ADDENDUM FOUR

CITY OF PHARR

PHARR NEW AQUATIC CENTER

April 3, 2012

STATE OF TEXAS
DALE RICHARD DeCLUE
84429
LICENSED
PROFESSIONAL ENGINEER
4/3/12

DECLUE AQUATIC DESIGN
TEXAS REGISTERED
ENGINEERING FIRM
F-7668

PROJECT MANUAL AND SPECIFICATIONS:

1. Section 002113 – INSTRUCTIONS TO BIDDERS: There is a liquidated damages amount of $1,000/day for each and every day past the completion date. Also, the City will pay for testing since no allowance was established by Section 012100 Allowances.
2. Section 131113 – Swimming Pool: Add the chemical controller specification (attached) for the BECSys5 controller. Replace the Equipment Schedule specification for the Aquasol controller with the BECSys5 controller (F06, F22, F35, F49).

DRAWINGS:

1. See attached Mechanical, Electrical and Plumbing items.
2. Provide the 8 ft. nominal (8'-6" actual) gate in the far northeast corner of the perimeter fence called out but not shown onj A100. See detail on SD102 referenced in this callout.
3. The pumps shown on AQ400 and called out on AQ402 as F03 and F04, but not indicated in the schedule on AQ400 are the same as the 25 hp pump F20.
4. Any place on the drawings that indicate an 8 lane by 25 yard pool or alternate for the lap pool, such as the Lap Pool design data on AQ400, please indicate that there is no alternate now but the 25 meter by 25 yard lap pool is the base bid (with the alternate data).

End of Addendum No. Four

BECSys5 Bid Specification, Rev. H with Holmes AutoPilot

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1 Water Chemistry Controller

1.1 General

The water chemistry control system shall provide continuous monitoring and control of sanitizers, oxidizers, pH, ORP, free chlorine, total chlorine, combined chlorine, temperature, system flow rate, total dissolved solids (TDS), turbidity, chemical inventory levels, surge tank water level, system pressures, and water chemistry balance calculations. Installation of the system shall be per the manufacturer's specification and no exceptions shall be allowed. A factory trained/authorized representative shall provide training to the owner. The specified controller is a BECSys5 manufactured by BECS Technology, Inc.

1.2 Certifications

The controller shall carry the following product certifications

- NSF/ANSI Standard 50;
- UL 61010-1;
- (CSA) C22.2 Number 61010-1;
- European Union Low Voltage Directive 73/23/EEC EN 61010-1;

1.3 Sensors

1.3.1 Standard Sensors

The controller shall come with pH, ORP, and temperature sensors meeting the following requirements.

1.3.1.1 pH

The controller shall provide a measurement of pH by utilizing a sensor with the following characteristics:

- 0 – 14 sensing range;
- ABS body with ½" NPT process connection;
- minimum of 32 milliliters of inorganic electrolyte gel; organic electrolytes, susceptible to breakdown in the presence of strong oxidants, shall not be considered equal;
- a porous Teflon liquid junction to provide a stable, low impedance reference contact, and to prevent fouling and clogging of the liquid junction;
- a silver/silver chloride (Ag/AgCl) reference element;
- a general purpose glass membrane pH sensing element;
- operating temperature range of 0 - 80 degrees C;
- operating pressure range of 0 - 100 psiG.

The controller shall continuously monitor, display and data log pH with 0.1 or 0.01 resolution (programmable).

1.3.1.2 ORP

The controller shall provide a measurement of ORP by utilizing a sensor with the following characteristics:

- -1000 to +1000mV sensing range;
- ABS body with ½" NPT process connection;
- minimum of 32 milliliters of inorganic electrolyte gel; organic electrolytes, susceptible to breakdown in the presence of strong oxidants, shall not be considered equal;
- a porous Teflon liquid junction to provide a stable, low impedance reference contact, and to prevent fouling and clogging of the liquid junction;
- a silver/silver chloride (Ag/AgCl) reference element;
- a solid platinum or solid gold ORP sensing element with a minimum of 1 cm^2 surface area; platinum-plated and gold-plated sensing elements, which are susceptible to abrasives, shall not be considered equal;
- operating temperature range of 0 - 80 degrees C;
- operating pressure range of 0 - 100 psig.

The controller shall continuously monitor, display and data log ORP with 1mV resolution.

1.3.1.3 Temperature

The controller shall provide a measurement of water temperature by utilizing a sensor with the following characteristics:

- 32 – 212°F (0 – 100°C) sensing range;
- 2 wire, 100 Ω resistive temperature detector (RTD) with a 0.00385 Alpha.

The controller shall continuously monitor, display and data log temperature with 1°F resolution.

1.3.2 Provide with the following Optional Sensors

The controller shall come with the following optional sensors.

1.3.2.1 Flow Sensor

The controller shall provide a measurement of pool circulation flow rate and volume by utilizing a flow sensor with the following characteristics:

- 0-8800 gpm (0-33265 liter/min) measuring range,
- paddle wheel flow sensor with a frequency output,
- dual O-ring seal,
- 25 foot cable,
- saddle,
- Flow volume: 999 trillion gallons, 1 gallon resolution; 999 trillion liters, 1 liter resolution.

