

DATE OF ISSUE:
December 9, 2015

DEPARTMENT OF GENERAL SERVICES
BUREAU OF PROFESSIONAL SELECTIONS AND ADMINISTRATIVE SERVICES
18TH AND HERR STREETS
HARRISBRUG, PENNSYLVANIA

BULLETIN NO. 1

on

**PROJECT NO. D.G.S. 404-62, PHASE 1 – REVISED REBID
RENOVATIONS AND EXPANSION OF TIPPIN GYMNASIUM, CLARION UNIVERSITY, CLARION, CLARION
COUNTY, CLARION PA
DLA/GUND PARTNERSHIP JOINT VENTURE
FOSTER PLAZA 9, SUITE 200
750 HOLIDAY DRIVE
PITTSBURGH, PENNSYLVANIA 15220**

**BID DATE – TUESDAY, JANUARY 5, 2016
TIME OF OPENING – 2:00PM, EST**

ALL CONTRACTS

- Item 1 Refer to attached documents for information for Small Diverse Business (SDB) submittal requirements and submittal scoring.
- Item 2 Refer to attached revised Small Diverse Business (SDB) submittal form.
- Item 3 Replace Appendix I Mandatory Requirements Checklist with the attached Revised Appendix I Mandatory Requirements Checklist
- Item 4 In the Notice to Proposers please note the following change to the Proposal Submission Deadline:
Proposals are due: Tuesday, January 5, 2016 at 2:00 p.m.
Subcontractors' Qualification Statements are due: Thursday, January 7, 2016 at Close of Business
- Item 5 To tour the site and existing facilities at Clarion, please contact Rein Pold at 814-393-2166.
- Item 6 The correct number of calendar for construction is 762 as indicted in the Notice To Proposers.
- Item 7 The water flow for Tippin Gym is 95-lbs. going into the building and it is reduced to 55-lbs.
- Item 8 In order to provide as much time as possible for long lead time products/materials, the Department shall issue a "Notice of Selection / Letter of Intent" in accordance with § 906 of the Commonwealth Procurement Code to the Selected Proposers on this Project. This letter will enable the successful Proposers to begin to incur costs for off-site work (including preparing, submitting, and acquiring approval of submittals, and ordering materials) prior to the

Construction Contracts being fully executed. The Department provided the two sets of steam shutdown dates as a means of added potential flexibility for you when developing your schedule to meet the Project's time frame. All Proposers' price provided in their Cost Submittal shall be the price regardless of the steam shut-down dates utilized for their Work.

SPECIFICATION CHANGES – CONTRACT NO. D.G.S. 404-62, PHASE 1.1

Item 1 312213-1, PART 1 GENERAL, SUBSECTION 1.2 DESCRIPTION OF WORK

Add: B. BASIS OF CONTRACT

1. Excavation for this Project shall be considered unclassified and shall include all types of earth and soil, any pebbles, boulders, and bedrock, municipal trash, rubbish and garbage and all types of debris of the construction industry such as wood, stone, concrete, plaster, brick, mortar, steel and iron shapes, pipe, wire, asphaltic materials, paper and glass. Unclassified excavation does not include unforeseen concrete foundations, walls, or slabs. All such materials encountered which are identified by this paragraph as unclassified shall be removed to the required widths and depths to create a finished product as shown and/or noted on the drawings and as written in the specifications. No additional compensation shall be made to the contractor for this unclassified excavation. The materials defined by this paragraph as unclassified will not be considered to be concealed conditions or unknown physical conditions below the surface of the ground for purposes of interpreting the language in the General Conditions of the Construction Contract.

Item 2 312213-3, PART 1 GENERAL, SUBSECTION 1.8 QUALITY ASSURANCE

Add: E. Compaction standards are to be based on Modified Proctor standards, as defined by ASTM D1557.

Item 3 312213-7, PART 3 EXECUTION, PARAGRAPH 3.5 FIELD QUALITY CONTROL

- Add: B. The Contractor shall furnish adequate advance notification to the Department and the Professional of times when footing excavations or paving subgrades are to be completed, so that the Soils QA agent can verify that the bearing quality of the soil has been properly inspected and/or tested by the Contractor. Formwork and concreting shall follow only after approval by the Soils QA agent.
- C. Should the bearing at the levels indicated be found by the Professional and the Department to be inadequate, they may order the excavation carried down to sound bearing. Such excavation shall be classed as additional work and payment be made on the basis of an agreed price according to the General Conditions. Should suitable bearing be found at a lesser depth than indicated, the Professional and the Department may order the reduction of excavation specified or shown on the drawings, and the Contractor shall allow a credit for excavation thus omitted on the same basis.
 - D. The Contractor shall perform all necessary Quality Control tests, inspections and procedures for the performance of the work in accordance with Section 01400 and this section, to produce end results specified. The Contractor's Quality Control Agent shall maintain clear and orderly records of such tests and procedures and make them available for field review and approval of the Professional and the Department. The Contractor's bid shall include the cost of all Quality Control tests.

