



Manchester-Boston Regional Airport
One Airport Road, Suite-300
Manchester, New Hampshire 03103

Addendum No. 1

Date: September 15, 2026

Solicitation No: 2600028

AIRPORT TERMINAL & WALKWAY – HVAC EQUIPMENT REPLACEMENT

This Addendum #1 to the Request for Proposal (RFP) for the AIRPORT TERMINAL & WALKWAY – HVAC EQUIPMENT REPLACEMENT project contains the following clarifications and changes to the RFP document as issued on August 31, 2026:

- Changes to RFP Document
- Responses to questions submitted in writing
- Appendix B – 2009 HVAC Load Calculation Draft Memorandum

CHANGES TO RFP DOCUMENT

RFP Volume III , Section 00 20 00 Scope of Work, Subsection G.3. Terminal Building Hydronic Heating System

Add the following sentence at the end of paragraph 4: *“The Contractor shall test the drained hydronic heating system fluid for appropriate chemical concentration to be specified by the Owner. Additional Ethylene Glycol chemical that may be needed for concentration adjustment or make-up volume when refilling the hydronic heating system piping will be provided by the Owner for the Contractor’s use in refilling the system.”*

QUESTIONS SUBMITTED IN WRITING

Question 1: Who is responsible for structural engineering and structural improvements (if required)?

Response: The Design-Builder.

Refer to RFP Volume III Section 00 20 00 Scope of Work, page 2 paragraph 3, and page 13 Subsection G.4 *Structural Support and Roofing Systems*, and Appendix-A ILLUSTRATIVE FIGURES -7 and -8

Question 2: Section 01520 Field Office Equipment: Are we required to provide personal computer and current model 4 door 4 wheel drive vehicle for the resident engineer?

Response:

Section 01520 of the RFP Volume II Airport Standard Specifications was deleted by RFP Volume III Special Provisions to the Standard Specifications – Project Requirements, page 4.

The Design-Builder/Bidder's attention is specifically directed to the Special Provisions Sections included in Volume III of the RFP for modifications and deletions to the Airport Standard Specifications.

If the Design-Builder/Bidder has a specific interpretation or uncertainty of whether any other section(s) of the RFP Volume II Airport Standard Specifications applies to the project work, for those sections that have not been modified or deleted by the Special Provisions Sections in RFP Volume III, then the Bidder should state their interpretation or exclusion of such individual Standard Specification Section (by name and number) in their Proposal cover letter and the Airport will consider the interpretation or exclusion in the Proposal review and evaluation process.

Question 3: Are coordination drawings required?

Response:

The Design-Builder/Bidder's attention is directed to RFP Volume III Section 00 20 000 Scope of Work, Page 8 Subsection E.2 *Design Development* for design-phase and construction-phase drawings submittals, and page 33 Subsection P. *Submittals*. Shop / fabrication (vendor) drawings submittals are also required by the Equipment Performance Specifications Sections.

Question 4: Section 01380 Construction Photographs: Will the photograph package described in this section be required for this project?

Response:

Section 01380 of the RFP Volume II Airport Standard Specifications has been modified (replaced) by RFP Volume III Special Provisions to the Standard Specifications - General Conditions, page 10. Refer to that section for details.

The photographs required are intended to document the existing site conditions just prior to commencement of construction to clarify the Contractor's responsibility for site restoration and to specifically show progress of work that will be covered up or difficult to observe when construction is complete. They do not need to show every aspect of the work. Photographs taken by the Design-Builder's / Contractor's site superintendent(s) with a cellphone and transmitted via email or cloud file-share transfer (such as a link to a SharePoint folder) will suffice for submittal. Submittal of electronic files on a CD will not be required unless the emailed (or cloud file-share) files have not been received.

Question 5: Section 00775-AIP: Is this section of the specifications applicable to this project?

Response:

Section 00775-AIP of the RFP Volume II Airport Standard Specifications applies to work that requires the use of such equipment/gages for soil compaction/density measurement verification. The work in this project is not anticipated to involve excavation or backfill or pavements of any kind, therefore that section of the Standard Specifications inherently would not apply.