The controller shall continuously monitor, display and data log flow rate with 0.1 gpm resolution.

1.3.2.2 Free Chlorine

The controller shall provide a measurement of free chlorine by utilizing an amperometric sensor with the following characteristics:

- 0.0 to 20.0 mg/l (ppm) measuring range with fully selectable scale,
- 32° - 113°F operating temperature range,
- a PVC body,
- replaceable PTFE membrane and electrolyte,
- gold cathode and silver/silver chloride anode.

The controller shall continuously monitor, display and data log free chlorine with 0.1 mg/l resolution.

1.3.2.3 Conductivity/TDS Sensor

The controller shall provide a measurement of conductivity/TDS by utilizing a sensor with the following characteristics:

- 0 to 20,000 micromhos (0 to 10,000 ppm TDS) measuring range,
- a 316 stainless steel electrode,
- PTFE insulator as well as a dual EPR O-ring seals,
- AC operation, which resists electrode plating.

The controller shall continuously monitor, display and data log conductivity/TDS with 1 micromho/ppm resolution.

1.3.3 Provide these Optional 4-20mA Sensors

The controller shall be capable of reading a total of four (4) of the following optional 4-20mA output sensors, or two (2) if conductivity/TDS sensor is used.

1.3.3.1 Turbidity Sensor

The controller shall provide a measurement of turbidity by utilizing a turbidity sensor with the following characteristics:

- operating range of 0 to 20 NTU, with 0.01 NTU resolution,
- nephelometric 90° scattered light method,
- a measuring frequency in the near-infrared light range of 880 nm
- a sapphire measuring window.

The controller shall continuously monitor, display and data log turbidity with 0.01 NTU resolution.

1.3.3.2 Pressure Transducers

The controller shall provide measurement of filter influent and/or filter effluent pressure by utilizing pressure transducer(s) with the following characteristics:

- 0 to 100 psiG measuring range,
- < ± 2% span max @ 25° C which includes linearity, hysteresis and repeatability,

- 0.25% static error band and 1.5% typical thermal error band,
- temperature compensated and fully calibrated,
- stainless steel wetted components with plumbing connections of 1/4”.

The controller shall continuously monitor, display and data log pressure(s) with 1 psiG resolution.

1.3.3.3 Vacuum Transducer

The controller shall provide measurement of strainer vacuum by utilizing a vacuum transducer with the following characteristics:

- -15 to +85 psiG measuring range,
- < ± 2% span max @ 25° C which includes linearity, hysteresis and repeatability,
- 0.25% static error band and 1.5% typical thermal error band,
- temperature compensated and fully calibrated,
- stainless steel wetted components with plumbing connections of 1/4”.

The controller shall continuously monitor, display and data log vacuum(s) with 1 psiG resolution.

1.3.3.4 Liquid Level Sensor

The controller shall provide measurement of liquid levels for surge tanks, backwash holding tanks and/or liquid chemical inventory by utilizing liquid level sensor(s) with the following characteristics:

- field configurable sensing range from 3 ft to 16 ft,
- field calibration for various tank levels, shapes and sizes,
- non-contacting sensing elements enclosed in PVC.

The controller shall continuously monitor, display and data log liquid level(s).

1.3.3.5 Total Chlorine Sensor (with Combined Chlorine Reading)

The controller shall provide measurement of total chlorine utilizing a sensor with the following characteristics:

- 0.0 to 20.0 mg/l (ppm) measuring range,
- 41° - 113°F operating temperature range,
- replaceable PTFE membrane and electrolyte,
- gold cathode.

The controller shall continuously monitor, display and data log total chlorine with 0.1 mg/l resolution. The controller shall also continuously monitor, display and data log combined chlorine (from the total chlorine and free chlorine sensors) with 0.1 mg/l resolution.

1.4 User Interface

1.4.1 Standard Display

The standard display shall be a backlit transflective LCD with 14 line x 40 alpha/numeric graphical characters that will continuously display information related to the following:

- All installed sensor readings,
- Set points, with current control status,
- All active alarms, including time activated,
- Smart menus w/ integrated on-screen help.

Contrast adjustment of the backlit LCD shall be provided through clearly marked keys on the front-panel without the need for access to internal controller circuitry. After initial adjustment, controller shall monitor internal temperature and automatically adjust contrast to prevent LCD blackout in extreme ambient temperature conditions. Controllers that do not include front-panel contrast adjustment and automatic temperature compensation shall not be considered equal.

The standard user interface shall include single-touch access to Set Points, Relay Modes, Calibrations, Menu access, and Reset Fail/Safes. An alphanumeric keypad shall be provided for ease of system configuration.

1.4.2 Color Touch-Screen Display (included)

The controller shall have an 8.4" color touch-screen NEMA 4 display that is remotely mountable from the controller(s), interfacing to the controller via Ethernet. The color touch-screen display shall be capable of providing an interface to multiple controllers on-site, with the following capabilities:

- Monitor readings, setpoints and alarms through a graphical operator's console view,
- Graph all inputs through color-coded traces, time-synchronized with system events,
- Full view and modify access to all parameters and system settings through menu tree interface,
- Password protection using the same passwords stored in the controller.

Monochrome displays shall not be considered equal.