- E. The Contractor shall submit its plan for Quality Control testing to the Professional and the Department for review and comments.
- F. Quality Control tests shall include tests on fill material, optimum moisture content and maximum density and field density tests of fill layers. The Q.C. Testing agent shall comment on the suitability of all subgrades, and the subgrades shall be acceptable to the Consulting Geotechnical Engineer.
- G. Handwritten copies of field test reports shall be provided to the Contractor. They shall be given to the Contractor and inspector within two (2) hours of completion, but in no event shall the technician leave the site without providing the Contractor and inspector with a copy of the test results. This shall include density, % moisture, plan location, elevation, comments and any other relevant data. Comments shall include any condition that might have an adverse affect on the operations, including weather, drainage, etc.
- H. The Contractor shall request consultation with the Consulting Geotechnical Engineer on any problems that arise during construction. Copies of the daily in-place soil density tests shall be faxed to the consultant by the Contractor through the testing agency within twenty-four (24) hours of the time the tests are made.
- I. The Contractor shall approve each subgrade and each fill layer before proceeding to the next layer. Any area which does not meet density, % moisture or other requirements at any time, shall be suitably reworked and retested by the Contractor at his own expense.
- J. The Professional and/or the Department will perform Quality Assurance Services in accordance with Section 01401 deemed necessary for the assurance of the Professional and/or the Department. This does not relieve the Contractor of his responsibilities. The Department will bear the cost of Quality Assurance tests.

SPECIFICATION CHANGES – CONTRACT NO. D.G.S. 404-62, PHASE 1.2

- Item 1 Replace section 237413 PACKAGED OUTDOOR CENTRAL STATION AIR HANDLING UNITS with the attached specification 237413 PACKAGED OUTDOOR CENTRAL STATION AIR HANDLING UNITS .

DRAWING CHANGES – CONTRACT NO. D.G.S. 404-62, PHASE 1.1

- Item 1 Drawing S0.04 TEST BORING LOGS, add the following note:
SUBSURFACE INFORMATION

1. Any available data concerning subsurface materials or conditions based on soundings, test pits or test borings, has been obtained by the Department for its own use in designing this Project. The Test Boring location drawings and the Test Boring Logs, as well as the Laboratory Test Results, contained within the Geotechnical Report are incorporated into the construction contract as a Contract Document. The remainder of the Geotechnical Report, with all other exhibits, is available for informational/guidance purposes only; it is not to be relied on by prospective Bidders. The Report is available to Bidders at the office of the Professional upon signature of a standard form of receipt, whereby the bidder acknowledges and understands that the information and recommendations in the Report is not warranted for accuracy, correctness or completeness, and is not incorporated into the construction contract as a Contract Document.
2. Test Boring logs reflect the conditions at the specific locations of each Test Boring only. The Contractor accepts full responsibility for any conclusions drawn with respect to conditions between Test Borings. Bidders may perform their own

investigation of existing subsurface conditions, with the Department's approval. Excavation for the Project is "Unclassified", as fully described in the Earthwork Section.

DRAWING CHANGES – CONTRACT NO. D.G.S. 404-62, PHASE 1.2

Item 1 Drawing H6.01 SCHEDULES, replace the ROOFTOP HVAC UNIT Schedule with the attached (2 pages) ROOFTOP HVAC UNIT Schedule.



Gary R. Taylor, P.E. Director
BUREAU OF ENGINEERING AND ARCHITECTURE

Call the Professional's Office, Telephone No. at (412) 921-4300, for names of those who have secured plans and specifications.

PLEASE ACKNOWLEDGE RECEIPT OF EMAIL WITHIN 24 HOURS BY COMPLETING THE BOTTOM OF THE PAGE AND EMAIL TO DLA/GUND PARTNERSHIP AT cjshaw@DLAplus.com

NAME	TITLE	DATE
FIRM		

1.13 INFORMATION CONCERNING SMALL DIVERSE BUSINESSES (SDB)

As noted in Section 2101 of Title 62, the Commonwealth Procurement Code, and in Section 9604(1) of Title 51, the Military and Veterans Code, it is Commonwealth policy to assist small and disadvantaged businesses and veteran and service-disabled veteran-owned businesses in doing business with Commonwealth agencies. **The Issuing Office encourages participation by Small Diverse Businesses as prime contractors, and encourages all prime contractors to make a significant commitment to use Small Diverse Businesses as subcontractors and suppliers.**

A Small Diverse Business is a DGS-verified minority-owned business, woman-owned business, veteran-owned business or service-disabled veteran-owned business.

A small business is a business in the United States which is independently owned, not dominant in its field of operation, employs no more than 100 full-time or full-time equivalent employees, and earns less than \$7 million in gross annual revenues for building design, \$20 million in gross annual revenues for sales and services and \$25 million in gross annual revenues for those businesses in the information technology sales or service business.

Questions regarding this Program can be directed to:

Department of General Services
Bureau of Diversity, Inclusion and Small Business Opportunities
401 North Street
Room 601, North Office Building
Harrisburg, PA 17120-0500
Phone: (717) 783-3119
Fax: (717) 787-7052
Email: gs-bsbo@pa.gov
Website: www.dgs.pa.gov

The Department's directory of BDISBO-verified minority, women, veteran and service disabled veteran-owned businesses can be accessed from:

[Small Diverse Business Search](#)

or <http://www.dgs.internet.state.pa.us/SmallDiverseBusinessSearch/>

2.6 SMALL DIVERSE BUSINESS SUBMITTAL REQUIREMENTS

As shown in the Mandatory Requirements Checklist, failure to include the Small Diverse Business Submittal envelope/package will result in rejection of the Proposal as non-responsive. The Proposer will not be given an opportunity to supply a Small Diverse Business Submittal after the Proposal Submission Date. A value should be entered into the Small Diverse Business Submittal Form. If left blank, it will be presumed that the value is 0% and the submission will be scored accordingly. If a Proposer commits to 0%, the proposal will not be rejected as non-responsive, but the Proposer will receive 0 points for their Small Diverse Business Submittal.

