Customs and Border Protection indicating the equipment is a product of the U.S.

17. Equipment shall incorporate a built in USB port to allow for storage and download of unit diagnostics for up to five days.

18. All equipment shall also be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling. Protection shall be provided for all 3 phase equipment utilizing ICM Controls Model 450 or equivalent. All single phase equipment with horsepower greater than or equal to 1/8 HP shall be provided with protection utilizing ICM Controls Model ICM 492 or equivalent. Where phase protection device can not be mounted within the respective equipment, provide a NEMA 4x or NEMA enclosure appropriate for the installation. The Contractor shall consult with the Owner's maintenance personnel and set up all programmable options based on the Owner's requirements, within the device's capabilities.

A. Unit Cabinet:

1. The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models

B. Fan:

1. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.32 in. WG external static pressure via dipswitch.

2. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

3. All fan motors shall be mounted for quiet operation.
4. All fans shall be provided with a raised guard to prevent contact with moving parts.

5. The outdoor unit shall have vertical discharge airflow.

6. The fan shall offer reduced fan noise via five adjustable airflow settings.

C. Refrigerant
   1. R410A refrigerant shall be required for outdoor unit systems.
   2. Polyolester (POE) oil shall be required.

D. Coil:
   1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
   2. The coil fins shall have a factory applied corrosion resistant finish.
   3. The coil shall be protected with an integral metal hail guard.
   4. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
   5. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

E. Compressor:
   1. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
   2. A crankcase heater(s) shall be factory mounted on the compressor(s).
   3. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
   4. The compressor will be equipped with an internal thermal overload.
   5. The compressor shall be mounted to avoid the transmission of vibration.
   6. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
   7. The Contractor shall provide a minimum, non-prorated, total of five year parts and labor, Manufacturer's warranty on outdoor unit compressor(s). The manufacturer's warranty shall provide for the repair and/or replacement of the compressor(s) that become inoperative because of defects in material or workmanship. The warranty period shall begin on the same date as final acceptance of the installation and shall continue for the full product warranty period specified above. The warranty shall include refrigerant and all other costs associated with the compressor(s) shipment to the Contractor or Facility, compressor(s) replacement, installation and returning the unit to its proper operating condition. The Contractor shall respond within 24 hours upon notification that a compressor has failed under the terms of the warranty.
"Respond" shall mean having a Manufacturer certified technician on site to evaluate the extent of the needed repairs and ordering of all items required for repair

F. Controls:
   1. The outdoor unit shall have the capability of up to 8 levels of demand control for each refrigerant system

G. Electrical:
   1. The outdoor unit electrical power shall be as shown on the plans.
   2. The outdoor unit shall be controlled by integral microprocessors.
   3. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system

2.05 BRANCH CIRCUIT CONTROLLERS

A. General

   The BC (Branch Circuit) Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no subcooling risk bubbles in liquid supplied to LEV and are not allowed.

   The BC (Branch Circuit) Controllers shall be specifically used with R410A Heat Recovery systems. These units shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity. The BC Controller shall be suitable for use in plenums in accordance with UL1995 ed 4.

B. BC Unit Cabinet:
   1. The casing shall be fabricated of galvanized steel.
   2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
   3. The unit shall house two tube-in-tube heat exchangers.
   4. The unit shall have service access from the bottom.
   5. The cabinet shall be insulated externally with 1” thickness, 3 lb. density duct board if it is not factory insulated.

C. Refrigerant
   1. R410A refrigerant shall be required.
**D. Refrigerant Branches**

1. All BC Controller refrigerant pipe connections shall be brazed or soldered. **Flared connections are not allowed.**

**E. Refrigerant valves:**

1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.

2. Each branch shall have multiple two-position valves to control refrigerant flow.

3. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.

4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

5. Provide a refrigerant isolation valve in each refrigerant line to each individual indoor unit. Isolation valve shall be located on the leaving side of each branch circuit controller.

**F. Future Use**

1. Each VRF system shall include at least one (1) unused branches or branch devices for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port as specified above.

**G. Integral Drain Pan:**

1. An Integral drain pan and drain shall be provided. Pan shall be insulated with 1” thickness, 3 lb. density ductboard and provide with drain valve and automatic shutdown switch. See plans for detail.

2. The Integral drain pan shall be removable.

**H. Electrical:**

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz.

2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).

3. The BC Controller shall be controlled by integral microprocessors

4. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
2.06 INDOOR / EVAPORATOR INDOOR UNIT GENERAL REQUIREMENTS

A. All Units shall be provided with sensor to shutdown unit if condensate line becomes obstructed.

2.07 WALL MOUNTED UNIT

A. General: The wall-mounted indoor unit shall have a modulating linear expansion device and a flat front.

B. Indoor Unit

The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. All casings, regardless of model size, shall have the same white finish
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
3. There shall be a separate back plate which secures the unit firmly to the wall.

D. Fan:

1. The indoor fan shall be an assembly with one or two line-flow fan(s) direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.

6. Both refrigerant lines to the indoor units shall be insulated as specified in Section 15700. Note that Manufacturer furnished preinsulated piping is not allowed unless it meets the requirements specified in Section 15700.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz. Coordinate all power requirements at the site prior to ordering equipment.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)

H. Controls:

1. This unit shall use controls provided by the equipment manufacturer to perform functions necessary to operate the system.

2. The unit shall be able to control external backup heat.

3. The unit shall have a factory built in receiver for wireless remote control.

4. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

5. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

6. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

7. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

3.01 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE INDOOR UNIT

A. General

1. The 4 Way Ceiling Recessed Cassette shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. Provide units that fit into an integral 24x24 ceiling tile where available as specified in Paragraph 3.02 below.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

3. Branch ducting shall be allowed from cabinet.

4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

5. The grille vane angles shall be individually adjustable from the wired remote controller to customize the airflow pattern for the conditioned space.

C. Fan:
   1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
   3. The indoor fan shall consist of five (5) speed settings, Low, Mid1, Mid2, High and Auto.
   4. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.
   5. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
   6. The indoor unit shall have switches that can be set to provide optimum airflow based on ceiling height and number of outlets used.
   7. The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.
   8. The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.
   9. The grille shall have i-see sensor that will measure room temperature variations and adjust the airflow accordingly to evenly condition the space.
  10. The unit shall be provided with occupancy sensor to control space requirements in an unoccupied mode.

D. Filter:
   1. Return air shall be filtered by means of a long-life washable filter.

E. Coil:
   1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   2. The tubing shall have inner grooves for high efficiency heat exchange.
   3. All tube joints shall be brazed with phos-copper or silver alloy.
   4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.

6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan. Pump shall have minimum 5-year warranty.

7. Both refrigerant lines to the indoor units shall be insulated as specified in Section 15700.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz. Coordinate all power requirements at the site prior to ordering equipment.

2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls:

1. This unit shall use controls provided by the equipment manufacturer to perform functions necessary to operate the system.

2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

3.02 4-WAY CEILING-RECESSED CASSETTE WITH GRILLE INDOOR UNIT

A. General:

1. The 4-WAY CEILING-RECESSED CASSETTE shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be a compact 22-7/16” wide x 22-7/16” deep so it will fit within a standard 24” square suspended ceiling grid.

2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

C. Fan:
1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

D. Filter:
1. Return air shall be filtered by means of a long-life washable filter.

E. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
7. Both refrigerant lines to the indoor units shall be insulated in accordance with Section 15700.

F. Electrical:
1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz. Coordinate all power requirements at the site prior to ordering equipment.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

G. Controls:
1. This unit shall use controls provided by the equipment manufacturer to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.

4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

6. The unit shall be provided with occupancy sensor to control space requirements in an unoccupied mode.

PART 4 EXECUTION

4.01 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

4.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

E. Preconstruction meeting to be conducted with manufacturer's field representative to review system design and schedule future job site visits and/or construction meetings that shall precede date of startup.

4.03 FIELD QUALITY CONTROL

A. Provide manufacturer's field representative to inspect installation prior to startup.

B. Manufacturer's field representative must conduct job site visits and/or construction meetings before date of startup.

4.04 SYSTEM STARTUP

A. Provide manufacturer's field representative to assist with system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

D. Furnish system start-up report and include in Owner’s Operating Manuals.
4.05 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

4.06 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of one day of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

4.07 PROTECTION

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

C. Clean all filters prior to turning the facility over to the Owner.

END OF SECTION
SECTION 15720
PACKAGED PAD MOUNTED GAS FIRED, DX COOLING DEHUMIDIFICATION UNIT (DHU)

Part 1 - General

1. Scope

Specification Sections 15010 and 15700 are applicable in full.