If the Design-Builder/Bidder has a specific interpretation or uncertainty of whether any other section(s) of the RFP Volume II Airport Standard Specifications applies to the project work, for those sections that have not been modified or deleted by the Special Provisions Sections in RFP Volume III, then the Bidder should state their interpretation or exclusion of such individual Standard Specification Section (by name and number) in their Proposal cover letter and the Airport will consider the interpretation or exclusion in the Proposal review and evaluation process.

Question 6: Is there a preferred contractor for the following scopes of work ? For Electrical, Roofing, Fire Protection ?

Response:

The Airport does not have preferred Contractors for this project.

The following Contractors have recently performed satisfactory work at the Airport:

- Electrical - Gerald LaFlamme Inc., Paquette & Howard Electrical Service, Interstate Electrical Services Corp.
- Roofing – Melanson Company, Inc.
- Fire Protection – R.B. Allen Co. Inc. is the Airport's current Fire Alarm System Maintenance & Programming Contractor

Question 7: Is there a maximum amount of time for HVAC systems to be down during replacement?

Response:

The Design-Builder shall minimize the duration of HVAC equipment outages and related systems outages to the extent possible.

The Airport anticipates that the HVAC equipment will be inoperable for several days in order to remove and replace the equipment. The Design-Builder shall plan, schedule, and coordinate the work with the Airport to minimize the outage durations and reduce any need for temporary HVAC measures to the extent possible. This will include extended working hours, multiple shifts, and nightwork as described in RFP Volume III Section 00 20 00 Scope of Work, Subsection A page 2 paragraph 4.

Question 8: Is the 2009 building heating/cooling calculations report available for distribution?

Response:

The 2009 HVAC Load Calculation Draft Memorandum is included in this Addendum as Appendix B. The Design-builder/Contractor shall note that this is for general reference purposes only and be aware that several building modifications and HVAC systems modifications/upgrades have taken place since 2009 which is a significant factor in the requirement for a new Building Heat Load Calculation and Report as described in RFP Volume III, Section 00 20 00 Scope of Work, Subsection E.3.

Question 9: Will the sign up sheet for the mandatory site visit be shared??

Response:

The firms in attendance at the Pre-Bid meeting are as follows:

- Medford & Wellington Service Co.
- Eckhardt & Johnson, LLC
- Granite State Plumbing & Heating, LLC
- Precision Temperature Control, Inc.
- Granite State Automation, LLC
- Louis P. Cote, Inc.
- Bolton & Menk Inc.
- Jacobs

APPENDIX - B

Addendum #1 to the Request for Proposal (2600028) for the AIRPORT TERMINAL & WALKWAY - HVAC EQUIPMENT REPLACEMENT project

Manchester- Boston Regional Airport HVAC Load Calculation Draft Memorandum

August 14, 2009

Introduction:

The HVAC system of the passenger terminal building is unable to maintain the cooling set point frequently during the summer. Cosentini Associates have calculated the cooling and heating load for the building and compared that to the existing design conditions to determine if there is a lack of cooling capacity in localized areas and/or systematically throughout the building. The comparison between the calculated cooling load capacity and actual capacity will be used to determine where, and to what extent, heat gains need to be reduced so as to reduce cooling loads. Potential cooling load reduction strategies will be developed in the next phase of the project and documented in the Longer-Term Energy Conservation Measures Memorandum.

Load Calculation:

The cooling and heating loads were calculated using Trane Trace 700 software (version 6.1). This is one of the standard software programs for calculating cooling and heating loads.

The software program calculates the peak cooling and heating loads for each zone by modeling the heat transfer:

- Through the building envelope (heat gain/loss and solar gain through windows)
- From internal heat gains (lights, appliances such as computers, x-ray machines, cooking equipment, and from people). The appliance loads are estimated on a power density basis (Watts/ Square foot) for each type of space.
- From ventilation loads (energy required to cool or heat the outside air).