A. To receive credit for being a Small Diverse Business Proposer or for subcontracting with Small Diverse Businesses (including purchasing supplies and/or services through a purchase agreement), an Proposer must include proof of Small Diverse Business qualification in the Small Diverse Business participation submittal of the proposal, as indicated below:

A Small Diverse Business verified by BDISBO as a Small Diverse Business must provide a photocopy of its DGS issued certificate entitled "Notice of Small Business Self-Certification and Small Diverse Business Verification" indicating its diverse status.

B. In addition to the above certificate, the Proposer must include in the Small Diverse Business participation submittal of the proposal the following information:

1. *All* Proposers must include a numerical percentage which represents the estimated percentage of the work (as a percentage of the total cost in the Cost Submittal) to be performed by the Proposer and not by subcontractors and suppliers. The estimated percentage will not become a contractual obligation.
2. *All* Proposers must include a numerical percentage which represents the total percentage of the total cost in the Cost Submittal that the Proposer commits to paying to Small Diverse Businesses (SDBs) as subcontractors, manufacturers and/or suppliers. The total percentages and each SDB subcontractor commitment will become contractual obligations once the contract is fully executed.

While not required as part of the submission, BDISBO shall provide the awarded Proposer a *Small Diverse Business Participation Plan* (Plan) Form at the Initial Job Conference. The Plan, which will be completed by the awarded Proposer, shall include a list of proposed DGS-verified SDB subcontractors, manufacturers and suppliers to be used along with their scope of work and/or supplies to be provided. The awarded Proposer shall provide the completed *Small Diverse Business Participation Plan* to BDISBO within thirty (30) days following the Initial Job Conference.

For purposes of calculating the percentage, the Proposer should recognize that:

1. Commitments to Small Diverse Business as subcontractors performing at least sixty percent (60%) of the subcontract with their own employees will be credited

toward the SDB submitted percentage at 100% of the total dollar value of the subcontract/supply contract. Any Small Diverse Business subcontract, where the subcontractor performs less than 60% of the subcontract will not be credited toward the SDB submitted percentage.

2. Commitments to Small Diverse Business manufacturers are credited at 100% of the total cost of the materials or supplies purchased.
 3. Commitments to each Small Diverse Business which is a supplier, the Proposer shall specify whether that supplier is a stocking or non-stocking supplier.
 - i. Commitments to stocking suppliers will be credited at 60% of the total cost of the materials or supplies purchased.
 - ii. Commitments to non-Stocking suppliers are credited at **only** the amount of the fee or commission charged by the Small Diverse Business non-stocking supplier for assistance in the procurement of the materials and supplies provided the fees or commissions are reasonable and not excessive as compared with fees customarily allowed for similar services and with the understanding that under no circumstances shall the credit, for a Small Diverse Business non-stocking supplier, exceed 10% of the purchase order cost.
-
- The name and telephone number of the Proposer's project (contact) person for the Small Diverse Business information.
 - The Proposer is required to submit **one** (1) copy of its Small Diverse Business participation submittal. The submittal shall be clearly identified as Small Diverse Business information and sealed in its own envelope, separate from the remainder of the proposal.
 - A Small Diverse Business can be included as a subcontractor with as many prime contractors as it chooses in separate proposals.
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- A Proposer that qualifies as a Small Diverse Business and submits a proposal as a prime contractor is not prohibited from being included as a subcontractor in separate proposals submitted by other Proposers.

Small Diverse Business Scoring Formula: All Proposers will be scored using the Priority Rank system as outlined in Section III.

3.5 SMALL DIVERSE BUSINESS SUBMITTAL SCORING

BDISBO has established the weight for the Small Diverse Business participation criterion for this RFP as 20 % of the total points. Each SDB participation submittal will be scored by BDISBO based upon its approach for utilization of SDBs in accordance with the below-listed priority ranking and subject to the following requirements:

1. A business submitting a proposal as a SDB prime contractor must perform 60% of the total contract value to receive points for this criterion under any priority ranking.
2. To receive credit for a SDB subcontracting commitment, the SDB subcontractor must perform at least sixty percent (60%) of the work subcontracted to it.
3. A significant subcontracting commitment is a minimum of five percent (5%) of the total contract value.
4. A subcontracting commitment less than five percent (5%) of the total contract value is considered nominal and will receive reduced or no additional SDB points depending on the priority ranking.

Priority Rank 1: Proposals submitted by SDBs as prime Proposers will receive 375 points. In addition, SDB prime Proposers that have significant ($\geq 5\%$) subcontracting commitments to additional SDBs may receive up to an additional 125 points (500 points total available).

Subcontracting commitments to additional SDBs are evaluated based on the proposal offering the highest total percentage SDB subcontracting commitment. All other Proposers in this Priority Rank will be scored in proportion to the highest total percentage SDB subcontracting commitment within this ranking.

Priority Rank 2: Proposals submitted by SDBs as prime contractors, with no or nominal subcontracting commitments to additional SDBs, will receive 375 points.

Priority Rank 3: Proposals submitted by non-small diverse businesses as prime contractors, with significant ($\geq 5\%$) subcontracting commitments to SDBs, will receive up to 250 points if qualifying Proposals are received from SDBs as Prime contractors in either Priority Rank 1 or 2. If no qualifying Proposals are received in Priority Rank 1 or 2, Proposals in Priority Rank 3 will receive up to 500 points. Proposals submitted with nominal subcontracting commitments to SDBs will receive points equal to the percentage level of their total SDB subcontracting commitment.

SDB subcontracting commitments are evaluated based on the proposal offering the highest total percentage SDB subcontracting commitment. All other Proposers will be scored in proportion to the highest total percentage SDB subcontracting commitment within this ranking

Priority Rank 4: Proposals by non-small diverse businesses as prime contractors with no SDB subcontracting commitments shall receive no points under this criterion.

