



OFFICE OF THE PURCHASING AGENT

TOWN OF ARLINGTON
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DATE: April 25, 2013

TO ALL BIDDERS

BID NO. 13-04

SUBJECT: 6th Floor Office Renovation/ Arlington High School

ADDENDUM NO. 6

TO WHOM IT MAY CONCERN:

With reference to the bid request relative to the above subject, please note the following:

REBID: FILED SUB-BID - HVAC

BID DEADLINE: MAY 9, 2013 11:00 A.M.

SEE ATTACHED (26 PAGES)

BIDDER MUST ACKNOWLEDGE ADDENDUM WITH SUBMISSION

All other terms, conditions and specifications remain unchanged.

Very truly yours,

Town of Arlington

Domenic R. Lanzillotti
Purchasing Officer



DATE: April 25, 2012

ADDENDUM NUMBER SIX

6TH FLOOR OFFICE RENOVATION
ARLINGTON HIGH SCHOOL

This addendum becomes an integral part of the bid documents and must be acknowledged on the bid form.

ATTACHMENTS

Invitation to Re-Bid
Filed Sub-Bid Form
Sketch SKM-2
Sketch SKM-3

CHANGES TO THE DRAWINGS:

- AD6-1 DRAWING M0.1 – HVAC LEGEND SCHEDULES AND GENERAL NOTES:**
A. **Incorporate** the clarifications and/or revisions on the following sketch: SKM-2.
- DRAWING M1.2 – HVAC 6TH FLOOR VARIABLE REFRIGERANT FLOW AND PIPING LAYOUT:**
A. *Incorporate* the clarifications and/or revisions on the following sketch: SKM-3.
- DRAWING M3.1 – HVAC CONTROL DIAGRAM:**
A. **Note** drawing has been changed for HVAC re-bid. Updated drawing is included in the construction document.

CHANGES TO THE SPECIFICATION:

- AD6-2 SECTION 00 11 12R – Invitation to Re-Bid/ Notice to Contractors**
Insert Invitation to Re-Bid for Section 23 00 00 HVAC.
- AD6-3 SECTION 00 41 02R – Forms for Filed Sub Bid**
Replace Form for Filed Sub Bid dated March 27, 2013 with new Form for Filed Sub Bid dated April 23, 2013.
- AD6-4 SECTION 230000 HVAC**
A. Paragraph 1.26 Phasing, Add the following sub-paragraph:
C. At the HVAC contractor's option the HVAC scope of work can be performed in two phases, Phase I and Phase II.
Under Phase I the following shall be provided:
1. Ventilation air ductwork shown on the drawings and as referenced in 230000 Article 1.1.C.

2. Provide all ductless cooling system refrigeration and condensate drain piping, insulation and power wiring. The DCU system rough-in work shall be installed and ready for final installation of ductless cooling terminal units which are to be installed with final connection as part of Phase II.

Under Phase II the following shall be provided:

1. Provide DCU evaporator and condensing unit installations, including associated controls, final piping and power wiring connections.
 2. Provide rooftop unit installation including final ductwork, piping and controls.
 3. Refer to Project Addendum No. 4 Section 01 11 00.B for project phasing timeframe.
- B. Paragraph 2.7 Rooftop Units, Sub-Paragraph F, Add the following sub-paragraph:
5. RTU controller hardware/software shall be specifically designed to provide building device-to-enterprise applications, Internet-enabled products and Internet-based automation systems.
 - a. Standard Control Features:
 - Supply Air Temperature Control
 - Space Temperature Sensor with Override
 - Morning Cool-Down w/Return Air Temperature Sensor
 - Morning Warm-Up w/ Return Air Temperature Sensor
 - Supply Duct Static Pressure Control
 - Supply Fan Status
 - Weekly, Daily & Holiday Scheduling
 - Alarms and Trend Logging
 - WEB-UI (Web User interface)
 - b. Unit Features:
 - Staged or Variable Capacity Compressor Cooling
 - Enthalpy Fully Modulating Economizer with or without Power Exhaust
 - Heat Wheel with Defrost and optional Bypass Dampers
 - Modulating Hot Gas Reheat
 - CO2 Monitoring Only
 - Filter Status
 - Condenser Head Pressure Control
 - Mixed Air Temperature Sensor for monitoring purposes
 - Compressor and Fan Status Current Sensors
 6. VAV Unit Overview
 - a. The primary mode of operation in the RTU VAV system is cooling. Factory supplied VFD's shall be used to vary the speed of the supply fan to maintain a field defined supply Duct Static Pressure Setpoint while maintaining a constant Supply Air Temperature. Hot water heat shall be used for Morning Warm-Up purposes and discharge air heating.
 - b. The following sensors provided (provided by RTU manufacturer unless noted otherwise) at a minimum for all VAV units.

- Supply Air Temperature Sensor
- Outside Air Temperature Sensor and Humidity
- Supply Air Duct Static Pressure Sensor
- Return Air Temperature Sensor
- Space Temperature Sensor with Override (furnished by RTU manufacturer, installed by ATC Contractor)

7. Unit Schedule or Occupied/Unoccupied Schedule

- a. The unit shall have the ability to be placed in the Occupied or Unoccupied mode of operation by one of the following three manners.
- Local schedule (Default) – When this option is selected, the unit has an internal schedule to determine when the unit will operate. This schedule is maintained by the local time clock in the controller and requires that the time be set accordingly.
 - Remote Start/Stop – The unit has the ability to be forced into occupied operation with the use of an external dry contact closure. If the unit receives a remote occupied input, it will remain in occupied operation until that status changes.
 - Networked schedule – When this option is selected, the unit will utilize network points for occupancy. These network points are fed to the system via the Building Automation System (Advanced Energy Management). If the network fails, the unit will operate to the last written values. To revert to the local schedule the network must be disabled.
- b. Provide a local Space Temperature Sensor (furnished by RTU manufacturer, installed by ATC Contractor) with an unoccupied override button which (if enabled) can be used to put the system into occupied mode for an adjustable period.