Furnish and install where indicated, factory-assembled, enclosed swimming pool environmental control/energy recovery system. They shall be oriented as shown on Construction Documents.

Furnish and install, where indicated, a factory-assembled, fully-enclosed, packaged environmental control system with energy recovery feature(s) designed for natatorium environment control.

Features shall include:

A. Space heating by means of a packaged indirect-fired natural gas duct furnace module

B. Cooling mode with heat rejection to a packaged outdoor air-cooled fluid cooler (dry-cooler)

C. Packaged minimum exhaust fan and purge fan with economizer mode

D. Unit mounted minimum Exhaust Fan with airflow measuring stations and Purge/Economizer Fan

E. Integral minimum outdoor air connection

F. Integral purge outdoor air connection with economizer mode

G. Heat recovery by means of a glycol run-around loop between the minimum exhaust and minimum outdoor air streams

2. Quality and Safety Assurance

A. The complete unit shall be listed by an industry recognized, third-party, safety code agency under the title of "Special Purpose Air Conditioners" and carry the appropriate label.

B. The system shall be ETL listed

C. The system shall be completely assembled, wired, piped, and test-run at the factory prior to shipping. All controls shall be factory adjusted to satisfy the design conditions. A factory test report shall be available, upon request

D. Manufacturer shall have a minimum of five-plus years prior experience making similar equipment as described in this specification.
E. Wherever possible, the system shall have a mechanical vestibule where the electrical panel, compressor(s), pool water heat exchanger(s), receiver(s) and most of the refrigeration controls are out of the process air stream.

F. The system shall have a microprocessor controller with unit-mounted refrigerant pressure transducers on each refrigeration circuit, multiple temperature sensors and an Ethernet connection for factory logging and parameter adjustment via the Internet. The refrigerant pressure transducers shall be actively used for system control. The customer (or their authorized representative) shall be provided access to the online logging and parameter adjustment interface, upon request. Demonstration of these capabilities must be carried out at the engineer's office prior to bid day.

G. The system shall have Virtual Tech 24-7 remote computer logging capability with automated alarm notifications and system performance alerts transmitted via e-mail to authorized users, when connected to a network with Internet access.

H. Warranty: The entire system shall have a 24-month limited parts warranty from the factory ship date.

1. A 1-year labor warranty shall be provided by the manufacturer and shall be connected to the factory via Virtual Tech Internet monitoring system from the date of initial commissioning.

2. The compressor(s) shall have a 5-year warranty from the date of substantial completion as determined by the Architect.

3. The internal airside heat exchanger coils shall have a 10-year warranty from the date of substantial completion as determined by the Architect. Coils on Fluid Cooler shall also have 10-year warranty.

4. The manufacturer's warranty shall provide for the repair and/or replacement of the compressor(s) that become inoperative because of defects in material or workmanship. The warranty period shall begin on the same date as final acceptance of the installation and shall continue for the full product warranty period specified above. The warranty shall include refrigerant and all other costs associated with the compressor(s) shipment to the Contractor or Facility, compressor(s) replacement, installation and returning the unit to its proper operating condition. The Contractor shall respond within 36 hours upon notification that a compressor has failed under the terms of the warranty. "Respond" shall mean having a Manufacturer certified technician on site to evaluate the extent of the needed repairs and ordering of all items required for repair.

I. When connected to Virtual Tech with Internet access, the system shall have remote service capability with the ability for field service technicians to receive service and trouble alerts by e-mail and make parameter adjustments via a browser interface on any Internet-capable device.

J. Unit shall be provided with surge protection and phase protection to insure against voltage unbalance, over/under voltage, phase loss, reversal, incorrect sequencing and rapid short cycling.

K. The Contractor shall provide for a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment and
furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit performance including the range of the refrigerant hot gas reheat coil

3. **Intent**

   A. It is the intent of this section of the specifications to provide a complete, operable, adjusted natatorium dehumidification system as shown and scheduled on the plans.

4. **Basis of Design**

   A. Unit shall be PoolPak and PPK Series. Equivalent units by Addison or DesertAire will be considered. Alternate Manufacturers may be provided subject to the following conditions:

   1. Equivalent Manufacturers shall include revised layout including details on supply/return air connections, piping connections, ventilation/exhaust connections, power/control wiring connections.

   2. 7 days prior to Bid: Equivalent Unit shall include Full Compliance Disclosure (by paragraph) to be submitted to the Engineer and approved by the Engineer in writing prior to the bid. Full Disclosure shall clearly list and define any exceptions or deviations to the specified equipment and specified performance, and any items, which exceed the specifications. Equivalent Manufacturer shall include a full disclosure of the unit’s energy recovery features including unit’s reheat capabilities and recovery of pool water evaporation energy.

   3. Where the intent of the specification is met but with different construction materials or methods, the difference shall be completely defined by paragraph in the Full Disclosure. The Full Disclosure shall include complete documented data.

5. **Equivalent Manufacturer’s Checklist to be Furnished to the Engineer (Circle One)**

   1. YES NO N/A Service Vestibule with compressors out of the air stream

   2. YES NO N/A Refrigerant pressure transducers used for active control of the refrigeration system and no manifold gauges needed to service the equipment

   3. YES NO N/A Fully dipped airside coils for corrosion protection

   4. YES NO N/A Fully modulating reheat coil for stable space temperature control from the DX system. Coil sized for rejecting 100% of all compressors heat.

   5. YES NO N/A All fans direct drive with VFD or ECM

   6. YES NO N/A Each evaporator coil provided with a baked powder painted IAQ Aluminum drain pan
7. YES NO N/A Two speed fluid cooler or outdoor condenser fans

8. YES NO N/A Cabinet 2" double walled with fully painted inner metal liner

9. YES NO N/A Fluid cooled unit with Heat rejection outdoors via a fluid cooler

10. YES NO N/A Heat recovery from the minimum exhaust air stream used to directly preheat the incoming minimum outdoor air stream

11. YES NO N/A Web-based interface capable of live interface with unit from smart phone with logging/trending data for up to 20 variables in one minute intervals per 24-hour period for factory service instant access

12. YES NO N/A Unit controller holds memory of basic refrigerant system info for 2 years of hourly data and 5 days of one-minute interval data

13. YES NO N/A Standard Electro-Guard® Plus on all air side coils: corrosion resistance and hydrophilic (decreasing water carryover and increasing

14. YES NO N/A Indirect fired gas heater packaged inside the unit

Part 2 - Product

1. General

The natatorium control system shall include:

A. Mechanical process dehumidification

B. Outdoor cabinet configuration

C. Packaged outdoor air-cooled fluid cooler (dry cooler) for AC heat rejection

D. A packaged indirect-fired natural gas duct furnace module installed downstream of the blower, sized as specified by the design engineer to meet the skin losses and outdoor air heating loads

E. Purge and economizer modes

F. Minimum exhaust and purge exhaust fan(s) with economizer mode

G. Heat recovery between the minimum exhaust air and outdoor air streams by means of a glycol run-around loop

H. Heat recovery between the minimum exhaust air and outdoor air streams and via a glycol run around loop

I. Programmable microprocessor controller with Virtual Tech remote Internet logging and parameter adjustment

J. Remote operator panel(s)

K. A service vestibule where the compressor, refrigeration specialties, control valves and all electronics are outside of process air stream

L. Outside air measuring elements
2. **Sequence of Operation**

The system shall be designed and sized to maintain the specified space conditions

A. **System Startup**

1. Power is turned on or the system is restarted
2. After a short initial delay to allow the sensors to stabilize, the blower starts and operates continuously
3. Based on sensor feedback, the system shall begin or resume operation based on the sequence below

B. **Airside Configuration**

1. The system continuously delivers the specified supply air volume to the natatorium
2. The minimum exhaust air flow is actively controlled to meet the engineer's schedule.
3. The minimum outdoor air flow is actively controlled to meet the engineer's schedule.