To the extent that there are multiple SDB Participation submittals in Priority Rank 1 and/or Priority Rank 3 that offer significant ($\geq 5\%$) subcontracting commitments to SDBs, the proposal offering the highest total percentage SDB subcontracting commitment shall receive the highest score (or additional points) available in that Priority Rank category and the other proposal(s) in that category shall be scored in proportion to the highest total percentage SDB subcontracting commitment.

SDB Scores will be calculated separately for each Base Bid. The Proposal with the Highest Small Diverse Business Submittal score will receive 500 points. The score for the remaining proposals will be calculated using the formula presented below:

$$\text{Small Diverse Business Score} = \frac{500 - (500 \times (\text{Highest Proposer's Points} - \text{Proposer's Points}))}{\text{Highest Proposer's Points}}$$

APPENDIX F

SMALL DIVERSE BUSINESS SUBMITTAL FORM

Submit 1 original in a sealed envelope separate from the
Technical Submittal and the Cost Submittal

After examination of the contract documents, which are made a part hereof as if fully set forth herein, the Proposer commits to the following percentage for Small Diverse Business participation on this project. The Proposer understands the language in the RFP regarding the calculation of the percentage.

Project: 404-62 Phase 1

Proposer (Firm) Name:

Is your firm a DGS-verified Small Diverse Business? Yes No (**MUST** check one)

As indicated in in Section 2.6, please indicate the numerical percentage which represents the *estimated* percentage of the work to be self-performed as a percentage of the total cost in the Cost Submittal. *This estimated percentage is requested for informational purposes.*

_____ % _____ Percent
(Figure) (Written)

Proposer Prime Contact Name: _____

Project Commitment for Small Diverse Business Participation As Subcontractors, Manufacturers and/or Suppliers as a percentage of the total cost in the Cost Submittal (Fill in both figure and written response for each base bid.)

Base Bid No. 1:

_____ % _____ Percent
(Figure) (Written)

Base Bid No. 2:

_____ % _____ Percent
(Figure) (Written)

Base Bid No. 3:

_____ % _____ Percent
(Figure) (Written)

SECTION 23 7413 - PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 STIPULATIONS

- A. The Specification Sections "General Conditions of Contract", "Special conditions" and "Division 01-General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.02 SECTION INCLUDES

- A. Packaged roof top unit.
- B. Unit controls.
- C. Remote panel.
- D. Roof mounting curb and base.
- E. Maintenance service.

1.03 RELATED REQUIREMENTS

- A. Section 07 6200 - Sheet Metal Flashing and Trim.
- B. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- C. Section 23 0548 - Vibration & Seismic Controls for HVAC Piping & Equipment
- D. Section 23 0913 - Instrumentation & Control Devices for HVAC: Control components, time clocks.
- E. Section 230924 - Direct Digital Control Systems for HVAC.

1.04 QUALITY ASSURANCE

- A. Packaged air-cooled condenser units shall be certified in accordance with ANSI/AHRI Standard 340/360 performance rating of commercial and industrial unitary air-conditioning and heat pump equipment.
- B. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.
- C. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.
- D. Unit Energy Efficiency Ratio (EER) shall be equal to or greater that prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.
- E. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

1.05 SUBMITTALS

- A. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics and connection requirements. Installation, Operation, and Maintenance manual with startup requirements shall be provided.
- B. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances and connection details. Computer generated fan curves for each fan shall be submitted with specific design operation point noted. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Unit shall be shipped with doors screwed shut and outside air hood closed to prevent damage during transport and thereafter while in storage awaiting installation.
- B. Follow Installation, Operation, and Maintenance manual instruction for rigging, moving, and unloading the unit at its final location.

- C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation, and Maintenance manual.

1.07 WARRANTY

- A. Manufacturer shall provide a limited "parts only" warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer's written instructions for Installation, Operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and filters. Compressor warranty shall be 5 years from startup one year labor warranty on the entire unit shall be provided by certified service company.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Aeon
- B. Addison HVAC: www.addison-hvac.com
- C. Carrier Corporation: www.carrier.com
- D. Trane Inc: www.trane.com

2.02 ROOFTOP UNITS

- A. General Description
 1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, air-cooled condenser coils, condenser fans, hot water coils, exhaust fans, energy recovery wheels.
 2. Unit shall be factory assembled and tested including leak testing of the DX coils, leak testing of the hot water coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment's literature pocket.
 3. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
 4. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
 5. Estimated sound power levels (dB) shall be shown on the unit ratings sheet.
 6. Installation, Operation, and Maintenance manual shall be supplied within the unit.
 7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's hinged access door.
 8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's hinged access door.
- B. Construction
 1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
 2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
 3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
 4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external

static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
 6. Access to filters, dampers, cooling coils, reheat coil, exhaust fans, energy recovery wheels, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
 7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
 8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
 9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
 10. Unit shall include lifting lugs on the top of the unit.
 11. Unit shall include interior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure. Air tunnel, fans and dampers shall all include the corrosion protection.
 12. Unit base shall be fabricated of 3 inch thick double wall, impact resistant, rigid polyurethane foam panels.
 13. Unit shall include factory installed, painted galvanized steel condenser coil guards on the face of the condenser coil.
- C. Electrical:
1. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
 2. Unit shall be provided with a factory installed and factory wired 115V, 13 amp GFI outlet disconnect switch in the unit control panel.
 3. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.
- D. Supply Fans:
1. Unit shall include direct drive, unhooded, backward curved, plenum supply fans.
 2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.
 3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
 4. Units have dual direct drive plenum fans (except RTU-3)
- E. Exhaust Fans:
1. Exhaust dampers shall be sized for 100% relief. Units to have dual exhaust fan assemblies.
 2. Fans and motors shall be dynamically balanced.
 3. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
 4. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles. All units with dual direct drive plenum exhaust fans except RTU-3.
 5. Unit shall include direct drive, axial flow exhaust fans. Blades shall be adjustable pitch with VFD.