8. Modes of Operation

- a. Each of the modes of operation are operated individually and do not operate simultaneously.
- b. The Modes of operation are:
- Cooling
 - Morning Cool-Down
 - Morning Warm-Up
 - Dehumidification
 - Ventilation

9. Cooling Mode

- a. The unit will provide cooling when the supply air temperature is above the Cooling Supply Air Temperature Setpoint. The unit will then operate to maintain the Cooling Supply Air Temperature Setpoint at the supply air sensor. The unit will leave cooling mode when the supply air temperature falls below the Cooling Supply Air Temperature Setpoint

minus $\frac{1}{2}$ the Cooling Supply Air Temperature Setpoint Differential. The supply fan VFD will modulate between the Supply Fan Minimum Position and 100% to maintain the Duct Static Pressure Setpoint.

- b. Cooling mode with modulating (Digital) Compressor
- The supply fan is operating and run status is confirmed.
 - No alarm conditions are present which prevent unit operation.
 - The outside air temperature is above the Cooling Lockout Setpoint. Factory default is 40°F and cooling lockout setpoint is adjustable from 25°F to 65°F.
 - The economizer is not enabled or the Econ Damper Cooling Lockout Time has expired.
 - In units containing both modulating and on/off type compressors, the unit will modulate the digital compressor(s) first and then stage the additional on/off compressors as necessary to satisfy the supply cooling setpoints.
 - Compressor minimum on and off timers and inter-stage time delays are in effect and may cause overshoot of the setpoint if not set correctly. These timers are adjustable but have minimum values to protect the compressor from excessive cycling.

10. Morning Cool-Down Mode

- a. The unit provides Morning Cool-Down on a transition from unoccupied to occupied mode and if the return temperature rises above the Morning Cool-Down Setpoint plus $\frac{1}{2}$ of the Morning Cool-Down Differential. The unit will leave morning cool-down if the unit enters Occupied Mode for the Maximum Morning Cool-Down Time or if the return air temperature falls below the Morning Cool-Down Setpoint minus $\frac{1}{2}$ of the Morning Cool-Down Enable Differential.
- b. Morning Cool-Down mode
- The supply fan operates at 100% speed and the run status is confirmed for two minutes.
 - No alarm conditions are present which prevent unit operation.
 - The unit outdoor air damper remains closed during this period.
 - Once the return temperature rises above the Morning Cool-Down Setpoint the unit enables the morning cool-down mode and modulates to maintain a Cooling Supply Air Temperature Setpoint until the Morning Cool-Down Setpoint is reached.

11. Morning Warm-Up Mode

- a. The unit provides Morning Warm-Up Heat on a transition from unoccupied to occupied mode and if the return temperature falls below the Morning Warm-Up Setpoint minus $\frac{1}{2}$ of the Morning Warm-Up Differential. The unit will leave morning warm up if the unit enters Occupied Mode for the Maximum Morning Warm-Up Time or if the

return air temperature rises above the Morning Warm-Up Setpoint plus $\frac{1}{2}$ of the Morning Warm-Up Enable Differential.

12. Hot water Morning Warm-Up Heat

- a. The output of the controls to a field supplied & mounted hot water valve is 0-10Vdc output.
 - The supply fan operates at 100% speed and the run status is confirmed for two minutes.
 - No alarm conditions are present which prevent unit operation.
 - The unit outdoor air damper remains closed during this period.
 - Once the return temperature falls below the Morning Warm-Up Setpoint the unit enables the morning warm-up heat mode and modulates the hot water valve (via 0-10Vdc) to maintain a Heating Supply Temperature Setpoint until the Morning Warm-Up Setpoint is reached.
- b. If the mixed air temperature sensor reads below 32 deg. F an alarm will be generated. The unit controls will send an output to open a field provided hot water or steam valve and close the outside air damper to assist in freeze protection of the coil. It should be noted that the unit controls do not operate re-circulating water pumps, boilers or provide anti-freeze protection in the water system; this is the responsibility of the building owner. The unit will return to normal operation when the mixed air sensor is above 40°F. This alarm is called the Mixed Air Low Limit alarm and can be disabled.
 - Mixed Air Averaging temperature sensor factory installed for freeze protection.

13. Condenser Fan Head Pressure Control

- a. Condenser fans will start at the Condenser Fan Enable Setpoint. Fans start at 33% airflow and modulate to maintain the Discharge Pressure Cooling Setpoint during cooling and the Discharge Pressure Dehumidification Setpoint during dehumidification. The fan will modulate between Condenser Fan Minimum Position and 100%. If the pressure drops below the Condenser Fan Disable Setpoint the fans will turn off and stay off until the Condenser Fan Enable Setpoint is reached. The following parts are factory provided with this option:
 - Discharge Pressure Transducer for each circuit.

14. Dehumidification Mode

- a. For dehumidification mode, VAV controls require the unit to include: Modulating Hot Gas Reheat. The supply fan VFD will modulate between

the Supply Fan Minimum Position and 100% to maintain the Duct Static Pressure Setpoint.

- b. The following sensors will be factory provided and installed.
 - Return humidity sensor (factory installed)
 - Suction pressure transducer (factory installed)
- c. The unit will enter dehumidification mode when the return air dewpoint rises above the Dehumidification Enable setpoint plus $\frac{1}{2}$ of the Dehumidification Enable Differential setpoint. The unit will leave the Dehumidification mode when the return dewpoint falls below the return Dehumidification Enable setpoint minus $\frac{1}{2}$ of the Dehumidification Enable Differential setpoint.
- d. A suction pressure transducer shall be provided which is used to stage or modulate the compressors to a lower evaporator coil face temperature to provide increased dehumidification capabilities. Units with four or more compressors will be equipped with a suction pressure transducer on the first and second refrigeration circuits.
- e. Dehumidification Operation
 - The supply fan is on and the run status is confirmed.
 - No alarm conditions are present which prevent unit operation.
 - The outside air temperature is above the cooling lockout setpoint. Factory default is 40°F and cooling lockout setpoint is adjustable from 25°F to 65°F.
 - The dehumidification loop will maintain an Evaporator Coil Temperature Setpoint by modulating and/or staging the compressor(s). The compressor(s) will be de-energized after the minimum run time(s) has expired.
 - The unit controls will also utilize an optional Hot Gas Reheat coil to maintain the Supply Reheat Temperature Setpoint.