C. **Dehumidification Mode**

1. Return air dewpoint is above dewpoint setpoint.
2. The compressor enters the Compressor Start sequence
3. If the system cannot maintain the relative humidity below setpoint, the second compressor circuit will start
4. Compressor waste heat is rejected into a glycol fluid loop which feeds the reheat coils and the air conditioning air-cooled heat exchanger in parallel.
5. The reheat coils are fully modulating (0-100%). The reheat output will modulate to maintain the space temperature at set point year-round

D. **Air Conditioning Mode**

1. The return air temperature is above the room temperature setpoint
2. The compressor starts, if not already operating in Dehumidification Mode
3. Excess compressor hot gas is diverted to a fluid-cooled heat exchanger. Up to 100% of compressor heat is rejected into the glycol fluid loop which is pumped outdoors to an outdoor air-cooled heat exchanger for 100% heat rejection at summer design ambient conditions
4. 100% of compressor heat is rejected at the outdoor air-cooled heat exchanger on a summer design day. On off-peak days, the air reheat output will modulate to maintain the space temperature at the set point

5. If the system cannot maintain the return air temperature setpoint, the second compressor will start

E. Space Heating Mode

1. The return air temperature is below the room temperature setpoint

2. The microprocessor space heating output signal (0-10 volts) is sent to the heating coil controller. The signal output will regulate based on the return air temperature

F. Exhaust Air Heat Recovery Mode

1. The minimum outdoor air damper and minimum exhaust fan(s) are tied to the system's occupancy schedule and will operate as programmed

2. Once the outdoor air temperature falls below the heat recovery setpoint (65 °F by default; field-adjustable) the glycol pump shall circulate a glycol mixture between the exhaust air and the outdoor air heat recovery coils, recovering heat from the space condition exhaust air and using it to preheat the incoming outside air

G. Purge Mode

1. This mode is manually triggered by an operator when super-chlorinating the pool. It can be triggered at the unit-mounted or optional remote operator panel(s), through the online Virtual-Tech interface or by the BACnet controller

2. Purge Mode has an adjustable timed duration after which the system automatically resumes normal operation

3. Once triggered by the operator:
   a. The compressor(s), if operating, pump down and cycle off
   b. A signal from the microprocessor sets the exhaust fan(s) to their maximum CFM
   c. The unit-mounted outdoor air dampers open fully and the return air dampers close
   d. The system stays in 100% outdoor air ventilation mode
   e. After the timed period expires, all dampers and fans return to normal operating settings and the system resumes normal operation
   f. During Purge Mode, the system will control heating based on supply air temperature

H. Economizer Cooling Mode
1. The return air temperature is above the room temperature setpoint
2. The microprocessor will compare the temperature of the outside air with the cooling setpoint
3. When outside air is deemed suitable by the microprocessor, it will be used as the first stage of sensible cooling
4. When outside air as determined to be suitable by the microprocessor, it will be used as the first source of cooling.
5. The system will switch over to using the compressor(s) if outside air conditions cannot satisfy the space cooling demand

I. Economizer Dehumidification Mode
1. The return air relative humidity is above humidity setpoint
2. The microprocessor will compare the moisture content of the outside air to the dehumidification setpoint
3. When the outside air is deemed suitable by the microprocessor, it will be used as the first stage of dehumidification
4. When outside air as determined to be suitable by the microprocessor, it will be used as the first source of cooling.
5. The system will switch over to using the compressor(s) if outside air conditions cannot satisfy the space humidity demand.

J. Freeze Protection
1. The supply air temperature falls below the freezestat setpoint or the optional freezestat sensor indicates a freezestat condition
2. Exhaust fan(s) are stopped, and outdoor air damper(s) are fully closed
3. When the freezestat alarm is tripped, it must be manually cleared by the operator

3. Cabinet
A. The cabinet shall be designed and configured for outdoor installation with a 2\" double walled cabinet
1. Infill panels and doors shall be constructed with 18 gauge G90 galvanized steel exterior and 18 gauge mil aluminum finish interior suitable for chlorine and pool chemical resistance.
2. The structural base frame shall be 3/16\" steel channel base with 12-gauge steel cross bracing.

B. Cabinet Construction: All cabinet 16, 20 and 24 gauge sheet metal shall be galvanized G90 steel or Galvalume\textsuperscript{TM} alloy with mill-applied zinc phosphate primer followed by an exterior grade white silicone modified polyester top coat. The sheet metal is engineered to form a cabinet with maximum strength and
rigidity. All seams shall be caulked with silicone to prevent air and water leakage or infiltration

1. **Base Rails:** The cabinet shall have a base frame comprised of 2 layers of 10 gauge mill galvanized G90 steel. Lifting lugs shall be provided on the base frame for rigging the system.

2. The cabinet walls shall be of double-wall construction using 20 gauge pre-painted steel with a fully painted inner metal liner and 2 inches of fiberglass insulation.

3. The cabinet floor shall be comprised of a 16-gauge galvanized steel panel with a 20-gauge pre-painted steel inner liner, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base frame of the unit.

4. The cabinet roof shall be 20-gauge pre-painted steel, 2-inch double wall engineered with structural bending for maximum rigidity and be mechanically fastened to the base walls of the unit.

5. The cabinets shall be mechanically assembled with stainless steel 5/32” sealed blind rivets. Where bolts are required bright zinc plated bolts shall be used.

6. Access doors shall be supported on multiple hinges, held shut by compression latches for quick access. Doors shall be provided for entrance to all sections housing components requiring routine maintenance. Full height access doors shall have "hold back" latches to prevent door closure during the performance of service procedures.

7. Access doors shall be mounted on multiple combination hinge/latch mechanisms which swing either direction 180 degrees and lifts off. Doors shall be provided for entrance to all sections housing components requiring routine maintenance. Doors shall be secured with minimum two tool-operated latches and sealed against the frame with rubber gasket material.

8. The unit shall have non-corroding protective mesh screens on all air intake openings.

9. The system shall have non-corroding protective mesh screens covering internal fan blades, protective grates covering all floor access ports.

C. **Outdoor Air Intake:**

1. Purge /Economizer and Minimum Outdoor Air connections with motorized dampers and controls.

2. Minimum outdoor air intake with airflow sensing elements.

D. **Insulation:** The unit shall be insulated per the following standards:

1. All exterior cabinet sections shall be insulated with two (2) inch thick fiberglass inside the double walled cabinet.

2. Fire resistant rating to conform to NFPA Standard 90A and 90B.
3. Sound attenuation coefficient shall not be less than 1.02 at a frequency of 1,000 Hz as per ASTM Standard C423
4. Thermal conductivity shall not exceed 0.26 Btu/hr-sqft-ft at 75°F

E. Cabinet configuration shall include:
   1. A filter rack with separate access doors shall be provided for the return air and minimum outdoor air streams
   2. Unit shall be equipped with a second outdoor air intake assembly with motorized 2 position extruded aluminum, Insulated, silicone side-sealed damper for Purge and Economizer operation
   3. Mechanical vestibule: The unit shall have the compressor, receiver, solenoid valves and the electrical panel in a separate compartment out of the processed air stream. All components shall be serviceable while the unit is in operation without disturbing the airflow
   4. Electrical panel: The unit shall have a built-in electrical control panel in a separate compartment in order not to disturb the airflow within the dehumidifier during electrical servicing. All electrical components shall be mounted on a 16 gauge galvanized sub-panel
   5. Supply Air: 2-inch MERV 8, 30% pleated filters with rust-free non-metallic structure on face loading rack.

4. Filters

Wherever possible, air filters shall be standard sized, replaceable, off-the-shelf filters including:

A. Exhaust Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure
   1. Exhaust Air: 2-inch MERV 8, 30% pleated filters with rust-free non-metallic structure.

B. Outside Air: 2-Inch MERV 8, 30% pleated filters with rust-free non-metallic structure
   1. Outside Air: Washable, aluminum media type with aluminum U-channel frame wrapped around the perimeter of crimped layers of aluminum media. The frame is designed with drain holes to ensure removal of excess water.