- F. Variable frequency drives shall be factory wired and mounted in the unit.
- G. Cooling Coils:
 - 1. Evaporator Coils:
 - a. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
 - b. Coils shall have interlaced circuitry and shall be standard capacity.
 - c. Coils shall have interlaced circuitry and shall be standard capacity.
 - d. Coils shall be hydrogen or helium leak tested.
 - e. Coils shall be furnished with factory installed expansion valves.
- H. Refrigeration System:
 - 1. Unit shall be factory charged with R-410A refrigerant.
 - 2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
 - 3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet.
 - 4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
 - 5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
 - 6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides and a factory installed replaceable core liquid line filter driers.
 - 7. Unit shall include a variable capacity scroll compressor on the lead refrigeration circuits which shall be capable of modulation from 10-100% of its capacity.
 - 8. Unit shall include all VFD controlled, variable speed scroll compressors on all refrigeration circuits which shall be capable of modulating refrigerant capacity.
 - 9. Lag refrigeration circuit shall be provided with factory installed hot gas bypass to protect against evaporator frosting and to prevent excessive compressor cycling.
 - 10. Lag refrigeration circuits shall be provided with factory installed hot gas bypass to protect against evaporator frosting and to prevent excessive compressor cycling.
- I. Condensers:
 - 1. Air-Cooled Condenser
 - a. Condenser fans shall be a vertical discharge, axial flow, direct drive fans.
 - b. Coils shall be designed for use with R-410A refrigerant and shall be multi-pass and fabricated from aluminum microchannel tubes.
 - c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
 - d. Coils shall be hydrogen or helium leak tested.
 - e. Condenser fans shall be VFD driven variable speed for condenser head pressure control. Factory provided and factory programmed VFDs shall continuously modulate the fan air flow to maintain head pressure at acceptable levels. Cooling operation shall be allowed down to 35°F with adjustable compressor lockouts.
- J. Heating Coils:
 - 1. Hot Water Heating Coils:
 - a. Coils shall be certified in accordance with AHRI Standard 410 and be hydrogen or helium leak tested.

- b. Coils shall be constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
 - c. Coils shall be two rows, single serpentine circuitry.
 - d. Coils shall be located in the reheat position downstream of the cooling coil.
 - e. Control valves shall be field supplied and field installed. Unit to include a freeze protection run around pump factory supplied and wired.
- K. Filters
- 1. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.
 - 2. Units shall include a Magnehelic gauge mounted in the controls compartment.
- L. Outside Air/Economizer
- 1. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return DDC actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.
- M. Energy Recovery Heat Wheel:
- 1. Unit shall contain a factory mounted and tested energy recovery wheels. The energy recovery wheels shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.
 - 2. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.
 - 3. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.
 - 4. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.
 - 5. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.
 - 6. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard AAON limited parts warranty. The remaining period of the warranty shall be covered by Airxchange. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for Installation, Operation, and Maintenance have been

followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.

7. Unit shall include 2 inch thick, pleated panel outside air filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the wheels.
 8. Hinged service access doors shall allow access to the wheels.
 9. Total energy recovery wheels shall be coated with silica gel desiccant permanently bonded by a process without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.
 10. Unit shall include energy recovery wheel defrost control provided by ATC.
 11. Unit shall include energy recovery wheel rotation detection sensors and a set of normally open and normally closed contacts for field indication of wheel rotation.
- N. Temperature controls and DNL panels to be provided by Johnson Controls for field mounting.

2.03 CURBS

- A. Spring Isolation Roof Curb: Kinetics ESSR: Curb type isolator with integral spring isolators, designed to provide a complete roof curb installation. All rooftop units shall be supported by vibration isolation curbs as manufactured by Kinetics Noise Control. The vibration isolation curbs shall be complete assemblies designed to resiliently support equipment at the specified elevation and shall constitute a fully enclosed air and weather-tight system. The isolation curb shall consist of an upper support rail with supply and return duct supports on which the equipment and duct openings rest and a lower support curb which is attached to the roof structure, separated by free-standing, un-housed, laterally stable steel springs. The upper support rail shall provide continuous structural support for the rooftop equipment and shall be designed to provide isolation against casing radiated vibration in the rooftop equipment housing and structure borne vibration from rotating and mechanical equipment in the rooftop package. The upper support rail consist of a structural channel with sufficient elevation above the spring to preclude interference with the rooftop equipment and permit access to inspect the isolation system after placement of the rooftop equipment. The lower support curb shall be a formed channel fabricated of heavy gauge galvanized steel with a continuous 1-1/2 inch x 1-1/2 inch nominal wood nailer attached to the isolation support pedestals. The isolation support pedestal, which include the seismic and wind load restraints, shall be bolted or welded to the building support steel to suitable transfer seismic and wind load forces to the building structure. The lower support curb shall have a minimum elevation of 48 inches from the top of the wood nailer to the base of the curb. Spring components shall be 2-inch deflection, free-standing, un-housed laterally stable steel springs. Springs shall have a lateral stiffness greater than 1.2 times the rated vertical stiffness and shall be designed for a typical 50% overload to solid. All springs shall have a polyester powder coated finish and the color codes to indicate load capacity. Spring coils shall rest on minimum 0.25 inch neoprene noise pads. The isolation curb system shall be complete with cross-bracing as required as a part of the upper and lower assemblies. Supply air and return duct shall be flexibly attached by the contractor to prevent transmission of vibration to the building structure. Airborne noise control packages, if required, shall be supported by the building roof structure within the curb and shall have no rigid contact with the isolation curb. Vibration isolators shall be selected by the manufacturer for each specific application to comply with deflection requirements as supply and return duct connectors for horizontal ductwork shall be sized and located per the drawings. The plenum/curb assembly shall include an integral "Noiseblock" STL panel on all sides of the plenum/curb.