Building envelope information has been taken from as-built drawings, specifications, and shop drawings. The lighting loads have been calculated for each type of space (office, lobby, holding area, restroom, etc.). The heat generated by people and population density is based on guidelines from the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE).

Explanation of Calculations and Comparison to Existing Design:

There are essentially two main components that are being analyzed for capacity- the rooftop units and the terminal units. The cooling for the passenger terminal building is ultimately accomplished in the rooftop units. Outside air (for ventilation) and return air is mixed in the rooftop unit and cooled by direct expansion (DX) coils inside the unit. A fan in the rooftop unit blows this cooled air through the ductwork to the terminal units. The cooling capacity required by the DX coils as calculated has been compared to the capacity of the installed DX coils. The terminal units are the Variable Air Volume (VAV) boxes that modulate the amount of cooling air to individual spaces or areas inside the terminal building. Comparison between the capacity of the terminal units and the calculated cooling loads determines the adequacy of the cooling for individual spaces.

Capacity of the Rooftop Units

The capacity of the rooftop units is the rate at which heat can be removed from the air and is expressed in cooling tonnage and Btu's per hour (Btu/h) where 1 cooling ton is equivalent to 12,000 Btu/h. The capacity is split into three categories

- **Sensible Cooling Capacity** This is the amount of heat that is removed due to simply reducing the temperature of the air, which will result in a reduction in dry bulb temperature only
- **Latent Cooling Capacity** This is the amount of cooling capacity required to remove moisture from the air, which reduces the wet-bulb temperature (and relative humidity). The cooling coil needs to be below the dew point of the air to remove any moisture from the air. Cooling coils are typically designed and operated to cool the air to around 55F in order to keep the humidity level in the space at a comfortable level
- **Total Cooling Capacity** This is the sum of the sensible and latent cooling capacities

The rooftop units are each cooled with multiple refrigerant circuits. The cooling is done through an evaporator coil in the unit. Air is returned from the space, mixed with an appropriate amount of outside air, and then the air is blown by a fan through the evaporator coil where it is cooled to the supply air temperature and ducted to the terminal units.

The amount of cooling the rooftop units need to do is based on the amount of outside air (required for ventilation), the design conditions of the outside air (dry bulb and wet bulb temperatures), the conditions of the return air (dry bulb and wet bulb temperatures) and the amount of supply air and its condition (dry bulb and wet bulb temperatures).

The amount of outside air is based on the number of people in the area served by the unit and the amount of air required by each person. The air requirement per person is set forth in ASHRAE standard 62.

There are multiple outdoor summer design conditions for each geographic location. They are referred to as the 0.4 percent, 1 percent, and 2 percent conditions. For example, the 1 percent condition is a statistical value which means that the outdoor temperature should on average be above this number 1 percent of the year. As the percentage increases, the design temperature will naturally be lower. The energy code for New Hampshire is based on the International Energy Conservation Code (IECC) 2006. The code stipulates that Hillsborough County (where Manchester-Boston Regional Airport is located) is in Climate Zone 5A. The 1 percent design conditions for Manchester, NH are used for the calculations.

Capacity of the Terminal Units

The cooling capacity of each terminal unit (VAV Box or fan-powered VAV box) is determined based on the supply air temperature, room design temperature (the temperature at which the room is to be maintained), and air quantity (measured in cubic feet per minute (cfm)). The cooling capacity is determined from the formula

$$\text{Capacity (Btu/h)} = 1.08 * \text{Airflow} * (T_{\text{design}} - T_{\text{supply}})$$

Typically, air handling units (AHU) are designed to discharge supply air at approximately 55F for VAV systems for cooling. Discharging air at this temperature allows for proper dehumidification. The design cooling temperature is assumed to be 75F. The design supply temperatures used for the calculations are based on the actual design supply temperatures which are in the range of 57F.