5. Coils

A. Evaporator/dehumidifier coils shall be designed for maximum moisture removal capacity
   1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases
2. Coil shall have galvanized casing and end plates

3. Aluminum fin and copper tubes mechanically bonded to assure high heat transfer.

B. Air reheat coils shall be sized for variable heat transfer into the air with a capacity of 100% of the compressors total required heat of rejection

1. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases

2. Coil shall have galvanized casing and end plates

3. Aluminum fin and copper tube joints mechanically bonded to assure high heat transfer

C. Coils shall have an 8-year warranty extension for a total of 10 years coverage

D. Heat Recovery Coils

1. The unit shall have heat recovery between the minimum exhaust and outdoor air streams per specifications
   a. The heat recovery coils shall be sized for heat transfer between the two air streams
   b. The heat recovery fluid circulating between coils shall be glycol. The module shall be a complete package and independent circuit that includes a circulating pump, fill valves and expansion tank

2. Coils shall be fully dipped and coated with a polyester/enamel coating for maximum corrosion protection. Coating shall comply with ASTM B117/D1654 and ASTM D2126 for corrosion resistance against common acids, salt and gases

3. Aluminum fin and copper tube joints mechanically bonded to assure high heat transfer

6. Drain Pans

Each evaporator coil shall be provided with a positive draining, compound-sloped, baked powder paint coated aluminum drain pan with fully-welded corners to ensure zero water retention

7. Blowers and Blower Motors (With Factory Mounted VFD’s)

A. Supply blowers:

1. The complete blower assembly shall be statically and dynamically balanced on precision electronic balancers

2. The blower assembly shall be mounted on a 1” deflection spring isolated rack
3. The fan inlets shall be equipped with accidental contact protection screen

4. Motor(s) shall be Premium efficiency painted cast iron construction TEFC, NEMA MG1-PART 31 Inverter Duty 15:1 Constant Torque Severe Duty with a service factor 1.25. Motors shall be 6 Pole 1200 RPM synchronous speed with HOA switch with motor safeties against overloading at 60 Hz operation directly on mains. Motors shall have double lip seals on both ends with re-greaseable bearings 254T frame and larger with Polyurea grease

B. Exhaust blowers:

1. The packaged exhaust blower (EF1) shall be sized to maintain the negative pressure requirement in the space during normal operation and its operation tied to the system's occupancy scheduler

2. The blower shall be impeller plenum fan complete with backward curved, three-dimensional, profiled blades made of high performance composite material. The blower shall be completely corrosion resistant and be maintenance free a direct drive via a direct current (DC) electronic commutated (EC) motor. The EC-Motor shall have zero slippage design and have continuously variable speed control when connected to the unit's controller

3. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels

4. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C

5. Thermal contacts installed in the windings compliant with THCL 155

6. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection

7. High corrosion resistance design with high quality and reliability

8. The exhaust fan shall be controlled from an end switch on the power open of the exhaust air damper. The exhaust dampers shall be protected by louvers to divert rain from the face of the dampers

9. Shall be packaged with the heat recovery module

10. The exhaust fan assembly shall include airflow measuring stations

C. Purge blowers:

1. The ventilation/economizer/purge exhaust blower (PEA) shall be unit mounted and sized to provide full exhaust from the space when operating with EF1

2. The fan shall be direct driven axial fan made of high-strength composite material in which the motor and controller are integrated. It includes FE2owlet blades combined with guide vanes and EC commutated direct-current external rotor motors provides maximum efficiency the quietest
performance. The EC motor shall have maintenance-free electronic circuitry, a rotor with permanent magnets, and an integral controller to provide the windings with electrical current so that, the motor rotates continuously and quietly. The fan is aerodynamically-optimized, sickle-blade profile, patterned with serrated trailing edge and winglets on the blade outer edge for energy and noise-optimized operation

3. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels

4. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C

5. Thermal contacts installed in the windings compliant with THCL 155

6. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection

7. High corrosion resistance design with high quality and reliability

8. The exhaust fan shall be controlled from an end switch on the power open and spring return outside air damper. The gravity exhaust dampers shall be protected by louvers to divert rain from the face of the dampers

8. Dampers

Internal dampers shall be made from extruded anodized aluminum with a parallel blade configuration and neoprene double-seal tips to minimize leakage. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant

A. The system shall be provided with normally closed outside air and exhaust air dampers equipped with spring-return actuators. The dampers adjust between 0% to 100% open position.

B. The outdoor air and exhaust air dampers shall be of opposed blade configuration. Dampers shall have 0.750-inch insulated blades made from extruded anodized aluminum with neoprene double-seal tips to minimize leakage. Damper leakage shall be less than 1% of maximum flow at 4-inch water column differential. Damper blades shall be mounted on steel rods which rotate on nylon bushings. All damper hardware shall be corrosion resistant

9. Minimum Outside Airflow Measuring Elements

A. The outside air shall be monitored via factory installed air monitoring stations.

B. Stations shall not require periodic calibration or maintenance.

C. Airflow monitor measurement accuracy shall be plus or minus, 2% of reading.

D. Monitors shall be constructed of anodized rods and mounting blocks shall be 304 stainless steel.

E. Shall be permanently mounted within the unit.

F. Self-purging and self-draining counter flow design
G. Water circuit piping shall consist of transparent braided PVC hose

H. Terminating connections are PVC schedule 40 NPT fittings located at the cabinet wall for easy connection

I. The maximum loop operating pressure is 60 psig

10. Compressors

A. Hermetic, scroll action compressor, suction gas cooled, suitable for refrigerant R-410A

B. The compressor(s) shall be mounted on rubber-in-shear isolators to limit the transmission of noise and vibration

C. The compressor(s) shall be equipped with removable crankcase heater(s) for liquid migration protection

D. The compressor(s) shall be located outside the conditioned air stream in the system's service vestibule

E. Compressors shall have a 3-year warranty extension for a total of 5 years coverage

F. The compressor manufacturer must have a wholesale outlet for replacement parts in the nearest major city

11. Refrigeration Circuit

A. The system shall consist of two factory sealed refrigeration circuits for dehumidification and sensible cooling. No site refrigeration work shall be required

B. Each refrigeration circuit shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need for service manifold gauges

C. All refrigeration circuits shall have solenoid control valves, check valves, a liquid line filter-drier, liquid and moisture indicator, thermostatic expansion valve and a pump down solenoid valve

D. The system shall have an externally adjustable balanced port design mechanical thermostatic expansion valve. The valve shall have a removable power head

E. Tamper proof, hermetically sealed non-adjustable high and low pressure switches and refrigeration service valves shall be installed using Schrader type valves. Refrigeration service valves shall be located outside of the airstream

F. The receiver shall have two refrigerant level (maximum and minimum) indicating sight glasses

G. The suction line shall be fully insulated with 0.500-inch closed cell insulation
12. Control Panel

A. The electrical contractor shall be responsible for external power wiring and disconnect switch fusing. Power block terminals shall be provided.

B. The system shall include a factory-installed non-fused disconnect.

C. Shall be mounted inside the service vestibule outside of the process air stream.

D. Blower motors shall be protected with thermal trip overloads.

E. The system shall have a voltage monitor with phase protection.

F. Available dry contacts shall include:
   1. Alarm
   2. Blower interlock
   3. Stage 1 & 2 heating
   4. Outdoor air damper control
   5. Remote exhaust fan #1
   6. Remote exhaust fan #2
   7. Outdoor-air cooled equipment
   8. System on
   9. Heat recovery

G. Terminals shall be provided to send 24-volt power to the outdoor air cooled condenser or fluid cooler fan contactor.

H. All wiring shall be installed in accordance with UL or CSA safety electrical code regulations and shall be in accordance with the NFPA. All components used in the system shall be UL or CSA listed.

I. Wiring diagrams shall be located near the electrical panel(s) on the system. These diagrams shall provide colour-coding and wire numbering for easy troubleshooting. All wires shall be contained in a wire duct.

J. The compressor(s) shall have a time delay on start to prevent short cycling.

K. Pressure transducers for measuring refrigerant discharge (high) pressure and suction (low) pressure shall be provided.

L. An airflow switch and a dry contact for alarm(s) shall be provided.

M. Controls supporting airflow measurement shall be provided.
13. Microprocessor Control

A. A microprocessor controller with the following characteristics will be provided:

1. All set points and parameter adjustments are pre-programmed at the factory during quality control testing

2. The microprocessor program shall be stored on updatable FLASH memory

3. A minimum of 11 analogue inputs, 4 analogue outputs, 24 digital inputs and 16 digital outputs

4. Four serial interface ports including both RS232 and RS485 types

5. An Ethernet port with RJ-45 connector and LED activity indicator

6. A real time clock to time-stamp the system operation log and to enable a programmable 7-day occupation schedule

7. Two manual demand forced modes to allow the user to manually bypass the microprocessor in the event of controller failure

8. The local and remote operator panel(s) shall have a backlit graphic liquid crystal display with touch controls

B. The system shall have pressure transducers monitoring the refrigerant discharge (high) and suction (low) pressures. The refrigeration circuit shall be accessible for diagnostics, adjustment and servicing without the need of service manifold gauges.