1.5 Control Functions

1.5.1 Water Chemistry

A. **pH Control**: The controller shall continuously control pH. Chemical feed shall be configurable for feed-up, feed-down, or dual feed and either on/off or time-based proportional feed.

B. **Sanitizer Control**: The controller shall continuously control sanitizer based upon the ORP reading, the amperometric sensor, or both with a bracketed control program. Chemical feed shall be configurable for either on/off or time-based proportional feed.

C. **Bracketed Sanitizer Control**: With the amperometric ppm sensor, the controller shall be configurable for bracketed sanitizer control; The bracketed control algorithm shall allow either the ORP or ppm setpoint to be chosen as the primary control point, while using other parameter to create a secondary boundary (min and max settings) that must be maintained in addition to the primary control point.

D. **Sanitizer Booster Feed**: The controller shall have a sanitizer booster program with selectable ORP and/or ppm set points with separate ending set points, allowing the option of the booster sanitizer to control to a lower set point while the primary system can recovers.

E. **Combined Chlorine/UV Control**: The controller shall provide turndown control of a UV system based upon combined chlorine set point; when combined chlorine is below set point the UV system will be turned down to decrease energy consumption and extend bulb life. A Fireman Cycle feature shall turn off the UV relay 0 to 60 minutes (settable) prior to backwash initiation or recirculation pump shutdown. The UV control algorithm shall include an Energy Conservation mode, with on/off set time and secondary set point.

F. **Superchlorination**: The controller shall have a programmable superchlorination function, based ORP or ppm superchlor setpoint, which is triggered manually.

G. **Dechlorination**: The controller shall have a programmable dechlorination function, based upon ORP or ppm dechlor setpoint, which is triggered either manually or by the completion of the superchlorination function.

H. **LSI & RSI**: The controller shall compute the Langelier Saturation Index and the Ryznar Saturation Index based upon current inputs and the Ca Hardness and Alkalinity entered by the operator.

1.5.2 Expanded

A. **Flow Monitoring**: The controller shall continuously monitor, display, and datalog system flow, maintaining a total flow volume. A low flow alarm shall be operator settable, which can be programmed to disable chemical feeds.

B. **Heater Control**: The controller shall perform on/off control of a heater based upon an operator settable temperature set point. A Fireman Cycle feature shall turn off the heater 0 to 60 minutes (settable) prior to recirculation pump shutdown. Heater control algorithm shall include an Energy Conservation mode, with on/off set time and secondary temperature set point.

C. **TDS Control**: The controller shall provide selectable control of TDS through simultaneous draining of water prior to filtration and addition of fresh make-up water.

D. **Enzyme Feed**: The controller shall include a programmable daily timed feed with start and end time, feed duration, and number of cycles to allow multiple feed cycles per day.

E. **Turbidity Control**: The controller shall feed polymer based upon turbidity setpoint.
F. **Chemical Inventory Monitoring**: The controller shall continuously monitor, display, and data log liquid pH adjuster and sanitizer inventory levels. The controller shall include low chemical level alarm points for each chemical being monitored.
G. **Surge tank Monitoring**: The controller shall continuously monitor, display, and data log surge tank levels.
H. **Autofill**: The controller shall automatically control a water makeup relay to add makeup water to maintain pool level set point, based upon surge tanks (or equivalent) level, with an overfill delay feature. The controller shall provide a programmable alternate set point (4 event 28 day timer).
I. **Sensor Wash**: The controller shall include a programmable sensor wash with start and end time, feed duration, and number of cycle to allow multiple feed cycles per day.

1.5.3 Energy Conservation

A. **Alternate Setpoints**: The controller shall have alternate Sanitizer, Heater, and Autofill setpoints, based upon a 4 event 28 day timer.
B. **Energy Conservation Mode**: The controller shall have the capability to disable all mechanical and chemical functions during programmed conservation cycle. The Energy Conservation Mode shall include the ability to periodically monitor and satisfy all operation requirements based upon a programmed time schedule.
C. **Provide with the Holmes AutoPilot System to monitor up to 30 points of utility usage on the project, reporting via the internet**.

1.5.4 Main Recirculation Pump

1.5.4.1 On/Off Control with Relay

Controller shall provide the capability to interface to and control a recirculation pump with a programmable relay. The controller shall include the following capabilities, available as appropriate based upon installed sensors and implemented features:

A. **Fireman Switch**: The following events shall satisfy Fireman Switch timing requirements prior to turning off recirculation pump:
    a. Energy Conservation mode (24 hr, 7 day function)
    b. Manual off
B. **Immediate**: The following events immediately turn off recirculation pump, regardless of Fireman Switch timing requirements:
    a. Surge Tank Level Low Alarm: Turn off pump immediately (surge tank is almost empty)
    b. Strainer Vacuum High Alarm: Turn off pump immediately (possible entrapment)
    c. Emergency shut down, triggered by front-panel Emergency Off: Turn off pump immediately (per Operator)

1.5.4.2 Total Dynamic Head (TDH)

Controller shall provide the capability to continuously monitor the Total Dynamic Head (TDH) of the main recirculation pump, directly calculated by the controller from recirculation pump influent vacuum and filter influent pressure transducers. TDH shall be displayed on the user interface and recorded in data logs, with user-programmable High and Low TDH Alarm settings.