The capacity of the terminal units should meet or exceed the cooling load (amount of heat generated or transferred into the space). Using a design temperature of 75F and the same

supply temperature in the calculations that the units are designed to discharge, the actual airflow of the VAV box should meet or exceed the calculated airflow required.

Explanation of Calculations and Comparison to Existing Design:

In order to evaluate the cooling capacity of the AHUs the sensible cooling capacity, total cooling capacity and supply air flow of installed AHUs was compared to the required sensible cooling capacity, total cooling capacity and supply air flow calculated by Trace 700 software. The results of this evaluation are provided in Appendix A and summarized in the following sections.

Roof Top Units

1. Rooftop Unit: AHU-1

AHU-1 serves the following spaces:

- north side of the upper lobby (2-40b, 2-41b)
- security check (2-46)
- news/gift space (2-51)
- restaurant (2-42b)
- kitchen (2-55)
- conference center (2-52 through 2-54)
- east departure lounges (2-59 through 2-65)
- east section of the third floor (3-14, 3-20 through 3-26)
- observation area and court area at third level (3-10, 3-28)

The calculations show that the installed capacity of AHU-1 is adequate to meet the calculated peak cooling load, with some capacity to spare. Calculated and installed total capacity, sensible capacity, and the amount of supply air differ by 2.5 percent, 12.2 percent and 7.1 percent, respectively (Appendix A, Table 1).

2. Rooftop Unit: AHU-2

AHU-2 serves the following spaces:

- large lobby space located on the left side from the entrance lobby including auto rental area, limousine service area, and baggage claim (1-148 through 1-152)
- three stairs located on the east side of the building (2-71 through 2-73)
- operation area (1-175 through 1-189)

The calculations show that the installed capacity of AHU-2 is adequate to meet the calculated peak cooling load, with capacity to spare. Calculated and installed total capacity, sensible capacity, and amount of supply air differ by 24.4 percent, 29.7 percent and 21.2 percent, respectively (Appendix A, Table 2). The large difference in installed and calculated peak cooling load is most likely caused by the addition of Blast Guard tint film after the passenger terminal building was constructed. The Blast Guard tint film installed on the glazing on the front façade has reduced solar heat gain to the lobby space of the terminal and lowered the required cooling capacity.

3. Rooftop Unit: AHU-3

AHU-3 serves the following spaces:

- south side of the upper lobby (2-40a, 2-41a)
- food court (2-42a, 2-37, 2-38)

- fast food (2-33, 2-34, 2-36)
- section of south departure lounge (2-26 through 2-31)
- west section of the third floor (3-01 through 3-05, 3-11 through 3-13, 3-15)
- upper lobby at third level immediately below the skylight (3-040)

The calculations show that the installed capacity of AHU-3 is adequate to meet the calculated peak cooling load, with some capacity to spare. Calculated and installed total capacity, sensible capacity, and amount of supply air differ by 4.5 percent, 15.7 percent and 9.1 percent, respectively (Appendix A, Table 3).

4. Rooftop Unit: AHU-4

AHU-4 serves the following spaces:

- large ticket lobby space located on the right side from the entrance lobby including Southwest, Independence and US Airways ticket counters (1-32, 1-33)
- stair/escalator (1-35)
- offices and restrooms (1-135a through 1-142, 1-135b through 1-146)
- baggage equipment area (1-109b, 1-110)
- office space located between counters and baggage equipment (1-100 through 1-108, 1-112 through 1-129)

The installed capacity of AHU-4 is adequate to meet the calculated peak cooling load, with capacity to spare. As for AHU-2, this unit has total cooling capacity, sensible cooling capacity and supply air flow that exceed the minimum requirements at peak load by 22.7 percent, 26.2 percent, and 13.6 percent, respectively (Appendix A, Table 4). The large difference in installed and calculated peak cooling load is most likely caused by the addition of Blast Guard tint film on the glass on front façade curtain wall which resulted in reduced solar heat gain to the lobby space.