15. Ventilation Mode

- a. Ventilation mode occurs in occupied mode whenever the unit has satisfied the heating, cooling or dehumidification requirements and when the outside air conditions permit. The supply fan VFD will modulate between the Supply Fan Minimum Position and 100% to maintain the Duct Static Pressure Setpoint.

16. Supply Air Temperature Setpoint Reset (SAT Reset)

- a. When enabled, the SAT Reset function allows the Cooling and Heating SAT Setpoints to be proportionally adjusted based on the space temperature. As the Space Temperature Sensor value moves within the High and Low Space Temperature Reset Setpoint range, the SAT Setpoint proportionally resets to a configurable Low and High SAT Setpoint range. When the Space Temperature Sensor is at the high value the SAT Setpoint will be at the low value and vice versa.

17. Full Modulating Economizer Control

- a. This optional damper assembly utilizes a modulating damper actuator with a minimum outside air position setpoint and either sensible or enthalpy economizer controls. The economizer damper will open to the Outside Damper Minimum Position during the occupied period and close completely during the unoccupied period.
- b. Economizer control with Enthalpy limit
 - The unit controls will use the economizer to offer free cooling to the space when the calculated outside air falls below the Enthalpy Economizer Enable setpoint minus $\frac{1}{2}$ of the Enthalpy Economizer Differential and the outside air temperature is below the space temperature. The outside air enthalpy value is calculated using the outside air humidity transmitter and outside air dry bulb temperature sensor. The economizer damper will modulate to maintain the occupied cooling temperature setpoint at the space temperature sensor and acts as the 1st stage of cooling. If the economizer is operating in free cooling and the controlled temperature sensor is not satisfied within the Econ Damper Cooling Lockout Time, the economizer will remain open and the unit will operate the mechanical cooling to satisfy the call for cooling. Economizer Mode will be disabled as outside air enthalpy rises above the Enthalpy Economizer Enable setpoint plus $\frac{1}{2}$ of the Enthalpy Economizer Differential.

18. Heat Wheel Control

- a. The optional heat wheel shall be designed to recover energy that would otherwise be lost through ventilation. The wheel collects lost energy from the unit exhaust air and returns it back to the unit entering airstream. The heat wheel is commanded off and optional heat wheel bypass dampers are fully opened during the economizer "free cooling" mode of operation.
- b. Occupied Mode:
 - The supply fan is operating and run status is confirmed.
 - No alarm conditions are present which prevent unit operation.
 - Heat wheel and power exhaust fan are enabled.
 - Optional heat wheel bypass: The outside air and exhaust air bypass dampers are commanded open when the heat wheel is disabled.
- c. Unoccupied Mode:
 - The heat wheel and power exhaust fans are commanded off and the optional heat wheel bypass dampers open.
 - Provide factory mounted heat wheel sensors:
 - Entering Outside Air Temperature Sensor - mounted in outside air entering side of heat wheel

- Leaving Outside Air Temperature Sensor - mounted in leaving air side heat wheel (between the heat wheel and economizer)
 - Outside Air Humidity Sensor - mounted in entering air side heat wheel (only provided if unit equipped with enthalpy economizer option)
- d. Heat Wheel Filter CFS:
- Clogged filter switch for heat wheel OA filter.
- e. Heat Wheel Humidity Sensor Monitor Package:
- Heat Wheel Leaving Outside Air Humidity Sensor (mounts in the outside airstream on the leaving side of the heat wheel).
 - Heat Wheel Return Air Humidity Sensor (mounts between the heat wheel and economizer in the return airstream)
- f. Sensible & Enthalpy Heat Wheel Start/Stop. Provide an adjustable outside air sensible and enthalpy setpoints that enables energy recovery wheel rotation only when the sensible or wet bulb conditions are suitable for economical heat transfer. The optional heat wheel bypass damper remains open when wheel rotation stops during this operation. The following sensors will be factory mounted before the heat wheel in O/A stream.
- Outside air temperature sensor
 - Outside air humidity sensor

19. Heat Wheel Defrost Control Mode

- a. Occupied Mode
- The heat wheel will enter defrost mode whenever the Outside Air temperature is below the Heat Wheel Defrost Enable Setpoint. The heat wheel will stop for the Heat Wheel Defrost Time every Heat Wheel Defrost Period to enable defrost of the heat wheel.
- b. Unoccupied Mode
- The heat wheel & exhaust fan is commanded off.

20. Exhaust Return Fan Control

- a. On/Off Power Exhaust Fan
- During Occupied Mode

21. Variable Volume Power Return fan control – tracks the supply fan VFD

- a. The return fan is energized anytime the supply fan is operational. The optional Variable Frequency Drive (VFD) will modulate to track the supply fan speed minus the Return Fan Offset.
- b. Exhaust Return fan current sensor for status/alarm.

22. Emergency Shutdown

- a. When a contact closure is seen at the emergency override input, the unit will stop immediately and shut down completely until the contact has opened again. This feature is typically used with smoke detector, freeze stat or Building Management System.

23. Operator Interface

- a. WEB-UI - the standard Web User Interface option allows the controller to host a web page that is specific to the unit. A standard internet browser is used to connect to the unit webpage. The controls package can be assigned an IP address or is DHCP ready for network viewing.
- b. Networked Operation: The control package shall provide the ability to communicate via various network protocols. If the unit is to be part of a network, the unit will operate per the network information provided and is the responsibility of the network manager/integrator/controls contractor to setup the network correctly. If the network fails the unit will default to the local setpoints and schedules of the unit controller. For local operation to operate properly, all sensors, setpoint and schedules must be maintained. Coordinate network control protocol with ATC Contractor.
- c. Provide mixed air temperature sensor for monitoring - This SPA provides an averaging temperature sensor factory mounted on the entering side of the unit filter rack prior to the cooling coil.