1.5.4.3 VFD Interface with 4-20mA signal

Controller shall provide the capability to interface to and control a recirculation pump equipped with a Variable Frequency Drive (VFD) through a 4-20mA signal. The controller programming shall allow the operator to manage the VFD entirely from the water chemistry controller, by providing the following capabilities:

- Programmable setpoint specified as either flow rate, effluent filter pressure, or fixed setting,
- Four programmable operator-triggered alternate profiles (“Manual Turndowns”),
- Four programmable scheduled alternate profiles (“Scheduled Turndowns”),

- Override setting for backwash,
- Ramp up and ramp down settings,
- Minimum output setting.

Remote access to current VFD status and all VFD parameters shall be provided through the BECSys for Windows PC software provided with controller. The name of each alternate profile shall be changeable by the operator, so that VFD menus and data log entries are intuitive and recognizable by the users of the system.

Systems that do not provide both local and remote management of the VFD through the water chemistry controller shall not be considered equal.

1.6 Control Outputs

1.6.1 Relay Outputs

The controller shall come with a total of 4 integral line or dry contact 5A solid-state relay outputs capable of switching 3A under all normal operating conditions, accounting for the effects of the temperature gradient inside the NEMA 4X enclosure. Systems that utilize relays that are not de-rated must submit an engineering evaluation justifying the use of relays at their full, optimal-condition capacity.

1.6.2 Expansion Relay Outputs (optional)

The controller shall be capable of expanding the number of relay outputs available by adding up to 3 Solid State Relay NEMA 4X expansion modules, each providing 5 integral 5A solid state dry contact or line powered relays capable of switching 3A under all normal operating conditions. Systems that utilize relays that are not de-rated must submit an engineering evaluation justifying the use of relays at their full, optimal-condition capacity.

1.6.3 4-20mA Outputs (optional)

The controller shall come with four separately isolated 4-20mA output signals with a load capacity of 440Ω per output channel. Each output signal shall be independently configurable for either of the following functions:

- Any enabled input, scaled between two operator-defined end points,
- VFD control of recirculation pump.

1.7 Safety Features

1.7.1 Manual-On limit

The controller shall have built-in limits to the amount of time any relay control output may be forced on (i.e. in Manual On mode). This is an important safety feature to prevent control outputs from inadvertently being left on after service or diagnostics.

1.7.2 High/Low Alarm Settings & Control Lockouts

The controller shall have programmable high and low alarm settings for pH, ORP, PPM, temperature, low flow & no flow and chemical overfeed, turbidity, pressure & vacuum, surge tank levels, chemical inventory.

The controller shall have a programmable lockout of sanitizer feed upon pH high or low alarm.

1.7.3 No Flow Alarm & Flow Restored Delay

The controller shall activate a No Flow alarm when the dedicated sample stream flow switch indicates there is insufficient flow through the sample stream. This No Flow alarm shall lockout all chemical feed control operations.

The controller shall include a Flow Restored Delay, which shall extend the No Flow lockout user-programmable amount of time after the No Flow alarm ends (i.e. flow is restored). This feature is necessary to assure that the system has valid, stable sensor readings of circulating water prior to making chemical feed control decisions.

1.7.4 Feed Limit Alarms

The controller shall trigger a FailSafe alarm if a chemical feed relay remains on longer than the programmable Feed Limit Timer. Chemical feeds shall automatically be disabled if the corresponding reading goes into a FailSafe alarm condition.

1.7.5 Emergency Off

The controller shall have a dedicated Emergency Off button on the front panel of the system, which immediately halts all chemical feeds and control outputs when pressed. This feature shall be password protectable, which shall require entry of one of the Security passwords.

1.7.6 Safety shield

The controller shall include a safety shield or other mechanism for allowing fuse replacement without access to high voltage circuitry or wiring.

1.8 Security

The controller shall have three security password levels: six for operators, two for managers and one for the distributor providing for a history of access identified by the user.

1.9 Data Logging

The controller shall have 512K battery backed-up RAM for input level recording and events. All input level shall be recorded for 10 to 56 days depending on sample rate (2 to 10 minutes).

The controller shall record and maintain the latest 1100 events over a maximum of 14 days recording all alarms, parameter changes, user logins, and operational cycles related to all control features.

1.10 Local Alarms Indicators

The controller shall signal all alarm conditions with the following indicators:

- a bright red flashing LED on the front of the controller,
- activation of a master alarm signal provided as a dry contact relay enabling the use of 0-240 VAC alarms, and
- each active alarm listed on the LCD display along with time activated.

1.11 Remote Communication, Access & Alarm Notification

1.11.1 Ethernet

The controller shall come with a standard, integral 100BaseT Ethernet connection. The controller shall be capable of providing Remote Access via PC with Ethernet connection and Alarm Notification via email or text message via an Ethernet connection to the Internet.

1.11.2 Wi-Fi (optional)

The controller shall come with a BECSys Wi-Fi module, which allows wireless integration into existing Wi-Fi networks.

1.11.3 Modem (optional)

The controller shall come with a 57,600 bps data modem. The controller shall be capable of providing Remote Access via PC with modem connection and Alarm Notification via pager or fax.