5. Rooftop Unit: AHU-5

AHU-5 serves the following spaces:

- ticket lobby including Delta and Comair ticket counters (1-31)
- baggage equipment area (1-109a)
- office space located between the ticket counters and baggage equipment area (1-083 through 1-099)
- outbound baggage (1-81, 1-82, 1-130)
- section of south departure lounge (2-016, 2-017, 2-019, 2-020 through 2-025)
- stair at the second floor (2-026b)

The calculations show that the installed capacity of AHU-5 is adequate to meet the peak cooling load, with capacity to spare. The calculated and installed total capacity, sensible capacity, and amount of supply air differ by 49.7 percent, 42.3 percent and 37.1 percent, respectively (Appendix A, Table 5). Reconstruction of the lobby extension in 2002 contributed to the reduced cooling capacity for two reasons: a section of the space originally served by system AHU-5 was assigned to system AHU-6&7, reducing the cooling load on AHU-5, and the stair exterior walls were converted to interior walls, eliminating the heat gain through those walls.

6. Rooftop Unit: AHU-6&7

AHU-6&7 serves the following spaces:

- ticket lobby (1-29, 1-30)
- security check area (1-28a, 1-28b)

- baggage claim (1-025a, 1-025b, 1-026, 2-027)
- connector (1-34, 1-35, 2-14c)
- offices located between lobby and baggage equipment area (full list of spaces provided in Appendix A, Table 6a)
- office space located on west side of the building extension and below the large holding room (full list of spaces provided in Appendix A, Table 6a)
- large holding room (2-01 through 2-06)

The calculations showed that the installed capacities of AHU-6&7 are adequate to meet the calculated peak cooling load. Calculated and installed total capacity, sensible capacity, and amount of supply air differ by 1.6 percent, -3.1 percent and -0.6 percent respectively (Appendix A, Table 6). The difference of -3.1 percent means that the installed sensible cooling capacity is slightly lower than the calculated cooling load for this unit. However, this difference is not significant and the unit will perform satisfactorily.

7. Rooftop Unit: RTU-1

RTU-1 serves the stair tower. The calculations show that the installed capacity of RTU-1 is adequate to meet the calculated peak load, with capacity to spare. Calculated and installed total capacity, sensible capacity, and amount of supply air differ by 42 percent, 56 percent and 27 percent respectively (Appendix A, Table 7).

8. Rooftop Unit: RTU-2, RTU-3, RTU-4

RTU-2, RTU-3 and RTU-4 serve the bridge area. Units RTU-2, RTU-3 and RTU-4 have sufficient total cooling capacity and sensible capacity to meet the peak load of the bridge area. Calculated and installed total capacity, sensible capacity, and amount of supply air differ by 9 percent, 13 percent and -4 percent, respectively (Appendix A, Table 6). A comparison of required and installed total capacity, sensible capacity and amount of supply air is provided in Appendix A, Table 7.

9. Rooftop Unit: RTU-5

RTU-5 serves the lobby and escalator below the bridge. Design cooling capacity, sensible capacity and amount of supply air flow of existing RTU-5 are lower by 20 percent, 19 percent and 32 percent compared to calculated required minimum capacity (Appendix A, Table 7). The units do not have sufficient capacity to provide design condition of 75 F under assumption that peak occupancy is 150 sf/person.

Terminal Units

In order to evaluate the cooling capacity of the terminal units, Cosentini Associates compared the quantity of supply air on shop drawings and as built drawings to the amount of supply air calculated by Trace 700 software. Brief summary for each zone is provided below. The results of this evaluation are provided in Appendix A and summarized in the following sections.

1. Lobby

The large lobby space was divided into five zones.