2.04 CONTROLS

A. AHU VAV

1. The following general sequence of operation shall apply if the described equipment is part of the current project.
 - a. Air Handling Unit
 - 1) 24 hour, 7 days a week operation with DDC schedules
 - 2) Variable volume supply and return fan with VFDs
 - 3) Outside, return, and relief dampers
 - 4) ERC
 - 5) DX cooling coil
 - 6) Hot water pre-heat coils
 - 7) Pre, final, and after filters
 - 8) This software sequence shall be demonstrated to the owner upon checkout. This software routine will allow for significant energy savings during mild weather conditions.
2. The new AHU will be provided with a new DDC panel (ASC). This unit will serve VAV boxes with hot water reheat in the building. The AHU will consist of a full economizer (OA, RA, and relief) dampers, pre-filter, ERC, heating coil, DX cooling coil, final filter, supply fans (VFD for each), return fan (VFD). The unit is designed to supply 55 deg. F. discharge air to terminal VAV boxes with reheat.
3. The damper actuators are by the AHU manufacturer (AAON).
4. Unit fan will run on a DDC time schedule. Whenever the supply fan starts the return fan shall also start.
5. Provide an adjustable ramp up speed application so that all fans start at low speed and gradually, over an adjustable time, ramp to their required controlled speed.
6. Provide a DDC sensor in the mixed air. This sensor via its ASC shall modulate the economizer dampers (OA and RA) to maintain 55 deg. F. The variable speed heat recovery wheel will be enabled when the absolute value of the difference between the return air temperature and the outdoor air temperature is greater than the heat recovery setpoint. Heat recovery wheel bypass dampers shall modulate to maintain the discharge air temperature setpoint. On a drop in exhaust air temperature below the heat recovery low limit setpoint, the heat recovery loop will change modes to maintain a minimum exhaust air temperature to prevent freezing. Upon a loss of heat recovery wheel status the heat recovery wheel will attempt to automatically restart until positive status is received.
7. The preheat will modulate to maintain the temperature setpoint. When the unit is shutdown, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint. Upon a loss of airflow, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint.
8. Whenever the outside air temperature rises above 65 deg. F. (OAT) the outside air damper and relief damper will return to minimum position.
9. Provide a DDC sensor in the fan discharge. This sensor via its ASC will modulate the hot water control valve in sequence with the compressor stats to maintain 55 deg. F. discharge temperature.
10. Provide filter differential switches on both pre and final filters to alarm at the DDC workstation upon sensing dirty conditions.
11. Whenever the AHU fans are de-energized, the outside and exhaust dampers will close, the hot water valve will maintain 55 deg. F. as sensed by the mixed air sensor to maintain non freezing conditions and keep small amount of flow to the unit.

12. Photoelectric duct mounted smoke detectors by others in the supply and return air ducts. Upon sensing the projects of combustion, these devices will de-energize the unit fan and alarm at the FACP. These devices must be manually reset.
13. Provide a low temperature protection T'stat bulb type located in the unit discharge to de-energize the unit supply and return fan whenever dangerous temperatures are reached. This device must alarm at the DDC panel and be manually reset.
14. Provide a duct static pressure controller with its sensing probe located 2/3 length of duct run. This sensor, via the AHU DDC panel, will select the lowest reading on a floor and modulate the VFD on the supply fan to maintain supply duct static.
15. Speed on the return fan shall be from a VFD. Provide an interlock so that the return fan starts with the supply fan.
16. All actuators for the AHU shall be electronic and controlled by the DDC (dampers and valves).
17. Points List:
 - a. AO - Outside damper, return damper
 - b. DI - Pre-filter, final filter
 - c. AO - Hot water valve
 - d. AO - DX
 - e. AO - Relief damper
 - f. AI - Relief plenum static
 - g. AI - Mixed air
 - h. AI - ERC discharge
 - i. AI - Discharge temperature
 - j. DI - Low temperature cutout
 - k. AI - Duct smoke detector
 - l. AI - Condensate Float
 - m. AI - OA flow
 - n. Duct static pressure 2/3 downstream
 - o. VFD supply fan
 - p. VFD return fan
 - q. VFD supply fan and return fan
 - r. Fan Status
 - s. Fan Fail
18. Safeties:
 - a. A capillary type low temperature limit sensor, located at the inlet of the cooling coil, shall close the OA dampers, open the hot preheat coil valve full, open the cooling coil valve full and shutdown the fans. An alarm shall be generated at the central site in the event of a freeze condition.
 - b. Smoke detectors shall be provided by the EC contractor and located in the supply and exhaust air ducts. Either detectors shall shutdown the fans and alarm the central site in the event that particles of combustion are detected. Power wiring and wiring from the detectors to the fire alarm system shall be by the electrical contractor. Control wiring from the auxiliary contacts on the detector to the AHU control circuit shall be by the DDC contractor.
 - c. Relays shall be provided in the power circuit to the OA damper actuator, preheat coil valve, and cooling coil valve actuators and wired through the freeze circuit to assure these actuators go to their fail-safe position if required regardless of microprocessor or software function.
19. Miscellaneous:
 - a. A differential pressure sensor shall be installed across the pre-filter, final filter and after filter banks and alarm the central site when the filters are dirty.