1.11.4 Remote Access

The controller manufacturer shall provide BECSys for Windows™ graphical remote operation software, for interactive connection to the controller from a PC. Remote operation software shall be Vista-compatible, and have all of the following operational modes:

A. Site Data Base – for organizing and accessing multiple controllers on site, or at multiple sites,
B. Graphical Operator's Console – to display current readings, setpoints, alarm points, Ryzner in an easy-to-read graphical mode,
C. Data Log Graphing – to review data logs with time-synchronized event data; data log traces shall be configurable, with color and line style selectable by operator,
D. Full Menu Tree – All system parameters accessible through a full menu tree interface.
E. Auto-Polling – to allow automatic download of data logs from all controllers in site database.

1.11.5 Alarm Notification

The controller shall be capable of providing alarm notification to 8 different recipients. Each recipient shall be individually configurable to receive alarm notification by one of the following methods.

A. **Email**: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.
B. **Text Message**: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.
C. **Fax**: Notification message shall include system type, serial number, location, system ID, and all active alarm including the date and time each alarm was triggered.
D. **Numeric Pager**: Notification message shall include callback number. Controller shall acknowledge pager notification when callback is received, and not notify subsequent recipients programmed for pager notification.

1.12 Enclosure

The controller shall be housed in a NEMA 4X polycarbonate enclosure.

1.13 Flow Cell

1.13.1 PVC flow cell

The flowcell shall have a PVC body with two ½" NPT ports for pH and ORP sensors, two ¼"NPT ports for temperature sensor and sensor wash acid injection, and a clear acrylic front viewing window. The flowcell design shall provide precise sample flow rate and water velocity regulation past the probes. The flowcell shall come provided with PVC ½" isolation ball valves, PVC ¼" wet test valve and standard reed or optional rotary flow switch.

Each flowcell shall be equipped with a pressure-sensing device. The pressure sensor shall consist of a compound pressure/vacuum gauge manufactured in stainless steel, 2 ½" diameter, liquid filled with an operating pressure range of 0 to 60 psig and vacuum of 0 to –30 in./ Hg.

1.13.2 Teflon flow cell (optional)

The flowcell shall have a teflon body with two ½" NPT ports for pH and ORP sensors, two ¼"NPT ports for temperature sensor and sensor wash acid injection, and a clear acrylic front viewing window. The flowcell design shall provide precise sample flow rate and water velocity regulation past the probes. The flowcell shall come provided with PVC ½" isolation ball valves, PVC ¼" wet test valve and standard reed or optional rotary flow switch.

Each flowcell shall be equipped with a pressure-sensing device. The pressure sensor shall consist of a compound pressure/vacuum gauge manufactured in stainless steel, 2 ½" diameter, liquid filled with an operating pressure range of 0 to 60 psig and vacuum of 0 to –30 in./ Hg.

1.14 Warranty, Start-up and Manuals

Controller shall be covered by a standard manufacturer's 5 year warranty.
Standard sensors shall be covered by a standard manufacturer's 2 year warranty.
Optional sensors and flow cell components shall be covered by a standard manufacturer's 1 year warranty.

The control system shall be provided with on-site start-up, on-site operator training, and 1 year on-site warranty service performed by a representative trained and authorized by the controller manufacturer.

Manufacturer shall supply an Operation and Maintenance Manual describing features, operating instructions, maintenance procedures and replacement parts.

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4/3/12

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ADDENDUM #4

1. Modify packaged rooftop unit schedule to specify new Aon on RTU-1 and RTU-2 which include natural gas heating sheet M103.
2. Modify natural gas pipe size to supply Aon units on plans sheet P101 and on gas riser sheet P103.
3. Updated specification section 15736 "Packaged Rooftop Air Conditioning Units" to accommodate the new Aon units specify.
4. Updated specification section 16001 "MEP System Requirements".

LEDUC ENGINEERING INC.

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04/03/12

F-8517

Guide Specifications - RN Series Rooftop Units

Packaged Rooftop Units / Outdoor Air Handling Units

Part 1 - General

1.01 Related Documents

1.02 General Description

A. This section includes the design, controls and installation requirements for packaged rooftop units / outdoor air handling units.

1.03 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 shall be certified in accordance with ANSI Z21.47b/CSA 2.3b and ANSI Z83.8/CSA 2.6, Safety Standard Gas-Fired Furnaces.

E. 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.

F. Unit shall be safety certified by ETL and ETL US listed. Unit nameplate shall include the ETL/ETL Canada label.

1.04 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.

1.05 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 instructions 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.

1.06 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.

Part 2 - Products

2.01 Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. Engineered Air
3. Munters
4. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. Variable capacity compressors with 10-100% capacity.
   c. Direct drive supply fans
   d. Double wall cabinet construction
   e. Insulation with a minimum R-value of 13
   f. Stainless steel drain pans
   g. Hinged access doors with lockable handles
   h. All other provisions of the specifications must be satisfactorily addressed

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, reheat coil, gas heaters, and unit controls.

2. Unit shall be factory assembled and tested including leak testing of the DX 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 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 D-1929 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, heaters, 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 base shall be fabricated of 1 inch thick double wall, impact resistant, rigid polyurethane foam panels.

12. 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, dampers, and economizer shall all include the corrosion protection.