24. Alarms

- a. Clogged Filter Switch – Controller will monitor a switch input from a differential pressure switch. If the pressure switch closes the unit will show an alarm for the clogged filter.
- b. Smoke Detector or Emergency Stop – The unit includes a N.C. contact input which will disable the unit until the contact opens. This feature can be used with smoke detector, freezestat, and/or phase/brownout. When the emergency override input is cleared the unit shall restart in a controlled manner.
- c. Supply Fan Alarm – If the supply fan proving switch input does not change state within 30 seconds of the supply fan being commanded on, the unit will go into alarm. This alarm will prevent any mode of operation until the supply fan is proven.
- d. Supply Air Low Limit – The Fan Shutdown Low Limit setpoint is a feature which prevents cold air from entering the building air stream. If the supply air temperature sensor falls below the Fan Shutdown Low Limit setpoint minus $\frac{1}{2}$ of the Fan Shutdown Low Limit Differential, the unit will generate an alarm and command the outside air damper to move to the Outside Damper Minimum Position for two minutes. If the supply air is still low after two minutes the unit will be shut down. The unit will re-energize when the supply air temperature sensor rises above the Fan Shutdown Low Limit setpoint plus $\frac{1}{2}$ of the Fan Shutdown Low Limit

Differential. After three Low Limit Alarms within a one hour period, the unit will remain shut down until it is manually reset.

- e. Supply Air High Limit – The supply air temperature sensor is used to determine if the leaving air is above the Supply Air High Limit setpoint plus the Supply Air High Limit differential. If this condition occurs the unit will be disabled and provide an alarm. The unit will re-enable once the supply temperature falls below the Supply Air High Limit setpoint minus the Supply Air High Limit differential.
- f. Mixed Air Low Limit (This alarm is only available with water or steam coils) – The mixed air temperature sensor is used to determine if the mixed air is below the Mixed Air Low Limit Enable Setpoint. If this condition occurs the unit will be disabled and provide an alarm. The unit will re-enable once the mixed air temperature rises above the Mixed Air Low Limit Disable Setpoint.
- g. Control Sensor Bad/Null Alarm – An alarm will be issued if a temperature sensor input is out of range. This is typically indicates a bad, wrong or incorrectly wired sensor. The unit will remain in alarm until the sensor is operating within the established range.

25. Refer to control drawing for additional alarm(s) required.

26. Setpoints

- a. Heating and Cooling Setpoints (points shall be adjustable).

| Setpoint Name | Default Value | Setpoint Range | Units | Description |
|-------------------------------------|---------------|----------------|-------|---|
| Heating Supply Air Temperature | 90 | 65-120 | F | Heating temperature setpoint |
| Morning Warm-up Setpoint | 68 | 65-85 | F | If return Air temp is below this value during morning warm-up period, heating will be enabled |
| Morning Warm-up Enable Differential | 3 | 2-6 | F | Heating is enabled/disabled at +/-½ this value added to the Warm-up heating setpoint |
| Morning Warm-up Time | 30 | 30-60 | Min | Maximum time for morning warm-up mode |
| Morning Cool-Down Setpoint | 80 | 75-100 | F | Cool down is available if the return air temperature is above this value |
| Morning Cool Down Differential | 3 | 2-6 | F | Cooling is enabled/disabled at +/-½ this value added to the Cool down setpoint |

| | | | | |
|--|----|-------|-----|---|
| Morning Cool-Down Time | 30 | 30-60 | Min | Maximum time for morning cool-down mode |
| Cooling Supply Air Setpoint | 55 | 35-80 | F | Main Cooling temperature setpoint |
| Cooling Supply Air Setpoint Differential | 6 | 3-10 | F | Control offset for heating or cooling |
| High Supply Air Temp Reset Setpoint | 60 | 50-70 | F | Supply Air Temperature Setpoint Reset – High Supply Air Temperature |
| Low Supply Air Temp Reset Setpoint | 50 | 40-60 | F | Supply air Temperature Setpoint Reset – Low Supply Air Temperature |
| Low Space Temp Reset | 70 | 65-72 | F | Low Space Temperature for Supply air Temperature Setpoint Reset function |
| High Space Temp Reset | 80 | 72-82 | F | High Space Temperature for Supply air Temperature Setpoint Reset function |
| O.A Cooling Lockout | 45 | 25-65 | F | Cooling operation will be locked out at this temperature |
| O.A. Cooling Lockout Differential | 5 | 0-10 | F | Cooling is enabled/disabled at +/- ½ this value added to the Cooling Lockout Setpoint |
| Outside Air Heat Pump Lockout Setpoint | 32 | 20-40 | F | Optional Emergency Heat enable setpoint |

b. Economizer Setpoints

| Setpoint Name | Default Value | Setpoint Range | Units | Description |
|--------------------------------------|---------------|----------------|--------|---|
| Enthalpy Economizer Enable | 23 | 18-25 | Btu/lb | Below this value enthalpy enabled Economizer may be used |
| Enthalpy Econ. Setpoint Differential | 4 | 1-10 | Btu/lb | Enthalpy Economizer is enabled/disabled at +/-½ this value added to the Enthalpy Econ Enable setpoint |
| Outside Damper Minimum Position | 100 | 0-100 | % open | The minimum outside air damper position during Occupied operation. |
| Econ Damper Cooling Lockout Time | 10 | 5-60 | min | The time that cooling will be locked out once economizer mode is activated |

c. Dehumidification Setpoints

| Setpoint Name | Default Value | Setpoint Range | Units | Description |
|---|---------------|----------------|-------|---|
| Dehumidification Enable | 50 | 0-100 | %RH | Relative humidity value in which dehumidification mode will be enabled |
| Dehumidification Enable Differential | 4 | 2-10 | %RH | Dehumidification is enabled/disabled at +/-½ this value added to the Dehumidification setpoint |
| Evaporator Coil Dehumidification Setpoint | 45 | 30-60 | F | If the suction temperature is above this value during dehumidification mode additional cooling stages will be activated |
| Supply Reheat Temperature Setpoint | 55 | 50-70 | F | Supply air temperature maintained during the Dehumidification Mode |