- Lobby 1: perimeter lobby space located on the right side of the entrance lobby including auto rental and baggage claim (1-148), auto rental and limo service (1-149, 1-150) and interior baggage claim area located in the south section of the building (1-151, 1-152)
- Lobby 2: entrance lobby (1-147)

- Lobby 3 lobby space located on the right side of the entrance lobby including Southwest, Independence and US Airways ticket counters (1-32, 1-33),
- Lobby 4 ticket lobby including United Delta and Comair ticket counters (1-31)
- Lobby 5 ticket counter and lobby space next to the screening area (1-29, 1-30)

The installed capacity of the perimeter terminal units in lobby 1 is lower than the calculated capacity by about 28.7 thousand Btu per hour (MBH) while the capacity of the interior units in the same area exceeds the calculated capacity by 10.7 MBH. Overall, the total design cooling capacity of the terminal units serving lobby 1 was slightly deficient by 18.0 MBH in meeting the peak load. The installed capacities of terminal units serving lobby 3 is also lower, by 89.5 MBH, than the calculated capacity. However, the units serving lobby 4 and lobby 5 have sufficient capacity to meet peak load (Appendix A, Table 8). As the calculated load assumes peak solar gain and maximum occupancy, the terminal units are expected to perform with significantly smaller deficiency at average solar heat gain. The major deficiency in the achieved thermal comfort is in the lobby 2 (entrance lobby) due to lack of direct supply of cold air. The supply air intended to condition the entrance lobby is delivered through the stair space and from the upper lobby but it is questionable whether the supply air can reach the entrance lobby and provide satisfactory comfort.

The lobby area and baggage claim have a lighting power density of 1.53 W/SF and 0.9 W/SF, respectively. The lighting power density for lobby space is somewhat higher compared to present ASHRAE lighting allowances. ASHRAE Standard 90.1-2004 recommends lighting power densities of 1.5 W/SF for ticket counters and 0.6 W/SF for the airport concourse. The lighting power density for the baggage area is in a good agreement with ASHRAE standard recommendation (1.0 W/SF).

A reduction in heat gain can be achieved by reducing lighting load through utilization of daylight control. Simplified calculation showed that reducing the lighting power density in perimeter zones down to the density recommended in the ASHRAE Standard 90.1-2004 for airport concourse can yield a reduction in heating load by

- 11.3 MBH in Lobby 1
- 1.8 MBH in the main entrance
- 7.3 MBH, 7.0 MBH and 7.6 MBH in lobby 3, Lobby 4 and lobby 5 respectively

Calculations of estimated reduction in lighting load are provided in Appendix A, Table 9.

2. Baggage Claim

Baggage claim covers a large floor area in the west section of the building extension, i.e. zones 1-26, 1-25a, 1-25b and 1-27. The installed capacity of the perimeter terminal units is lower than the calculated capacity by about 11.9 thousand Btu per hour (MBH), while the capacity of the interior units in the same area exceeds the calculated capacity by 7.7 MBH. Overall, the total design cooling capacity of the terminal units serving lobby baggage claim was slightly deficient by 4.2 MBH in meeting the peak load. The lighting power density in baggage claim area, at average 0.76 W/SF, is below the recommended value by ASHRAE Standard which is 1 W/SF.

Departure Lounges and Holdroom

The departure lounge was divided into four zones

- Lounge 1 East departure lounge (2-59 through 2-65)
- Lounge 2 South departure lounge of the building section built in 1992 (2-26 through 2-31)
- Lounge 3 South departure lounge of the building section built in 1998 (2-16a, 2-17, 2-19, 2-24)

- Holdroom (2-01 through 2-06)

The design cooling capacity of the installed terminal units serving lounge 1, lounge 3 and a large holdroom providing access to gates 1 through 4 is greater than the cooling load calculated, while the terminal unit capacity serving lounge 2 is slightly lower. However, because Lounge 2 and lounge 3 comprise one big open space, the capacity of terminal units is adequate for the calculated peak cooling load. However, it was observed that the quantity of design supply air varies throughout the departure lounges, with the maximum quantity occurring in the mid section of each zone. This may result in some temperature variation within the space. The estimated reduction in heat gain due to reduction in lighting load in the daylight zones within holdroom area is 7.4 MBH. This value was calculated under assumption that daylight can replace 0.6 W/S.F. of installed lighting power. More accurate calculations will be provided in analysis performed using e-quest software 3-63.