C. Electrical

1. Unit shall be provided with standard power block for connecting power to the unit.

2. 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, unhoused, 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. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

E. 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 6 row high capacity.

   c. Coils shall be helium leak tested.

   d. Coils shall be furnished with factory installed thermostatic expansion valves.

   e. Coils shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6,000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year non-prorated warranty.

F. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.

2. Compressors shall be scroll type with thermal overload protection, independently circuited and carry a 5 year non-prorated warranty, from the date of original equipment shipment form 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 thermostatic 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. Lead refrigeration circuits shall be provided with hot gas reheat coil, modulating

valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

9. First capacity stage shall be provided with on/off condenser fan cycling and adjustable compressor lockout to allow cooling operation down to 35°F.

G. 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 constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.

   c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

   d. Coils shall be helium leak tested.

   e. Coils shall have a flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6,000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year non-prorated warranty.

H. Gas Heating

1. Unit shall include a natural gas furnace with 4 stages of capacity control.

2. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.

3. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.

4. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.

5. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.

I. 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.

J. Outside Air/Economizer

1. Unit shall include 100% motor operated outside 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 15 CFM of leakage per sq. ft. of damper area when subjected to 2 inches w.g. air pressure differential across the damper. Damper assembly shall be controlled by spring return, 2 position actuator. Unit shall include outside air opening bird screen and outside air hood with rain lip.

K. Controls

1. Factory Installed and Factory Provided Controller

   a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.

   b. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.

   c. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.

   d. Make Up Air Controller

      1. Unit shall modulate cooling with constant airflow to meet ventilation outside air loads. Cooling capacity shall modulate based on supply air temperature.

      2. With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet outside air humidity loads and prevent supply air temperature swings and overcooling of the space.

      3. Unit shall modulate heating with constant airflow to meet ventilation outside air loads. Heating capacity shall modulate based on supply air temperature.

   e. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad or interface module with touch screen. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available

from a single unit. Connection between unit controllers shall be with a modular cable.

Part 3 - Execution

3.01 Installation, Start Up, Operation, and Maintenance

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Factory Authorized Representative shall provide on-site Start Up of the rooftop package unit and associated controls. A startup report shall be provided detailing the completion of work and initial settings. Startup and startup report to the owner shall include the following items.

i. Compressors and Refrigerant

ii. Condenser Fans

iii. Economizer

iv. Electrical Power

v. Factory Installed Controls

vi. Factory Provided Field Installed Sensors

vii. Mechanical Cooling and Dehumidification System

viii. Supply Fans

D. Owner will schedule start up appointment with Factory Authorized Representative.

E. Factory Authorized Representative shall be located within 50 miles of jobsite.

F. Factory Authorized Service Technician shall be located within 50 miles of jobsite.

3.02 Factory Authorized Representative shall provide on-site training to the owner. Training shall cover operation and maintenance of the package unit and all factory provide control items. The owner shall schedule the time and date directly with the Factory Authorized Representative.

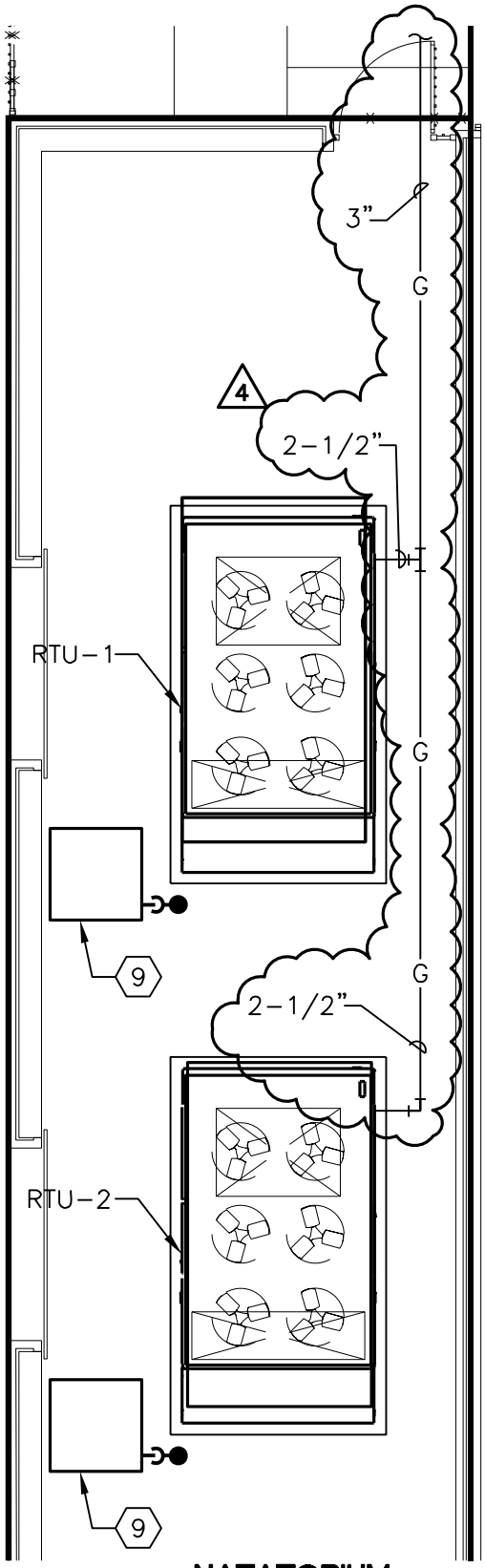
MEP SYSTEM REQUIREMENTS

I. The Plumbing Contractor shall be licensed in the State of Texas to perform the plumbing work contained in these documents and shall submit a copy of his license with the Division 15 submittal data. The Plumbing Contractor shall be responsible for the furnishing and installation of all equipment and systems covered by specifications and drawings.