d. Supply Fan Setpoints

| Setpoint Name | Default Value | Setpoint Range | Units | Description |
|------------------------------------|---------------|----------------|--------------|--|
| Duct Static Pressure Setpoint | 1.5 | 0-5 | Inch WC | Setpoint used to adjust supply fan VFD to maintain supply duct static pressure |
| Supply Fan VFD Minimum Position | 33 | 0-100 | % of maximum | Minimum allowed VFD Speed |
| Supply Fan Low Limit | 45 | 0-45 | F | Low supply air temperature allowed before unit alarm sounds and shutdown may occur. |
| Supply Fan Low Limit Differential | 4 | 0-6 | F | Unit enabled/disabled at +/-½ this value added to the Supply Fan Low Limit Setpoint |
| Supply Fan High Limit | 150 | 150-200 | F | High supply air temperature allowed before unit alarm sounds and shutdown may occur. |
| Supply Fan High Limit Differential | 4 | 0-6 | F | Unit enabled/disabled at +/-½ this value added to the Supply Fan High Limit Setpoint |

e. Return/Exhaust Fan Setpoints

| Setpoint Name | Default Value | Setpoint Range | Units | Description |
|------------------------------|---------------|----------------|-------|---|
| Exhaust Fan Minimum Position | 33 | 0-100 | % | Minimum allowed VFD speed |
| Exhaust Fan Enable Setpoint | 20 | 10-100 | % | Outside damper must be open to this setpoint prior to exhaust fan operation |
| Exhaust/Return Fan Offset | 10 | 0-50 | % | Offset between return fan VFD and supply fan VFD |

f. Heat Wheel

| | | | | |
|---------------------------|----|-------|-----|--|
| Heat Wheel Defrost Enable | 32 | 20-45 | F | Ambient temperature at which the heat wheel stops rotation to allow tempered exhaust air to defrost wheel. |
| Heat Wheel Defrost Time | 2 | 2-15 | Min | Amount of time the heat wheel stops rotation during the defrost period |
| Heat Wheel Defrost Period | 30 | 25-60 | Min | The period of time the heat wheel defrost function occurs |

g. Miscellaneous Points

| | | | | |
|--|-----|---------|-----|--|
| Mixed Air Temp Low Limit Enable | 32 | 30-75 | F | Unit is disabled and alarm sounds if the mixed air temperature entering the unit falls below this setpoint. For Chilled Water, Hot Water, or Steam Units only. |
| Mixed Air Low Limit Disable | 40 | 40-75 | F | The Low Limit is disabled and the unit regains normal operation when MA temperature rises above this setpoint |
| Discharge Pressure Cooling Setpoint | 340 | 295-400 | psi | The minimum discharge pressure in which cooling operation is allowed |
| Discharge Pressure Dehumidification Setpoint | 390 | 295-400 | psi | The minimum discharge pressure in which dehumidification operation is allowed |

| | | | | |
|------------------------------------|-----|---------|-----|--|
| Condenser Fan Enable Setpoint | 320 | 275-390 | psi | Head Pressure Control - Discharge pressure at which condenser fan operation is allowed |
| Condenser Fan Disable Setpoint | 250 | 200-275 | psi | Head Pressure Control - Discharge pressure at which condenser fan is disabled |
| Condenser Fan Minimum Position | 25 | 0-33 | % | Head Pressure Control – Minimum speed allowed for condenser fan VFD |
| Leaving Water Temperature Setpoint | 10 | 5-15 | F | Setpoint for Water Cooled Condenser Valve Control |

f. Timers

| Timer Name | Default Value | Timer Range |
|--------------------------------------|---------------|-------------|
| Cooling Interstage Delay | 1 minute | Adjustable |
| Cooling Minimum On Time | 3 minute | Adjustable |
| Cooling Minimum Off Time | 3 minute | Adjustable |
| Cooling Loop Ramp Time | 2 minute | Adjustable |
| Cooling Throttling Range | 8F | 2-50 |
| Cooling Integral Constant | 1 | 0.1-10.0 |
| Economizer Loop Ramp time | 10m | Adjustable |
| Throttling Range | 8 | Fixed |
| Integral Constant | 1 | 0.1 – 10.0 |
| Modulating Hot Gas Reheat Purge Time | 1m | Adjustable |

| | | |
|--|------|------------|
| Modulating Hot Gas Reheat Purge Period | 12hr | Adjustable |
| Heating Interstage Delay | 1 | Adjustable |
| Heating Minimum On Time | 0 | Adjustable |
| Heating Minimum Off Time | 0 | Adjustable |
| Heating Loop Ramp Time | 5m | Adjustable |
| Heating Throttling Range | 8F | 2-50 |
| Heating Integral Constant | 1 | 0.1-10.0 |
| Econ Damper Cooling Lockout Time | 10m | Adjustable |

C. Section 2.7 Rooftop Units, Replace Sub-Paragraph O with the following:

O. Controls

1. General – Automatic Temperature controls for Rooftop unit shall be DDC (direct digital control type).
2. Unit manufacturer shall provide a DDC/BMS compatible controller and all packaged rooftop unit controls so that the rooftop unit can operate in a "stand-alone" fashion. Refer to Drawing No. M3.1 for rooftop unit control sequence, diagram and points list. HVAC and ATC Contractor shall coordinate required control protocol (e.g. BACNet MS/TP, Modbus, LonWorks, etc.) prior to ordering rooftop unit.
3. The ATC Contractor shall program control points on Drawing M3.1 from the RTU Controller to the building ATC/BMS system.
4. HVAC and ATC Contractors shall coordinate with unit manufacturer to ensure all sequence of operation and control points are achieved with the BMS to complete the specified sequence of operation and points lists

D. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph A(3), Replace with the following:

3. The HVAC ATC control work required for this project shall be integrated into the existing building American Energy Management BMS System. Refer to HVAC Specification and control drawings for BMS control system integration requirements.

E. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph A(4), Replace with the following:

4. The existing system compatibility shall be coordinated with the existing ATC company (American Energy Management) in charge of the existing BMS system.

Coordinate all points, interfacing need, etc. to allow for new equipment to be monitored, controlled, etc with existing BMS.

- F. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph H(1), Replace with the following:
 - 4. All new equipment shall be added to existing BMS as indicated in HVAC Specification and control drawings.

- G. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph J, Replace paragraph with the following:
 - J. Reserved.