20. Trends:
 - a. All points shall be owner selectable to be trended.
- B. AHU Constant Volume
 1. This single zone unit has economizer dampers, hot water heating coil, and a direct expansion cooling coil.
 2. This air handler consists of an outdoor air and return air section, pre-filter, energy recovery coil, hot water heating coil, cooling coil, supply fans, and exhaust fans. The air handler will be DDC controlled. The air handler shall operate in an occupied/unoccupied mode as follows:
 - a. When indexed to the "occupied" mode, the supply and return fan shall start and the economizer dampers will modulate to a minimum outdoor air position. The energy recovery coil speed will be controlled by the manufacturer integral controls. The variable speed heat recovery wheel will be enabled when the absolute value of the difference between the return air temperature and the outdoor air temperature is greater than the heat recovery setpoint. On a drop in exhaust air temperature below the heat recovery low limit setpoint, the heat recovery loop will change modes to maintain a minimum exhaust air temperature to prevent freezing. Upon a loss of heat recovery wheel status the heat recovery wheel will attempt to automatically restart until positive status is received. The preheat will modulate to maintain the temperature setpoint. When the unit is shutdown, the preheat coil will be commanded to a present position should the outdoor air temperature fall below the low outdoor air temperature setpoint. Upon a loss of airflow, the preheat coil will be commanded to a preset position should the outdoor air temperature fall below the low outdoor air temperature setpoint. The space temperature as sensed by a room thermostat will reset the air handlers discharge temperature as measured by a discharge thermostat. The heating coil valve, economizer dampers, and coiling coil shall operate in sequence to maintain the space temperature. When the space temperature is below setpoint, the valve serving the heating coil will be full open to the coil, the economizer dampers in the minimum outdoor air position and the cooling coil shall be closed. As the space temperature approaches the space temperature setpoint, the valve serving the heating coil will first modulate closed to the coil and upon a continued rise in space temperature, the economizer dampers will modulate to the 100% outdoor air position should the mixed air temperature drop below 45 deg. F (adjustable). Should the space temperature exceed the space setpoint, and outdoor air no longer be capable of providing adequate cooling, the economizer dampers will modulate to the minimum outdoor air position and the space temperature shall energize the cooling compressor to maintain the space at setpoint.
 - b. When indexed to the "unoccupied" mode, the supply fan shall stop and the economizer dampers will close the outdoor air and the cooling shall be closed. The valve serving the heating coil will open to the coil. Should the space temperature drop below the night setpoint, the supply fan shall start, the dampers will remain in the return air position and the valve serving the heating coil will remain open to the coil. When the space temperature rises above the night setpoint, the supply fan shall stop and the valve and dampers will remain as previously described.
 3. Provide a carbon dioxide sensor located behind the return air grill which will connect to the local DDC. Upon a level of high concentration (PPM between 800-1000), a control loop shall be created in the computer to ramp the minimum position upwards until the control unit becomes satisfied, the control ramp cycle shall increase of 5% minimum every 5 minutes.
 4. Smoke detectors by Division 16 in the return and supply air streams shall de-energize the supply fan upon activation. A low temperature detector in the mixed air stream will de-

- energize the supply and return fans should temperatures fall below 38 deg. F. During either mode, all dampers and valves shall position to their fail-safe position.
5. Differential pressure switches shall be piped across each filter bank. When the differential pressure increases to a level indicating the filters are dirty, the switch contacts shall state signaling the condition to the DDC system. The DDC system will utilize the switches to confirm the fans are in the desired state (i.e. on /off).
 6. A motor operated damper shall be provided at each intake roof hood and intake louver. Each damper shall open when the zone is in "occupied" cycle and remain closed all other times
 7. A condensate float switch shall be mounted in the drain pan and open when the drain begins to fill sending an alarm to the DDC system
 8. Points List:
 - a. DO - Supply Fan and Return Fans
 - b. DI - Supply Fan and Return Fan Proof
 - c. DI - Filter Alarm
 - d. DI - Condensate Float Alarm
 - e. DI - Supply Air Smoke
 - f. DI - Return Air Smoke
 - g. DI - Low Temperature Thermostat
 - h. AI - Return Air Temperature
 - i. AI - Mixed Air Temperature
 - j. AI - ERC Discharge
 - k. AI - Space Temperature
 - l. AI - Return CO2

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.02 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.03 CLOSEOUT ACTIVITIES

- A. Demonstrate operation to Using Agency's maintenance personnel.