II. The Electrical Contractor shall be a licensed Master Electrician and shall submit a copy of his license with the Division 16 submittal data. The Electrical Contractor shall be responsible for the furnishing and installation of all equipment and systems covered by specifications and drawings.

III. All trades shall coordinate their work with the other trades at the job site. The order for installation priority is as follows:

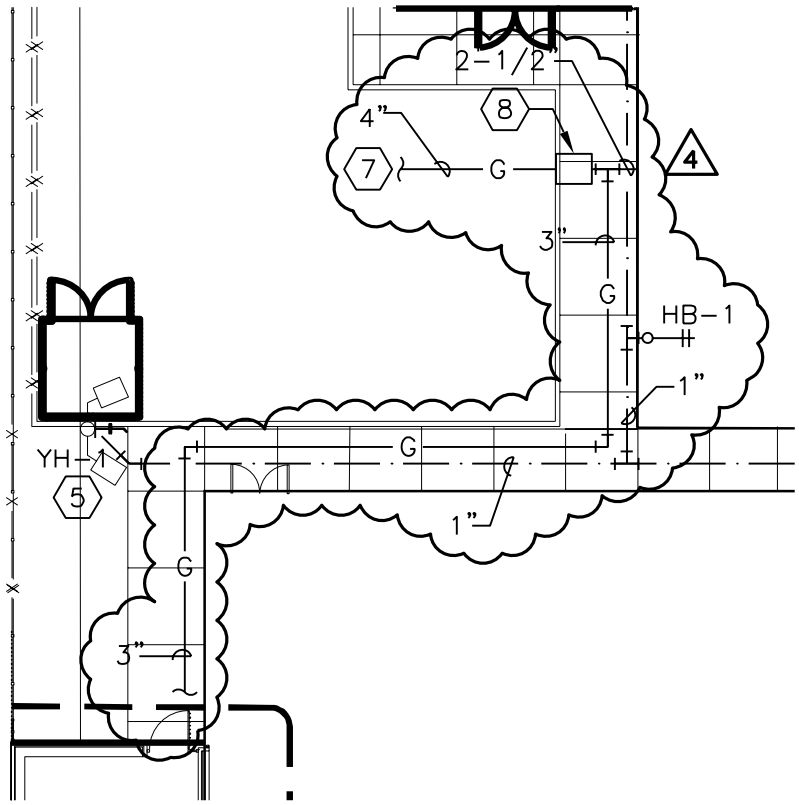
First priority – Plumbing systems
Second priority – Mechanical system
Third priority – Electrical Systems



NATATORIUM

2 PLUMBING PLAN

SCALE: 1/8" = 1'-0"



SITE PLAN

1 PLUMBING PLAN

SCALE: 1" = 20'

LEDUC ENGINEERING INC.