- H. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph K, Replace paragraph with the following:
 - K. Reserved.

- I. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(2)(a), Replace paragraph with the following:
 - a. Reserved.

- J. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(2)(b), Replace paragraph with the following:
 - b. Reserved.

- K. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(3), Replace paragraph with the following:
 - 3. Reserved.

- L. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(4), Replace paragraph with the following:
 - 4. Reserved.

- M. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(6), Replace paragraph with the following:
 - 6. Reserved.

- N. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(8), Replace paragraph with the following:
 - 8. Reserved.

- O. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph M(9), Replace paragraph with the following:
 - 9. Reserved.

- P. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph N(4), Replace paragraph with the following:
 - 4. Reserved.

- Q. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph O(2), Replace paragraph with the following:
 - 2. Delta

- R. Paragraph 2.16 Automatic Temperature Controls, Sub-Paragraph O(3), Replace paragraph with the following:
 - 3. Johnson Controls

- S. Paragraph 3.7 Installation of Rooftop Units, Sub-Paragraph G, Replace paragraph with the following:
 - G. Field Piping
 - 1. All control valves furnished and shipped loose by the RTU manufacturer shall be installed by the HVAC contractor and wiring by the ATC contractor.

- T. Paragraph 3.14 Automatic Temperature Controls (DDC), Sub-Paragraph A(1)(c), Replace paragraph with the following:
 - c. Controllers and safety devices:
 - 1. All safety devices such as freezestats, duct mounted heat detectors, smoke detectors, etc., shall be hard wired to shut down the fans independently. Provide audible alarm with silence switch as well as DDC indication.
 - 2. All supply, return and exhaust fans shall be provided with pressure differential switches. Current sensing devices, starter auxiliary contacts, and relay contacts are unacceptable proof of fan operation.

- U. Paragraph 3.14 Automatic Temperature Controls (DDC), Sub-Paragraph A(3)(a), Replace paragraph with the following:
 - a. Owner's Instructions: Provide services of manufacturer's technical representative for 4 hours of onsite instruction on running and basic troubleshooting of DDC control system.

- V. Paragraph 3.14 Automatic Temperature Controls (DDC), Sub-Paragraph A(3)(c)(2)(e), Replace paragraph with the following:
 - e. Reserved.

END OF ADDENDUM NO. 6
(see attachments)

DOCUMENT 00 11 12R: INVITATION TO RE BID

PART 1 - GENERAL

BID # 13-04

RE-BID OF 6th FLOOR OFFICE RENOVATION ARLINGTON HIGH SCHOOL

Sealed SUB bids for the HVAC Work associated with the 6th Floor Office Renovation Arlington High School project, 869 Massachusetts Avenue, Arlington, Massachusetts will be received at the Office of the Town Manager/Purchasing Agent attention Domenic R. Lanzillotti, Purchasing Officer, first floor, Town Hall Annex, 730 Massachusetts Avenue, Arlington, Massachusetts 02476 in accordance with bid documents prepared by Turowski2 Architecture Inc, 313 Wareham Road, Marion, MA, 02738.

Filed Sub Bids due: Thursday, May 9, 2013 at 11:00 AM at that time will be publicly opened and read aloud. All bids must be in sealed envelopes plainly marked **BID # 13-04 , 6th FLOOR OFFICE RENOVATION ARLINGTON HIGH SCHOOL HVAC RE- BID**

Attention is called to the fact that this re-bid includes Addendum 1 through 5 of the original bid documents as well as Addendum 6 including revised sheet M3.1 and other HVAC related changes.

If mailed, the sealed proposals shall be addressed and mailed to:

Town Managers Office/Purchasing Department
Town Hall Annex
730 Massachusetts Avenue
Arlington, MA 02476

PRE-BID SITE VISIT WILL BE HELD ON Wednesday, May 1, 2013 at 3:00 PM AT THE ARLINGTON HIGH SCHOOL, MAIN (Accessible) Entrance 869 MASSACHUSETTS AVENUE, ARLINGTON, MA. ALL PROSPECTIVE BIDDERS ARE ENCOURAGED TO ATTEND

DCAM CERTIFICATION: GENERAL CONTRACTING

Each Filed Sub-Bidder shall submit with his bid, a Certificate of prequalification issued by the DCAM, all as required by M.G.L. C.149, s 44A-J inclusive. Applicable sections of MGL Chapter 30, MGL Chapter 674 of the acts of 1981, and "Construction Reform" amendments continued in MGL Chapter 193 of the Acts of 2004.

Plans and Specifications will be available at the Office of The Town Manager/Purchasing Department, Town Hall Annex, 730 Massachusetts Avenue, Arlington, Massachusetts 02476, on or after 12:00 P.M. Thursday, April 25, 2013 for a refundable deposit of \$50.00 (Cashier's or Treasurer's check only) for each set of Plans and Specifications. Checks shall be made payable to the "Town of Arlington". A mailing fee of \$25.00 (Non-Refundable) by separate check made payable to the "Town of Arlington".

Bid Documents, required forms, specifications and plans can be viewed and downloaded on the Town website www.arlingtonma.gov/purchasing.

6th Floor Office Renovation
Arlington High School

Turowski2 Architecture, Inc.
April 17, 2013

Every General Bid shall be accompanied by cash or certified check or treasurer's or cashier's check issued by a responsible bank or trust company, or bid bond, all in the amount of 5% of the value of the bid, payable to the "Town of Arlington". No bidder may withdraw his bid for a period of sixty (60) days, Saturdays, Sundays and legal holidays excluded, after the date set for the opening of the General Bids.

The Filed Sub-Bids for this work are:

15500: HVAC

Attention is called to the fact that minimum wage rates and health and welfare and pension fund contributions are established for this contract and are a part of the specifications.

Work under this contract shall be governed by MGL Ch.149, Sec.44A-J.

The conditions of employment as set forth in Sections 26 to 27D and 27F of Chapter 149 of the General Laws, as amended, shall prevail in the execution of the work under this contract.

Attached By-Law of the Town of Arlington, Title I, Article 16, concerning Construction Projects which exceed \$200,000.00 is part and parcel of the bid.