END OF SECTION 23 7413

ROOFTOP HVAC UNIT										
MARK	DESCRIPTION	SUPPLY FAN					RETURN/RELIEF FAN			
		CFM	MIN O.A. CFM	EXT SP IN. WC	RPM	MTR. SIZE HP	CFM	EXT SP IN. WC	RPM	MTR. SIZE HP
RTU-1	SOUTH	20,000	20,000	2.0	925	2@ 25	20,000	1.45	949	2@ 15
RTU-2	M.A.G. GYMNASIUM (Base Bid 1)	19,000	16,200	2.5	765	2@ 25	19,000	1.25	878	2@ 15
RTU-2	M.A.G. GYMNASIUM (Base Bid 2)	21,800	16,200	2.5	922	2@ 25	21,800	1.25	927	2@ 15
RTU-2	M.A.G. GYMNASIUM (Base Bid 3)	24,200	16,200	2.5	998	2@ 30	24,000	1.25	979	2@ 15
RTU-3	NATATORIUM SEATING	8,700	2,700	2.5	992	10	7,500	0.25	678	2@ 3
RTU-4	NORTH	20,000	20,000	2.0	925	2@ 25	20,000	1.45	949	2@ 15
RTU-5	ARENA / CONCOURSE	33,600	31,700	1.75	1657	2@ 30	33,600	0.25	1132	2@ 10

NOTES: 1. VAV, ENERGY RECOVERY, DISCONNECT. VARIABLE FREQUENCY DRIVE.
2. CONSTANT VOLUME, DISCONNECT.
3. MODULATING COMPRESSORS
4. RUN AROUND PUMP FOR HEATING COIL FREEZE PROTECTION

ROOFTOP HVAC UNIT (CONT)															
MARK	HEAT RECOVERY DATA							DX COOLING CAPACITY							
	SEASON	TYPE	RECOVERED MBH	EAT		LAT		TOTAL CAP. MBTUH	SENS. CAP. MBTUH	EAT		LAT		REFRIGERANT	EER / IEER
				db	wb	db	wb			db	wb	db	wb		
RTU-1	SUMMER	ENTHALPY	392.13	89.0	72.0	81.06	66.78	861	594	81.06	66.8	53.3	53.0	R-410A	11 / 17
	WINTER		1340.33	0.0	0.0	40.83	40.83			81.06	66.8	53.3	53.0		
RTU-2	SUMMER	ENTHALPY	373.45	89.0	72.0	80.27	66.24	947	648	78.35	64.8	47.4	47.2	R-410A	11 / 17
	WINTER		1279.75	0.0	0.0	44.92	44.14			78.35	64.8	47.3	47.2		
RTU-2	SUMMER	ENTHALPY	373.45	89.0	72.0	80.27	66.24	1006	723	78.35	64.8	47.3	47.2	R-410A	10.6 / 16.6
	WINTER		1279.75	0.0	0.0	44.92	44.14			78.35	64.8	48.6	48.5		
RTU-2	SUMMER	ENTHALPY	373.45	89.0	72.0	80.27	66.24	1016	763	78.35	64.8	48.6	48.5	R-410A	10.9 / 16.6
	WINTER		1279.75	0.0	0.0	44.92	44.14			78.35	64.8	48.6	48.5		
RTU-3		NONE						359.73	263.95	79.3	65.3	50.75	50.7	R-410A	10.5 / 16
RTU-4	SUMMER	ENTHALPY	392.13	89.0	72.0	81.06	66.78	799.01	586.58	81.06	66.8	53.3	53.0	R-410A	11 / 17
	WINTER		1340.33	0.0	0.0	40.83	40.83			81.06	66.8	53.3	53.0		
RTU-5	SUMMER	ENTHALPY	509.82	89.0	72.0	82.09	67.71	1334.67	981.77	81.6	67.4	54.0	53.9	R-410A	10.5 / 16
	WINTER		1800.5	0.0	0.0	35.54	35.54			81.6	67.4	54.0	53.9		

5. ENERGY RECOVERY, DISCONNECT, CONSTANT VOLUME, VARIABLE CAPACITY. PROVIDE FACTORY RELAY TO LOCK OUT COMPRESSORS DURING EMERGENCY POWER. PROVIDE INTEGRAL VIBRATION ISOLATION.
6. PROVIDE 48" HIGH ROOF CURB WITH 48" WIDE MAINTENANCE PLATFORM ON TWO SIDES WITH STAIRS. MAINTENANCE PLATFORM TO BE SUPPORTED ABOVE ROOF BY THE ROOF CURB.

ROOFTOP HVAC UNIT (CONT)											
MARK	HEATING CAPACITY							FILTER			
	FACE V. FPM	TOTAL MBH	EWT °F.	LWT °F.	GPM	WTR PD FT. W.C.	AIR PD IN.W.C.	TYPE	THICKNESS	MERV EFF.	No./SIZE
RTU-1	503.4	633.3	180	154	50	1.2	0.08	PL	2"	8	35/-
RTU-2	550	1016	180	140	30	0.8	0.25	PL	2"	8	35/-
RTU-2	550	1127	180	140	30	0.8	0.25	PL	2"	8	35/-
RTU-2	687.1	1163	180	140	30	0.8	0.25	PL	2"	8	35/-
RTU-3	400.0	437	180	145	25	0.6	0.14	PL	2"	8	35/-
RTU-4	503.4	633.3	180	154	50	1.2	0.08	PL	2"	8	35/-
RTU-5	862.5	1954.3	180	139.8	90	10.2	0.42	PL	2"	8	36/-

ROOFTOP HVAC UNIT (CONT)						
MARK	ELECTRICAL				WEIGHT LBS	NOTES
	UNIT FLA	MCA	MOP	VOLTAGE/ PHASE		
RTU-1	230	238	250	460-3	15,228	1, 4, 6
RTU-2	265	275	300	460-3	17,000	1, 3, 4, 6
RTU-2	277	287	300	460-3	17,000	1, 3, 4, 6
RTU-2	289	299	300	460-3	18,118	1, 3, 4, 6
RTU-3	78	83	100	460-3	7,100	2, 4, 6
RTU-4	230	238	250	460-3	15,228	1, 4, 6
RTU-5	344	355	400	460-3	21,763	4, 5, 6