STATE OF TEXAS
J. A. GUADARRAMA SIERRA
107961
LICENSED
PROFESSIONAL ENGINEER

04/03/12

F-8517

4 ADDENDUM 4: 04/03/2012

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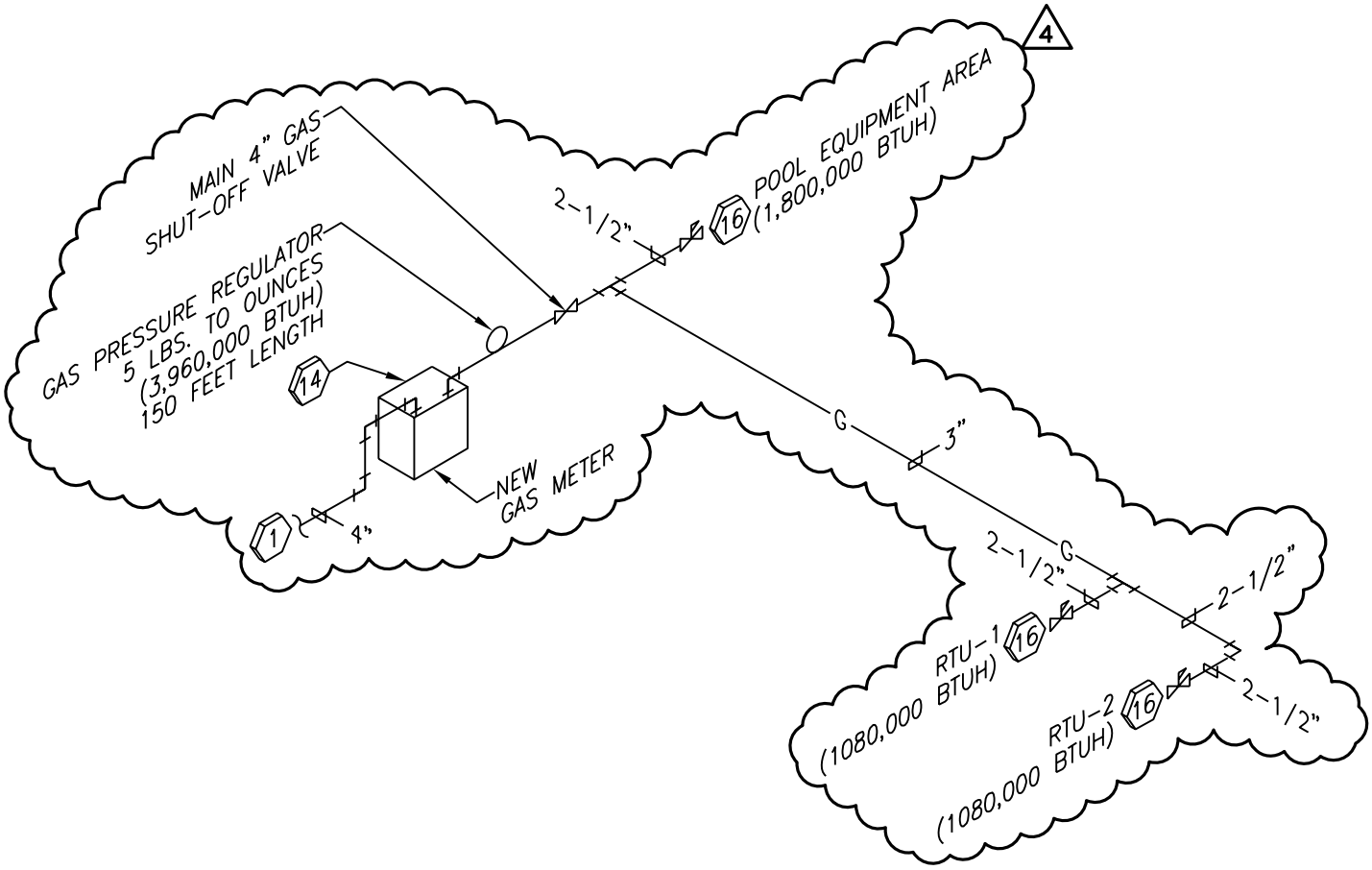
PROJECT:

PHARR
SWIMMING POOLS
PHARR TX.

DRAWN:	LEDUCCAD
CHECKED:	H.LEDUC
JOB NO.	1160
DATE:	04/03/12
DRAWING NO.	P101



NOTE: PLUMBING CONTRACTOR SHALL VERIFY EXACT BTUH REQUIRED WITH NATATORIUM GAS EQUIPMENT PRIOR TO INSTALLATION.

1 GAS RISER

NOT TO SCALE

KEY NOTES:

1. REFER TO SHEET P101 FOR CONTINUATION.
14. GAS METER, GAS PRESSURE REGULATOR, AND MAIN BUILDING SHUT OFF VALVE.
16. GAS COCK WITH FLEXIBLE CONNECTION TO EQUIPMENT. REFER TO EQUIPMENT CONNECTION DETAIL.

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DRAWING NO.	P103

4

PACKAGED ROOFTOP UNIT SCHEDULE

UNIT NO.	NOMINAL TONS	TOTAL CFM	OUT. AIR CFM	E.S.P. (W.G.)	TOTAL COOL. CAP. (MBH)	SENS. COOL. CAP. (MBH)	O.A. TEMP (°F)	ENTERING db/wb(°F)
RTU-1	50	15000	---	1.5	700.93	488.39	98	83/70.23
RTU-2	50	15000	---	1.5	682.77	484.03	98	83/70.23

COOLING						HEATING	
COMPRESSOR R.L.A. (ea.)	COND. FAN F.L.A. (ea.)	FAN F.L.A.	COMB. FAN F.L.A.	ELEC. CHAR	FUEL	INPUT	RE-HEAT COIL
(4) 18.6	(6) 2.3	11.0	0.9 (4)	460V/3ø	NAT. GAS	1080 MBH	301 MBH
(4) 18.6	(6) 2.3	11.0	0.9 (4)	460V/3ø	NAT. GAS	1080 MBH	301 MBH

MCA	MOCP	ERR	WEIGHT LBS. UNIT ONLY	REF. SPEC. MODEL: AAON	REMARKS
115	125	11.4	6420	RN-050-3-0-EB09-3E4	1,2,3,4
115	125	11.4	6420	RN-050-3-0-EB09-3E4	1,2,3,4

NOTES:

1. PROVIDE 36" FACTORY ROOF CURB, TO BE MOUNTED DIRECTLY TO CONCRETE PAD FOR RTU.
2. PROVIDE 2" THICK FILTERS.
3. PROGRAMMABLE THERMOSTATS.
4. MECHANICAL CONTRACTOR SHALL CONFIRM ELECTRICAL REQUIREMENTS WITH ELECTRICAL CONTRACTOR.

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PROJECT:
PHARR SWIMMING POOLS
PHARR TX.

DRAWN: LEDUCCAD
CHECKED: H.LEDUC
JOB NO. 1160
DATE: 04/03/12
DRAWING NO.
M103