C. The following status LEDs shall be on the controller:

1. Alarm - indicates there has been a failure requiring service.

2. Dehumidification - indicates that the system is dehumidifying the space.

3. Cooling - indicates that the air-conditioning mode.

4. Space Heat - indicates that the space heating is operating.

5. Maintenance - indicates whether maintenance is required.

6. Manual - indicates that the system has been set to manual operation.

D. The following set points shall be accessible and adjustable from the operator panel:

1. Space temperature

2. Space relative humidity

3. Supply Airflow

4. Min Outside Air %

5. Space Pressure %
E. The following sensors shall be unit-mounted and monitored at the operator panel. All information from these items shall be actively used in the system control and operation strategies:

1. Refrigerant high pressure
2. Refrigerant low pressure
3. Return air temperature
4. Supply air temperature
5. Return air relative humidity
6. Evaporator leaving air temperature
7. Suction temperature
8. Discharge temperature
9. Supply Airflow
10. Min Outside Airflow
11. Min Exhaust Airflow

F. System Fault: Shall indicate via text message to the display what systems require attention or servicing. Built-in monitoring and diagnostics shall allow the user to view the following:

1. Power failure
2. Dirty air filter
3. Refrigerant high and low pressure
4. System off
5. Anti-short cycle delay

14. Air Heating

The packaged indirect-fired natural gas duct furnace module shall be sized to meet the scheduled heating capacity and have the following characteristics:

A. Modulating (0-10V) auxiliary air heat control

B. The duct furnace module shall be a natural gas indirect-fired type using spark ignition with a heating capacity as shown in this submittal and is installed in a 'blow through' configuration downstream from the blower. The heat exchanger tubes are constructed of formed and welded 16-gauge series 409 stainless steel suitable for installation downstream of the cooling coil and satisfactory for air inlet temperatures below 40 °F. The burner is the power firing type and incorporates a primary combustion air blower and spark ignition transformer
C. The duct furnace module shall be a propane gas indirect-fired type using spark ignition with a heating capacity as shown in this submittal and is installed in a 'blow through' configuration downstream from the blower. The heat exchanger tubes are constructed of formed and welded 16-gauge series 409 stainless steel suitable for installation downstream of the cooling coil and satisfactory for air inlet temperatures below 40 °F. The burner is the power firing type and incorporates a primary combustion air blower and spark ignition transformer

D. Standard controls shall include a modulating gas valve, intermittent spark ignition, overheat control, rollout flame supervision, combustion air flow proving switch, positive burner safety switch, pilot cock, main gas cock with 100% shut off, adjustable main and pilot pressure regulators

E. The natural gas duct furnace module shall be an ETL recognized component. The gas train shall be complete with all controls factory mounted to comply with requirements of ETL. The gas train is complete with a modulating main gas valve and is ready for connection to a natural gas supply with pressure between 7 in and 14 in WC

F. The liquid propane duct furnace module shall be an ETL recognized component. The gas train shall be complete with all controls factory mounted to comply with requirements of ETL. The gas train is complete with a modulating main gas valve and is ready for connection to a propane gas supply with pressure between 7 in and 14 in WC

G. The complete system shall be test-fired and preliminary adjustments made prior to leaving the factory

15. Air Conditioning

Air-cooled air conditioning via a fluid cooler

A. The system shall be equipped with an air conditioning mode where excess compressor heat is rejected to a factory packaged integral outdoor air-cooled heat exchanger (aka Dry Cooler) via a single glycol fluid loop. No site refrigeration work shall be required. The packaged fluid cooled condenser and outdoor air-cooled heat exchanger shall both be capable of rejecting 100% of the compressor heat rejection with an air on temperature at summer design conditions

B. The system shall be provided with a dry contact rated for 24VAC/5A to operate the remote outdoor fluid cooler control

C. Each refrigeration circuit shall include refrigerant valves, a receiver with pressure relief valve set at 650 psig, a pressure control valve and a pressure differential valve, and two manual shutoff valves to isolate the outdoor fluid cooler

D. Coils shall be tested at 425 PSIG and mounted vertically for complete surface utilization. Coils shall be counter flow and have adequate capacity to dissipate the total heat rejection of the system at design conditions

E. The fan(s) shall be direct driven axial fan(s) with dual speed external rotor motor(s) and innovative bionic blades in die-cast aluminum moulds
1. The fan assembly shall be balanced in Class G 6.3 acc DIN ISO 1940, dynamic on two levels

2. The fan assembly shall be suitable for ambient temperatures of -40°C to max. +70°C

3. Thermal contacts installed in the windings compliant with THCL 155

4. Drive motor in external rotor principle, sealed in protection class IP54 with moisture protection impregnation of the windings, topical protection

5. High corrosion resistance design with high quality and reliability

16. Factory Performance Testing

A. The system shall be thoroughly tested under factory test conditions. A copy of the original test report shall be provided with the Owner’s Operating and Maintenance Manual

B. Microprocessor controls shall be factory adjusted and pre-set to the design conditions during testing

Part 3 - Execution

1. Product Delivery, Acceptance, Storage and Handling

A. Perform a thorough physical inspection of the system upon delivery from the shipment carrier

B. Identify and immediately report any physical damage to manufacturer

C. If the system is to be stored prior to installation, store in a clean, dry place protected from weather, dirt, fumes, water, construction and physical damage

D. Handle the system carefully during installation to prevent damage

E. Damaged systems or components shall not be installed. Contact the manufacturer for RMA instructions

F. Comply with the manufacturer's rigging and installation instructions for unloading the system and moving it into position

2. Connections

A. Where installing piping adjacent to the system, allow space for service and maintenance

B. Duct connections: drawings indicate the general arrangements of the ducts. Connect the system to ducts with flexible duct connectors. Comply with code requirements for flexible duct connectors

C. Electrical connections: comply with code requirements for power wiring, switches and motor controls in electrical sections
D. Unit shall be provided with factory installed single point power connection. Any deviation from this requirement shall be coordinated with the Electrical Contractor and Electrical Engineer prior to bid. No changeorder will be allowed for any additional connections or changes required that differ from those indicated on the electrical plans.

E. Coordinate all power requirements with the electrical engineer and electrical contractor prior to ordering equipment.

3. **Installation**

   The agency responsible for start-up should work in accordance with the specifications and in accordance with the manufacturer's instructions and only by workers experienced in this type of work.

4. **Start Up**

   A. Detailed instructions for startup as provided by the manufacturer must be followed.

   B. Installing contractor must contact the manufacturer prior to start up to confirm start up procedures and must schedule Factory Assisted Start Up at least 2 weeks prior to start up request date.

   C. Virtual Tech Remote Internet access and control shall be initiated and confirmed by the factory prior at start up for 1 yr. extended labor warranty to be in effect.

   D. The Contractor shall provide for a factory-trained technician, employed by the unit manufacturer and not a sales representative, to check out all equipment and furnish written report indicating equipment is installed in strict accordance with manufacturer's recommendations. Also, provide temperature, pressure and amp readings taken during testing to substantiate unit.

END OF SECTION
SECTION 131110 – SWIMMING POOL TIMING SYSTEM  (Revised 7.10.19)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Electronic timing and scoreboard system with multi-sport capability used for practice pacing and instruction, competitive swimming events, diving, water polo, and synchronized swimming.

B. Starting system integrated with electronic timing, relay judging platforms, and scoreboard system.

C. All in-deck plates shall be furnished and installed by Other.

D. All in-deck junction boxes, power, data boxes, wall boxes, and conduit shall be furnished and installed under the work of Division 16 - Electrical.

1.02 RELATED SECTIONS

A. Division 16 - Electrical.

1.03 ACCEPTABLE MANUFACTURERS

A. Colorado Time Systems, Inc., 1551 E 11th St., Loveland, CO 80537, 800.279.0111

B. Equivalent per specifications.

1.04 SUBMITTALS

A. Submittals shall include the following:

   1. Product data.
   2. Shop drawings detailing scoreboard, conduit, and junction boxes.
   3. Operations and maintenance manuals.
   4. Warranty information.

1.05 JOB CONDITIONS

A. Manufacturers proposing to submit a quotation for the electronic timing and scoreboard system must confirm that all embedded items are compatible with the installation of their respective systems. Proposed system must integrate with existing Colorado Time Systems’ equipment when present.

B. Manufacturers shall review the construction documents and shall notify the architect 10 (ten) days prior to the bid date of conflicts or additions to the work of other subcontractors for the proper installation of their system.
1.06 WARRANTIES

A. Contractor shall warrant the completed installation of all systems in this section for one year.
B. Manufacturer shall warrant the display board and deck plates for 3 years, computer console, touchpads, and starting system for 2 years.
C. Timing Company must supply first meet support to be scheduled with Colorado Time Systems and the End User.