Bids to receive consideration must be in the hands of the Purchasing Agent or his authorized representative not later than the day and hour above mentioned. The Awarding Authority reserves the right to waive any informalities and to reject any or all general bids. Performance and labor and materials payment bonds by a company authorized to do business in Massachusetts and satisfactory to the Awarding Authority, each in the amount of 100% of the Contract Price will be required of the successful General Bidder. Upon the return of Plans and Specifications in good condition and within sixty (60) days after the receipt of General Bids, plan deposit will be returned by the Awarding Authority.

Contract Documents are on file for Contractors' inspection at:

Office of the Town Manager/Purchasing Agent, Town of Arlington
Robbins Memorial Town Hall, 730 Massachusetts Avenue, Arlington, MA

END OF DOCUMENT

DOCUMENT 00 41 02R: FORM FOR FILED SUB-BID

TO: All General Bidders except those excluded:

- A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the Drawings, Specifications and Addenda, all work specified for _____ Trade, as specified under the following Section(s) _____

of the Contract Documents, Specifications and any Drawings specified under such Sections, prepared by Turowski 2 Architecture, Inc, P.O. Box 1290, 313 Wareham Road, Marion, MA, 02738 for 6th Floor Office Renovation, Arlington High School, Arlington, MA for the Contract Sum of: _____ Dollars

(Total Sub-Bid Price Amount in Words)

(\$ _____)
(Total Sub-Bid Price Amount in Numbers)

- B. Addenda: This Sub-Bid includes the following addenda:

() () () ()
(Indicate Addendum Numbers Received)

- C. Alternates: The following alternate prices are to be added to or subtracted from the above stated Sub-Bid Proposal. (In the event that an alternate does not affect the Contract Price, the Sub-Bidder shall remark "No Change".)

DEDUCT

For Alternate No. 1:

"Eliminate Work Associated With Creating Rooms 608c and 609c and All Sprinkler Modifications"

\$ _____

For Alternate No. 2:

"Eliminate Roof Top Unit and Modify Associated Work"

\$ _____

- D. Restrictions: The following restrictions are placed on this proposal. This sub-bid may be used by any General Bidder except the following:

This sub-bid may be used by only the following General Bidders:

| | |
|--|--|
| | |
| | |
| | |

Note: To exclude General Bidders, insert "X" in one box only, and fill in blanks following that box. Do not answer "D" if General Bidders are not excluded).

- E. Sub-Sub-Contractors: The names of all persons, firms and corporations furnishing to the undersigned labor, or labor and materials, for the class or classes or part thereof of work for which the provisions of the section of the specifications for this sub-trade require a listing in this paragraph, (including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specifications). the name of such class of work or part thereof and the bid price for each such class of work or part thereof are:

| Class of Work and Sub-Sub-Bidder Name [Description] | Amount |
|--|----------|
| [Description] | \$ _____ |
| [Description] | \$ _____ |
| [Description] | \$ _____ |

(Do not give bid price for any class or part thereof furnished by the undersigned.)

The undersigned agrees that the above list of sub-sub-bids to the undersigned represents bona fide bids based on hereinbefore described Drawings, Specifications and Addenda and that, if the undersigned is awarded the contract, they will be used for the Work indicated at the amounts stated, if satisfactory to the Awarding Authority.

- F. ITEM UNIT ADD/ DEDUCT

Unit Prices for material identified or discovered prior to or during work which is not in Base Bid. Unit prices include labor, disposal, and all necessary fees. The same unit price shall apply whether the work is added or deducted. Refer to Section 012200 – UNIT PRICES

Item No.1: Removal and Disposal of Vinyl Asbestos Floor Tile and Replace with New VCT

\$ _____ per square foot

Item No. 2 –Construction of Mini-containment < 10SF

\$ _____ per containment

Item No. 3– Duplex Electrical Outlets

\$ _____ per duplex outlet

Item No. 4– Duplex Data Outlet Infrastructure

\$ _____ per back box

- G. Contract: The undersigned agrees that, if he is selected as Sub-Bidder, he will within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Sub-Contract to the General Bidder selected as the General Contractor, execute with such General Bidder a Sub-Contract in accordance with the terms of this Sub-Bid and contingent upon the execution of the General contract, and, if requested so to do in the general bid by such General Bidder who shall pay the premiums therefore, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and each in full sum of the subcontract price.

The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore described plans and specifications, (including all general conditions stated therein) and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Awarding Authority.

- H. Examined Conditions: The undersigned Sub-Bidder hereby declares that he or she has visited the site and the conditions present and has carefully examined the Contract Documents, together with all Addenda issued, received and acknowledged below, and has familiarized himself or herself with the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and other conditions which may affect the cost, progress or performance of Work, and has made independent investigations, deemed necessary by the Sub-Bidder.
- I. Certification of Unbiased Bidding: The undersigned also hereby certify under the penalties of perjury that they are the only persons interested in this proposal, that no person acting for, or employed by, the Awarding Authority is directly or indirectly interested in this proposal, or in any contract which be made under it, or in expected profits to arise therefrom; and without directly or indirectly influencing or attempting to influence any other person or corporation to bid or to refrain from bidding or to influence the amount of the bid of any other person or corporation. The undersigned further declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this proposal is based solely on their own investigation and research and not in reliance upon any representation of any employee, officer or agent of the Awarding Authority.
- J. Withdraw bids: The Sub-Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 30 calendar days after the scheduled closing time for receipt of bids.
- K. Authority Rights: The Sub-Bidder understands the Awarding Authority right to reject any and all Bids.
1. Should the Invitation to Bid, Instructions to Bidders, Form for General Bid, Conditions of the Contract, Plans or Specifications require submission of special data to accompany the bid, the Awarding Authority reserves the right to rule the sub-

bidder's failure to submit such data an informality and to receive said data subsequently, within a reasonable time as set by the Awarding Authority.