3. Security Check

Terminal units serving security check areas (1-28a and 1-28b) located in the central section of the passenger terminal building extension have design cooling capacity that is not sufficient to meet the calculated peak load (Appendix A, Table 8). Because the largest component of the cooling load is due to occupancy, the thermal condition may vary significantly with number of people present in these areas. Deficiency in supply air of 29 percent and 25 percent at peak load (expressed in energy units of 30 MBH and 6.5 MBH) for security check areas 1-28a and 1-28b, respectively, was calculated under the assumption that large and small security areas are occupied by 167 and 45 people, respectively.

4. Connector with Bar

This two story zone consists of a corridor (1-35) and set of stairs (1-34) on the first level, and a bar (2-14c) on the second level. Installed cooling capacity in this area is less than the calculated cooling load by 27 percent, or expressed in energy units, is deficient by about 112.5 MBH (Appendix A, Table 8). Reduction of lighting load in this area will not significantly contribute to the required cooling capacity reduction.

5. Upper Lobby Area

The upper lobby was divided into two thermal zones:

- Upper lobby 1: entrance area below a large skylight (2-40b and 2-40a)
- Upper lobby 2: upper lobby space located between gift/news area and concessions (2-41a and 2-41b)

The terminal units serving upper lobby 1 have sufficient capacity to meet peak load in this area and to partly cover the heat gain experienced by the entrance lobby (Appendix A, Table 8).

6. Court and Observation Area

The court area was divided into three zones:

- Court 1: common court area at second floor (2-43a and 2-43b)
- Court 2: two separate security check areas individually served by systems AHU-1 and AHU-3 (2-45 and 2-46)
- Observation area including walkways at the third floor (3-10, 3-28 and 3-29)

The court space is conditioned at two levels: 1) supply air is delivered at the second floor, right at the entrance to security areas; 2) supply air is delivered above the walkways at the third level. The amount of supply air delivered at the second floor is sufficient to cover the heat gain

generated by occupancy and miscellaneous load. The supply air delivered at the third level is sufficient to cover heat gain through the walls, solar heat gain from vision glass, the load from lighting and partially the solar heat gain from the skylights. Overall, this two story space lacks cooling capacity of 130 MBH (Appendix A, Table 8). Air stratification with temperature gradient is likely to occur due to significant floor to ceiling height in this area. The highest temperature will occur immediately below the ceiling and gradually decrease as we approach the floor.

7. Third Floor Offices

All perimeter offices located on the third floor are served by terminal units with design cooling capacity that is lower than the required capacities. Deficiency in cooling capacity in perimeter spaces is about 43.1 MBH. Average lighting power density at the third floor is relatively high, with an average of 1.9 W/S.F. Reducing the lighting power density to 1.1 W/S.F. would reduce the required cooling capacity by 8.2 MBH. The benefit of interior shading devices were not considered in the calculations.

8. Restaurant/Fast Food Area/Conference Center

Shop drawings and as-built drawings do not document the actual amount of supply air that is delivered to several areas located on the second floor in the court area. The HVAC design had provided capped duct connection for later installation of terminal units as those spaces were fitted out. For that reason, the analysis for the restaurant, fast food area, conference center, and a couple other smaller spaces was performed assuming the design cooling capacity matches the capacity of the capped duct connections in those areas. All these areas have the capacity to receive a sufficient amount of supply air, except for the fast food space that lacks cooling capacity of 7 MBH.

Summary:

- The stated design capacities of the rooftop units have adequate capacity to meet the cooling load. However, based on the previous examination of the performance of the HVAC system (documented in the July 7, 2009 memorandum entitled *Summary of Air Handling Unit Controls Memorandum*), it appears that the system is not operating as intended in the design.
- There are some areas where the terminal unit capacities do not meet the peak cooling load. The energy analysis portion of this project will address potential cooling load reduction strategies aimed at ensuring the design matches the cooling load. These strategies will be documented in the Longer-Term Energy Conservation Measures Memorandum.