PART 2 - PRODUCTS

2.03 CHAMPIONSHIP START SYSTEM - STANDARD (SS) QTY (1)

A. A single cable from wall plate to start system shall carry signal for driving up to 12 individual block speakers, 12 individual Colorado Time Systems' Relay Judging Platforms with Speedlights, external strobe(s), and external speaker(s).
B. System shall use wired microphones and shall have a volume control on each microphone input.
C. Start system shall have a sturdy, all metal, non-corrosive enclosure, legs and tripod mount (TR-3) Qty (1)
D. System shall have external connections for additional strobe light(s), speaker output, start output, and Speedlights.
E. System shall run from external 12-volt/AC power adapter and have two (2) internal Gel cell batteries. The internal batteries will automatically be recharged while the start system is plugged in to the external power supply.
F. There will be an LED warning light on the system showing when the internal batteries are starting to get low on power.
H. Start system must be compatible with underwater speaker system (SP-UND).
I. Provide (1) SJ-25 Start Jumper Cable.

2.05 AUXILIARY SPEAKERS - SP-125 (1)

A. Auxiliary speakers shall be 40-watt 8ohm. Auxiliary speakers’ output level shall be fully adjustable.

2.06 TIMING SYSTEM (GEN7 SWIM TIMER) QTY (1)
A. Timer shall be a standalone unit with physical connections to timing inputs. Timer shall be controlled by user interface device (computer or tablet) via USB or network.

B. Timer interface (computer or tablet) shall be supplied with all necessary software to time and score swimming in compliance with the appropriate sanctioning body(ies): FINA, NCAA, YMCA, USA Swimming, and National Federation of High Schools.

C. Timer shall accept inputs for up to 12 lanes for a parallel wiring installation.

D. Timer shall time to a user-selectable resolution from 1 second to .001 second. It shall take starts and finishes from the near end and/or far end of the pool. It shall accept inputs from the start system, touchpads, up to three manual backup times per lane, and relay judging platforms.

E. Timer shall run off of a 12 Volt power supply connected to a standard 110/240 VAC outlet and will automatically switch to (and display on screen of connected interface device) internal battery source power, in case of line power failure without affecting the continuity and accuracy of the timing system.

F. Timer shall interface to single- and multi-line scoreboard and shall post immediate results to scoreboard in "Lane" or "Place" order (user selectable). The timer shall also have the capability to pull race results from memory and post those results to the scoreboard in "Lane" or "Place" order (user selectable).

G. Timer shall be capable of communicating wirelessly with wireless scoreboards (2.4GHz) using ZigBee wireless communication.

H. Timer to include internal clock calendar with self-sustaining battery to time/date stamp all results.

I. Timer shall meet acceptable safety standards. Shall be ETL approved, or equivalent.

J. User interface shall display complete race status. The interface shall be capable of functioning as a miniature scoreboard displaying information simultaneously for all active lanes including lane number, current length in race or final place, split or finish time, relay judging status indicator, and backup time and backup button status.

K. All race data, including near and far end splits, shall be stored to internal memory for later recall to facilitate meet management connectivity and printing. Printed reports shall include cumulative and subtractive splits as well as relay judging times (when required).

L. Backup timing provides backup time via push button provided on a per lane basis should swimmer fail to trigger touchpad or touchpad fails to register. Timer to be capable of accepting up to three backup button times per lane.

M. Meet memory shall be capable of being transferred to external storage (via USB) or cloud data backup services (i.e. DropBox, Google Drive, etc.).
N. Relay judging automatically compares the touchpad hit of an incoming swimmer with the starting swimmer's time of departure from the optional relay judging platform. Results display both "plus" and "minus" takeoff times and can be printed and stored in race memory.

O. Timer shall communicate with meet management peripheral software on a two-way "handshake" basis, enabling the meet manager's resident computer to query the timer's memory via the USB port or via the network at any time for any race results.

P. The system's Automatic Event Sequencer shall be capable of holding both standard and user defined event sequences. The event order will be able to be downloaded from meet management software. The desired order is user selectable. EVENT SEQUENCES with appropriate race distance and race description for high school, college meets, and two "User Defined" meets to permit construction of custom meets. USA Swimming, YMCA, and FINA. When recalled from memory, race distance and descriptions are automatically selected for the operator.

Q. Timer shall automatically flag timing discrepancies (in the user interface, on the results printouts, and in stored memory) greater than .30 seconds between touchpad and backup times.

R. Timer shall have touchpad delay feature with ability to program delays from 1 to 99 seconds.

S. The user interface software shall permit operation of essential functions including Lane Off/On, Finish Arm, Split Arm, and Print Results directly from the main screen to ensure speed and simplicity of operation during critical race times. The interface shall permit the operator to insert a backup time when required (edit) or to disqualify (DQ), automatically posting it to the scoreboard, and provide automatic re-ranking of results. Any corrections generated by the operation (edit or DQ) shall be clearly identified on the results printouts.

T. The user interface shall permit the operator to correct for an erroneous touch by adding/subtracting a touchpad hit to correct the lengths completed. The interface shall not permit the operator to finish a race in any lane; timers including such a function are unacceptable because they permit the possibility of cheating.

U. Timer shall include electronic beeper and LED signaling to indicate touchpad, backup button, and relay judging inputs. Timers which do not allow the user to configure (enable/disable) this feature are unacceptable.

V. Timer connectivity shall include:

1. USB (Type A) port for external storage.
2. USB (Type B) port for meet management connectivity.
3. USB (Type B) port for user interface computer connectivity.
4. Ethernet port for network connectivity.
5. WiFi (ZigBee) for wireless scoreboard connectivity.

6. Three (3) independent scoreboard output ports.

7. Redundant near and far end connections timing inputs (touchpads, backup button, relay judging platforms) for up to 12 lanes.

8. Start system connection directly to timer.

9. External DC power port.

W. Timer shall be capable of updating internal software/firmware via Internet connection.

X. Timer software shall have the ability to adjust the intensity of LED scoreboard brightness.

Y. When recalled from memory, race distance and descriptions are automatically selected for the operator.

Z. Printouts shall be on a parallel printer connected to the rear panel of the timer. Printout of race results shall be switch selectable in "Lane" or "Place" order, or both. A single keystroke shall print touchpad and backup button times. Printout shall include race number, event/heat number, event description to facilitate meets, and time & date stamp for each race. The system will allow the user to select any of 8 different data to be printed. Printout of relay judging to include both "plus" and "minus" takeoff times for each leg of the relay.

AQUAGRIP TOUCHPADS

2.07 AQUAGRIP TOUCHPADS (TP-78G)

A. Touchpads shall be 78 inches wide x 22 inches tall x .3 inches thick. Provide (9) touchpads.

B. Touchpads shall be integrated to the timing system using in-deck wiring to a wall plate connection.

C. Touchpads shall be constructed of an all-plastic exterior with only the electrical connector metal exposed. Stainless steel will not be acceptable in pool environment.

D. Touchpads shall have a uniform fine grit, non-abrasive surface that prevents swimmer slippage in any direction.

E. Touchpad markings shall have contrasting colors with a 2" black border and black end-wall cross pattern for portion covered by touchpads.

F. Touchpad brackets shall be custom made to fit the pool gutter system. Diagram required upon placement of order.
G. Touchpad caddy for storing touchpads supplied shall be (1) CAD-TP/P.

H. CH41-8 (2) Eight Lane Cable Harness for near end and far end, CHE-41P-75(1) FOR Extension cable to far end, TPMD and VP-2.

I. Provide (25) PB-6 push buttons, (8) for backup timing with pads, (16) for far end button only timing and (1) spare

2.09 THREE JUDGE DIVING SCORING SYSTEM

A. Diving Scoring System shall utilize scoreboard to display diving scores and results without modification from swimming configuration.

B. Diving Scoring System Software shall:

   a. Diving Scoring System Software shall support standard and synchronized scoring.
   b. Accept three judges’ input scores and compute award based upon proper formulas for three judges. Software shall be operable with either remote judges’ terminals or manual input of flash card scores.
   c. System must be expandable to use up to eleven judges scoring terminals.
   d. Permit display of the lead diver number, current diver number, dive number, degree of difficulty, judges’ scores and diver’s calculated award and total score.
   e. Permit entry of all diving data into non-volatile memory for storage or receive data from meet management computer without additional modifications. Data shall include diver number, round number, dive number, and position. Degree of difficulty shall be automatically calculated based upon dive number per current FINA/USD/NCAA/High School regulations. Dive degree of difficulty can also be manually input.
   f. Automatically recall the diver with round number, dive number and DD using minimal keystrokes. Systems which require live entry of dive information are unacceptable.
   g. Permit storage of diver’s point totals and provide ranking of the divers at the end of each round.
   h. Permit editing of judges’ scores if required by meet officials.
   i. Provide an output for computer data handling of diving events.
   j. Permit two point deduction from the judges’ scores and zero points for a failed dive. Such changes shall be clearly shown on the printout.
   k. Printout shall provide preliminary data, diver ranking by rounds, and results of individual dives with judges’ scores.
   l. Judges’ terminals shall be housed in sealed, water-resistant, shockproof housing.
   m. The terminals shall provide a signal to inform the judge that the diving console has requested a score. Signal shall cease when an appropriate score is transmitted. They shall also allow each judge to input a score with a minimum of keystrokes, review that score via a...
BOAZ RECREATION CENTER  
Boaz, Alabama

built-in LCD display, and correct a score if needed before transmitting to the Judging Software.

n. The Software shall provide a switchable mode for sending data to the scoreboard display.
   A. Mode- Automatic- In this mode the software must send the judges scoring information to the display with no software operator interaction.
   B. Mode- Hold for Authorization – In this mode the software must receive authorization from a referee terminal or an assistant referee terminal prior to sending the scoring data to the display.