- L. Qualifications: The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all requirements of the plans and specifications.
1. Have been in business under present business name _____ years.
 2. Ever failed to complete any work awarded? yes / no
(if yes, attach a full description of the circumstances)
 3. Attach a list three or more recent buildings with names of General Contractor and Architect on which you served as subcontractor for work of similar character as required for the above named building. Provide the cost of the sub-contract for each project listed.
 4. Bank References:

- M. Furnish Labor: The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and he/she will comply fully with all laws and regulations applicable to awards made subject to Massachusetts General Laws (MGL) Chapter 149, Section 44A.
- N. Non-collusion: The undersigned Bidder certifies under the penalty of perjury, that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection, the word "person" shall mean natural person, joint venture, partnership, corporation, or other business, or legal entity.
- O. Affidavit of eligibility to perform work in the Commonwealth of Massachusetts: The undersigned certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated hereunder.

Date of Bid: _____

(Name of Bidder - Company Name)

BY _____
(SIGNATURE of Person Signing Bid and Title)

(PRINTED Name of Person Signing Bid and Title)

6th Floor Office Renovation
Arlington High School

Turowski2 Architecture, Inc.
April 23, 2013

(Business Mailing Address)

(City/Town, State and Zip Code)

Corporate Seal

(Business Telephone Number)

Note: If the bidder is a corporation, indicate state of incorporation under signature and affix corporate seal; if partnership, give full names and residential address of all partners; and if an individual give residential address if different from business address.

END OF DOCUMENT

DUCTLESS COOLING UNIT SYSTEMS

| | | | | | | | | | |
|---------|---------|-----------------|------|-----|----|------|-----|---|------|
| DCue-23 | PKTY 30 | SCHOOL COMM. RM | CP-1 | 710 | 30 | 34.0 | 208 | 1 | 15.0 |
|---------|---------|-----------------|------|-----|----|------|-----|---|------|

SELECTION BASED ON "MITSUBISHI", PROVIDE WIRELESS TSTAT, LOW AMBIENT CONTROL AND INTERNAL MOUNTED CONDENSATE PUMP OF MODEL LISTED ABOVE. CPM BASED ON FANS SET AT LOW SPEED. PROVIDE WITH AIR COOLED CONDENSING UNIT AS INDICATED IN THE SCHEDULE. ALL REFRIGERANT TUBING SHALL BE SIZED BY UNIT MANUFACTURER. PROVIDE ALL NECESSARY JOINT KITS, FITTINGS AND ACCESSORIES FOR A COMPLETE OPERATING SYSTEM PER MANUFACTURER'S RECOMMENDATIONS. PROVIDE NECESSARY EQUIPMENT FOR FUTURE BMS SYSTEM INTERFACE. COORDINATE CONTROL PROTOCOL REQUIREMENTS WITH ATC CONTRACTOR SYSTEM SHALL BE CAPABLE OF HEATING OR COOLING SYSTEM CHANGEOVER.

SYSTEM PUHY-P288 IS MADE UP OF 3 MODULES: MOD 1-PUHY 120, MOD 2-PUHY P96, MOD 3-PUHY P72. ELECTRICAL REQUIREMENTS BASED ON EACH MODULE.

AIR COOLED CONDENSING UNITS (FOR ALTERNATE 2 ONLY)

| UNIT NO. | MANUF. NO. | SERVICE | ENT. D.B. | NOMINAL TONS | FANS NO./HP. | COMP. NO./TONS | VOLT/PH. | REFRIG CIRCUITS | REFRIG TYPE | REMARKS |
|----------|------------|---------|-----------|--------------|--------------|----------------|----------|-----------------|-------------|---------|
| ACC-1 | TTA150 | AHU-1 | 95 | 12.5 | 1/1 | 2/5.6 | 208/3 | 2 | R410A | |

SELECTION BASED ON TRANE

IF ALTERNATE NUMBER 2 IS ACCEPTED FOR THE PROJECT THE CONTRACTOR SHALL PROVIDE THIS EQUIPMENT AND PLACE ON ROOF. CONTRACTOR TO COORDINATE LOCATION ON ROOF WITH OWNER. UNIT SHALL BE MOUNTED ON 4x4 FT SLEEPERS IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. OWNER SHALL BE RESPONSIBLE FOR CONNECTING EQUIPMENT INTO EXISTING SYSTEM.

ADDENDUM #6

REF. DRAWING M0.1

Turowski2 Architecture
 P.O. Box 1290
 313 Wareham Road
 Marion, MA 02738

CONSULTANT:

GARCIA GALUSKA DESOUSA CONSULTING ENGINEERS
 500 Beacon Court, Rock, Massachusetts, MA 02773-1271
 INC.
 Tel: (508) 548-4400
 Fax: (508) 548-4401

6TH FLOOR OFFICE RENOVATION
ARLINGTON HIGH SCHOOL
 869 MASSACHUSETTS AVENUE
 ARLINGTON, MA 02476

DATE:
4-19-13

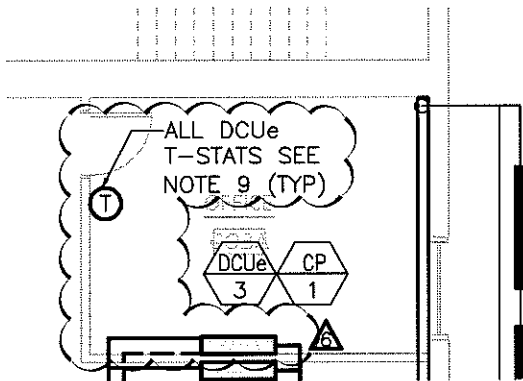
JOB NUMBER:
12-45

SCALE:
NTS

SHEET NO:
SKM-2

NEW WORK NOTES:

9. PROVIDE WIRELESS THERMOSTATS FOR ALL DCU_e UNITS. PROVIDE WALL MOUNTED HOLSTER BRACKETS FOR EACH THERMOSTAT.



ADDENDUM #6 REF. DRAWING M1.2



Turowski2 Architecture
P.O. Box 1290
313 Wareham Road
Marion, MA 02738

6TH FLOOR OFFICE RENOVATION
ARLINGTON HIGH SCHOOL
869 MASSACHUSETTS AVENUE
ARLINGTON, MA 02476

DATE:
4-19-13
JOB NUMBER:
12-15
SCALE:
NTS

SHEET NO:

SKM-3