C. Remote judging terminal and interface shall be as follows:
   a. Interface hub shall plug into the PC via USB 2.0 or greater
   b. Judges terminals shall include a quick release mating connector for connection to the Diving Cable Breakout Box.
   c. Judges’ terminals shall include rugged communications cable to connect to the diving interface box. Cable should be removable for easy cost effective replacement of the cable.
   d. Judges’ terminals shall utilize sealed keyboards with a 128x64 Pixel Backlit LCD display suitable for indoor and sunlight readability.
   e. Judges terminal LCD must be capable of displaying Divers Name.
   f. Judges terminal LCD must be capable of displaying Divers Team or Country Name.
   g. Judges terminal LCD must be capable of displaying scores of other judges once the scores have been accepted.
   h. Judges terminal LCD must be capable of displaying Dive and Dive Degree of Difficulty
   i. Judges terminal LCD must be capable of displaying the Terminal Number so they can be easily identified to the judge
   j. Judges terminals shall include a request change button to notify the software that the judges input is requesting permission to correct the submitted score.
   k. Judges terminals must be able to be assigned as a Referee’s terminal or Assistant Referee’s terminal allowing the device to control when the judging data is transmitted to the scoreboard display.
   l. Provide three Judging Terminals (JT-01) with associated cables. Provide one interface hub box (IH-01) with associated cables. Provide one cable breakout box (CB-01) with associated cables

2.12 GEN7 PACE CLOCK PROGRAM

A. Accessory software program shall turn multi-sport computer and multi-sport scoreboard into an effective training system and coaching tool.

B. Interface to HYTEK’s "Workout Manager" software with direct download to computer timer.

C. Programmable workouts are saved into memory for up to 80 workouts.

D. Workouts display on multi-line scoreboard by lane.
E. START/STOP all lanes with one keystroke, or individually.

F. Include programmable "fudge factor" for coaches' election.

2.13 WIRELESS PACE CLOCK PRO (PCW-PRO)

A. Provide (2) portable pace clocks with (4) 10" LED digits (red or amber).

B. Unit with digits less than 10" will not be accepted due to inadequate viewing distance.

C. Pace clock shall have a minimum of 15 LED intensity settings, and the capability to adjust the LED intensity using a System 6 console or via the control panel.

D. Wireless pace clock shall have a minimum of 8 channels of wireless communication in the 900MHz or 2.4GHz spectrum, with a minimum indoor line of sight communication range of 500 ft.

E. Wireless pace clocks shall have the capability to be set up as "master" or "slave."

F. Wireless pace clock set as "master" must re-transmit pace clock data to "slave" pace clocks set to receive data on the same frequency.

G. Pace Clock Pro electronic training device shall be provided, enabling swimmers to perfect their starts, relay exchanges, and turn speeds.

H. Pace clock shall have the capability of being programmed by a handheld console for pacing functions. Additionally, it shall be capable of being programmed with the timing console.

F. Pace clock shall operate on AC power or two internal rechargeable 12 volt Gel cell batteries. The internal battery will automatically be recharged while the clock is plugged in to the external power supply.

G. Pace clock shall have a battery life of 6 hours/internal rechargeable battery.

H. Pace clock shall have the capability of being located anywhere on the deck, mounted on a wall, or recessed within a wall.

I. Pace clock shall have 5 ports to operate in conjunction with the following Colorado Time Systems equipment: push button(s), relay judging platforms, start system, and two touchpads.

J. Pace clock shall be capable of performing 15 training modes: (additional equipment may be required for some functions)

1. Lap counter
2. Simple pace clock
3. Pace clock with cumulative splits
4. Pace clock with lap splits
5. Relay exchanges
6. Start reaction
7. Turn speed
8. Breakout time
9. Start reaction & breakout time
10. Five single-lane timing modes
11. Mid-race timing

2.14 SCOREBOARD SYSTEM (MS-0150) 8 LANE SWIMMING SCOREBOARD

A. Scoreboard shall use 5” LED digits. (Red)
B. Vinyl lettering shall be 3” for LANE/PLACE/TIME, EVENT/HEAT
C. Scoreboard can be used indoors or outdoors.
D. Display intensity shall be controlled by ambient light sensor.
E. Integrated 2.4 wireless to work with Dolphin Timing System or Gen 7 Legacy Timer
F. Wired units work off RS232
G. Power: 115VAC-230VAC 50/60Hz- 2Amps
H. Led colons-
I. Scoreboard shall display the following minimum requirements:
J. 1-8 Lines – Lane, Place and Time
K. 1 Line – Event and Heat
L. Scoreboard shall consist of single 5052-alloy aluminum chassis with internal digit brackets.
M. Scoreboard shall be for wall mount or attached to portable caddy.
N. Dimensions: 5’10” (H) x 4’(W) x4 ¼” (D)
O. Weight: 70LBS
P. Certifications: cETLus, FCC and Rohs Compliant
Q. Operating Temperature -41 to 131 degrees Fahrenheit

2.15 SCOREBOARD SYSTEM (MS-0165) DIVING SCOREBOARD

R. Scoreboard shall use 5” LED digits. (Red)
S. Vinyl lettering shall be 3” for Diving signage
T. Scoreboard can be used indoors or outdoors.
U. Display intensity shall be controlled by ambient light sensor.
V. Integrated 2.4 wireless to work with Dolphin Timing System or Gen 7 Legacy Timer
W. Wired units work off RS232
X. Power: 115VAC-230VAC 50/60Hz- 2Amps
Y. Led colons-
Z. Scoreboard shall display the following minimum requirements:
AA. Current diver, Total, DD, Dive, up to 7 judges score, round, award, lead diver, total
BB. Sponsor panel included
CC. Scoreboard shall consist of single 5052-alloy aluminum chassis with internal digit brackets.
DD. Scoreboard shall be for wall mount or attached to portable caddy.
EE. Dimensions: 5’10” (H) x 4’(W) x4 ¼”(D)
PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

A. Verify that all work by others, related to this section, is installed.

B. Carefully examine all of the construction documents that affect the work of this section.

C. Prior to starting work, notify the Architect and General Contractor of any defects requiring correction.

D. Protect other materials and installed work against damage while completing work in this section.

3.02 INSTALLATION

A. Furnish and install all custom cables, connectors, scoreboard mounting brackets, and fasteners.

B. Owner or contractor will provide lift and (2) laborers for mounting scoreboard and pulling cables.

C. Furnish and install equipment in accordance with the manufacturer drawings and instructions.

D. Provide scoreboard mounting, all timing system cable terminations, system checkout, and a local operator training at the time of installation. Training shall consist of one 4-hour session at time of installation.

E. Provide as-built drawings precisely locating all items.

F. Wiring and grounding shall be installed in strict accordance with the latest edition of the National Electric Code.

END OF SECTION 13156
SECTION 131120 – CONCRETE POOL DECK FINISHES

PART 1 - GENERAL

1.1 Section Includes

A. Surfacing of exterior concrete pavement.
B. Surfacing of interior concrete floors.

1.2 Related Sections

A. Section 033000 – Cast-in-Place Concrete.
B. Section 033000 – Architectural Concrete.
C. Section 321313 "Concrete Paving" for concrete pavement and walks

1.3 References

A. ANSI A118.4 – Specifications for Latex Portland Cement Mortar.

1.4 Submittals

A. Submit under provisions of Section 033000.
B. Product Data: Manufacturer’s data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer’s full range of available colors and patterns.
E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product color and patterns.

1.5 Quality Assurance

A. Manufacturer’s Qualifications.

B. Installer Qualifications.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by the Architect.
   2. Do not proceed with remaining work until workmanship, color and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.6 Delivery, Storage, and Handling

A. Properly label and identify all containers as Sundek materials.

B. Deliver and store all materials to prevent damage to product and containers.

C. Store all material in a clean, dry location where temperatures are maintained between 40 and 90 degrees, Fahrenheit.

D. Comply with manufacturer’s Material Safety Data Sheets (MSDS) for delivery, storage, and handling of products.

1.7 Project Conditions

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results.

B. Exterior Surfaces: Do not apply materials in wet weather.

PART 2 - PRODUCTS

2.1 Manufacturer

2.2 Classic Texture System

2.3 Acceptable Materials

A. Sundek Premix:
   1. Copolymer modified thin set cement coating to be used in conjunction with Sundek Additive, available in Tan, Grey, Red and White colors.

B. Sundek Primer/Additive:
   1. Vinyl acetate emulsion with 53% solids content.

C. Sundek Finish Coat:
   1. Water based acrylic color effect available in 16 standard colors or any customer color choice as a special order.

D. Sundek Clear Finish Coat:
   1. Water based Acrylic Clear coat with 20% solids.

E. No materials can be substituted other than those specified by Sundek Products, Incorporated.

2.4 Performance

A. Weighs lbs./ft @ (3/16”)……………………………………1.3 lbs.

B. Thickness (typical)………………………………………3/16”.

C. Bond Strength (ASTM C297)…………………………….469 psi.

D. Accelerated Aging (ASTM A756 D&E)………………….Unaffected.

E. Freeze-Thaw (ASTM C67)…………………………………No Breakage <1% weight loss.


G. Abrasion (ASTM D1242)……………………………….0.328 in. = 3000 psi concrete.

H. Absorption (ASTM D570)…………………………….12.7%.

I. Percolation (ASTM D1242) 48”/48hr…………………….<1%.


K. Impact Resistance (MIL D3134 F)………………………….No Breakage / <.62 in.

L. Concentrated Load Test (500 lbs.)………………………..No Breakage / <.001 in.
PART 3 - EXECUTION

3.1 Examination

A. Concrete shall be structurally sound, with required reinforcement and footings. Place and finish concrete in a skilled and workmanlike manner.

B. Install control joints throughout concrete as required to prevent cracking. All control joints must be honored and cannot be bridged with the Sundek Classic Texture Effect installation.

C. Provide surface drainage at all points no less than ¼ inch per linear foot. Drainage correction is not guaranteed in the Sundek Classic Texture Effect installation.

3.2 Preparation

A. Clean concrete surface with high-pressure power washer.

B. Remove dirt, grease, oil, curing compounds or other foreign substances which may prevent proper bonding.

C. Provide protective masking at all adjacent areas not to be coated.

D. Repair cracks, surface damage and any corrective measurers on concrete.

3.3 Application

A. Spray or roll Sundek Primer/Additive on area to be coated. Allow to dry and become transparent.

B. Sundek Base Coat (Required for blending repairs and profiling rough concrete surfaces).
   1. Apply Sundek Base Coat using squeegee or trowel uniformly on area to be coated to a minimum thickness of 1/16” and allow to dry.
   2. Optional Masonry Effect – Place Sundek Masonry Effects templates at area to be coated.

C. Mix Sundek Premix for Base Coat Application using mechanical agitation for 3-6 minutes as per mix design.
   1. Sundek Additive Primer……………………………………………………..0.5 gal….4.5 lbs.
   2. Sundek Premix……………………………………………………..1 bag…..45 lbs.
   3. Clean Water (Water ratio will vary with temp. and Humidity)…..1 gal.

D. Mix Sundek Premix for Classic Texture using mechanical agitation for 3-6 minutes as per mix design.
   1. Sundek Additive Primer……………………………………………………..0.5 gal….4.5 lbs.
   2. Sundek Premix……………………………………………………..1 bag…..45 lbs.
   3. Clean Water (Water ratio will vary with temp. and Humidity)…..1 gal.
E. Spray Sundek Classic Texture Premix thru hopper gun with air pressure at 12 psi.
F. Knock down sprayed texture after it looses its gloss.
G. Spray Sundek Finish Coat to surface, once it is completely dry, by roller or airless type sprayer and allow to dry completely.
H. Optional Masonry Effects – Remove Sundek Masonry Effects templates when colored area is dry.
I. Optional Scoring Effects – Score desired pattern into Sundek Classic Texture Effect using masonry cutting wheel and grinder.
J. Apply Sundek Clear Finish Coat with roller or sprayer.
K. Remove all protective masking upon drying of Sundek Clear Finish Coat.

3.4 Protection
A. Protect all phases of Sundek Classic Texture Effect from moisture, freezing and foot traffic for 24 hours. Prevent vehicular traffic for 72 hours from finish of application.
B. Owner or General Contractor will provide protection for finished Sundek Classic Texture Effect from damage by others until acceptance by responsible party.

3.5 Maintenance
A. Power wash or rinse thoroughly on a regular basis as needed.
B. A mild solution of muriatic acid can be used for tougher stains.
C. Touch up and repair all minor repairs as needed with touch-up kits provided by Sundek during installation.
D. Re-coloring of coating can be done to refresh the appearance and promote longevity.
E. Contact your Sundek dealer for further assistance.

END OF SECTION 033000
FLOOR PLAN - PART "C" IF DEDUCTIVE ALTERNATE IS NOT TAKEN
FLOOR PLAN - PART "C" BASE BID

NOTE: REFER TO ENLARGED PLANS FOR ADDITIONAL DIMENSIONS AND NOTES.
A NEW RECREATION CENTER
FOR
THE
BOAZ PARKS AND RECREATION
BOAZ, ALABAMA

H C R E E T A L E T O R S I G N A T E D
No. 1082
WALTER T. McKEE, JR.
MONTGOMERY, ALA.

SEE EXTERIOR ELEVATIONS FOR HEIGHT & LOCATION(S)
ALUMINUM CANOPY SECTION (AC)
6'-0"
SEE PLANS
SEE PLANS
6" GUTTER
NOTE: STAIR SHALL HAVE
4" MIN. & 7" MAX.
RISER HEIGHTS.

COORDINATION NOTE: THIS DETAIL IS INTENDED TO SERVE AS A GUIDE FOR
TYPICAL DRYWALL SOFFIT / FURRING INSTALLATION. IT MUST BE MODIFIED
AS NEEDED TO ADAPT IT TO VARYING CONDITIONS INDICATED ON
REFLECTED CEILING PLANS AND THAT MAY BE ENCOUNTERED ON THE JOB.
IN ADDITION TO THE FRAMING INDICATED, EACH CONTRACTOR IS
RESPONSIBLE FOR THEIR OWN BLOCKING.
SEE REFLECTED CEILING PLANS FOR LAY-IN CEILING
ATTACH 5/8" GYPSUM BOARD TO STUDS and RUNNERS WITH SCREWS
SPACED MAX. 1'-0" O.C..
INSERT METAL STUDS BETWEEN RUNNERS SPACED 2'-0" O.C. and ATTACH
STUDS TO RUNNERS.
INSTALL METAL RUNNERS TO CEILING and SIDEWALL WITH FASTENERS NOT
TO EXCEED 2'-0" O.C.. ON STUD WALLS, SPACE FASTENERS TO ENGAGE
STUDS.
METAL OR WOOD FRAMING TO BE ERECTED ON MAX. 2'-0" CENTERS IN
ACCORDANCE WITH CONVENTIONAL PROCEDURES.
SUPPLEMENTAL FRAMING AT BOTTOM OF ROOF TRUSSES OR SECOND
FLOOR STRUCTURE WITH SUPPLEMENTAL FRAMING AS REQUIRED.
METAL ROOF TRUSSES
SUPPLEMENTAL FRAMING
AS REQUIRED

KEY NOTES

1/2"
SEE RCP'S FOR LOCATIONS.

SCALE:
1" = 1'-0"

SCALE:
1" = 1'-0"

SCALE:
1" = 1'-0"

SCALE:
1" = 1'-0"

MISC DETAILS
A9.4

METAL STAIR - PLAN
1" = 1'-0"

6 LADDER W/ SAFETY CAGE - PLAN - CONC (MAL)
1 ALUMINUM CANOPY SECTION (AC)
7 ROOF LADDER SECURITY DETAIL (MAL)
A NEW RECREATION CENTER
FOR
THE
BOAZ PARKS AND RECREATION
BOAZ, ALABAMA

Phone
(256) 533-1575

PROJECT NO.
LBYD, Inc.
Civil and Structural Engineers
1525 Perimeter Pkwy NW
Suite 510
Huntsville, AL 35806

18.197
07.01.19

SP3.4
INDOOR POOL SECTIONS & DETAILS