ADDENDUM #3 
February 21, 2012 

This Addendum becomes part of the contract documents and shall be acknowledged by the Design/Build contractor. All parts of the RFP documents dated February 7, 2012, as amended by Addendum #1 and 2, shall remain in force except as modified by this addendum.

GENERAL ITEMS::

1. Re: SC-8.2 Article 54.D.1 Liquidated Damages:
   CLARIFY that Liquidated Damages will amount to $10,000 per day and $250,000 per football game.

MECHANICAL ITEMS:

1. Mechanical Items:
   Refer to the attached addendum, dated 2/21/2012 by M-E Engineers for additional clarifications.

END OF ADDENDUM #3
Existing Conditions at Coors Events Center (CEC)

Mechanical

The existing Buff Vision area is open to the service corridor and is served by a dedicated VAV box from AHU-3 which was installed in 2010. AHU-3 provides direct & indirect evaporative cooling, hot water preheat, air-side economizer, and filtration. The dedicated VAV box serving the Buff Vision area is not provided with a reheat coil.

The existing Control Room area is heated via existing heating and ventilation unit C-40a located in the Conference level mechanical room which was installed in approximately 1980. Heated outside air is delivered to the service corridor which is open to the Control Room area. Hot water unit heaters are provided in the existing Control Room area and are expected to remain in the plenum above the new Control Room area. No cooling is provided in the Control Room area.

Existing heating hot water supply/return, domestic cold water, domestic hot water supply, domestic hot water return, and vent lines run above the Control Room area and are expected to remain.
Scope of Work Summary

Mechanical General Criteria

Applicable Criteria
- All HVAC and plumbing systems shall be designed in accordance with the following:
  - UCB Mechanical Standards
  - Plans prepared by Sink Combs Dethlefs
  - 2009 International Building Code (IBC) with Colorado State Buildings Programs (SBP) amendments
  - 2009 International Fire Code (IFC)
  - 2009 International Mechanical Code (IMC)
  - 2009 International Plumbing Code (IPC)
  - 2009 International Energy Conservation Code (IECC)
  - Other ASHRAE Standards as are reasonably applicable to the project.
  - Applicable plumbing, gas, energy, building, and other codes.
  - National Fire Protection Association criteria latest version.
  - SMACNA Sheet Metal Contractors Association Standards for Duct Construction.
  - ASME - American Society of Mechanical Engineers.
  - AWWA - American Water Works Association.
  - ULC - Underwriters Laboratories.

Design Conditions
- Elevation: 5280 ft.
- Summer:
  - Outdoor Design Temperature: 94.3 dB/60.3 wB
  - Outdoor Evaporation Design Temperature: 64.9 wB/81.1 dB
  - Roof mounted outdoor air intakes: 100 dB/59 wB
  - Indoor Design Temperature:
    - Buff Vision: 75°F
    - Control Room: 75°F
    - Audio Room: 75°F
    - Server Room: 80°F
- Winter:
  - Outdoor Design Temperature: -20.0 dB
Indoor Design Temperature:
- Buff Vision: 70°F
- Control Room: 70°F
- Server Room: 70°F

Relative Humidity Control:
- Server Room, Buff Vision, Control Room, and Audio Room: No low humidity control
Mechanical System Summary

General

All scope areas including Buff Vision, Control Room, Audio Room, and Server Room shall include drain pans under existing piping to prevent leakage onto sensitive equipment.

All piping and ductwork systems shall be re-balanced upon completion.

All piping shall be isolated and separately flushed prior to startup.

Buff Vision – Option 1 and Option 2

The existing 10” VAV box and associated low pressure ductwork serving the Buff Vision area will be removed and replaced with a new 8” VAV box and new low pressure distribution. The new VAV box shall be located to minimize noise within the Buff Suite editing rooms, and new low pressure ductwork shall be routed to each Buff Vision room with minimum 3 ft. flexible ductwork connections to supply diffusers. The new VAV box will not be provided with a reheat coil.

One branch return duct serving the Buff Vision area shall be removed and the return main shall be capped. The remaining branch return duct will serve as an open plenum return within the Buff Vision area. Return grilles shall be provided in each Buff Vision room with lined boots for sound control. The return ductwork main within the Buff Vision area shall remain.

The existing unit heater located within the Buff Vision area will be removed and relocated within the adjacent service corridor. The unit heater shall be located between existing columns to prevent a potential obstruction in the service corridor path.

The Buff Vision area will be served by existing AHU-3 which does not provide low end humidity control.

Due to the dependency of direct/indirect air handling systems on outside air conditions (AHU-3), high temperature excursions in the space may occur when outside air enthalpy exceeds design conditions.

Control Room, Audio Room, and Server Room – Option 1 - Water-source Heat Pump and DX CRAC Unit

The new Control Room and Audio Room shall be zoned together and shall be provided with a new 3.5 ton water-source heat pump with cooling water piped from existing mains within the Practice Facility service corridor. Outside air shall be ducted to heat pump return ductwork from existing heating and ventilation unit C-40a located in the Conference level mechanical room.

A new 1,420 CFM transfer fan shall be provided with supply and return ductwork interconnected with heat pump supply and return ductwork. Control dampers shall be provided on the transfer fan supply and return as well as the heat pump supply duct for transfer fan mode operation, and the transfer fan shall be provided with an ECM motor for variable speed control.
The Control Room and Audio Room will not be provided with humidification under Option 1.

The Server Room shall be provided with a new 5 ton air-cooled DX CRAC unit with split condensing unit located on the concourse level roof. The CRAC unit shall be provided with low-ambient control, humidification, and electric reheat. Outside air shall be ducted to the CRAC unit return ductwork from existing heating and ventilation unit C-40a located in the Conference level mechanical room.

The transfer fan will be utilized during winter months to cool the Control Room and Audio Room and will operate only when adjacent service corridor temperature is 65°F or less and the transfer fan can adequately cool the zone. As zone temperature increases or if the service corridor temperature is higher than 65°F, the interior cooling water loop pumps shall be enabled, and the zone heat pump shall be enabled.

During winter months, the heat pump system may operate with the interior cooling water loop pumps enabled and the exterior tower water loop disabled due to low outside air temperatures. During these conditions, the interior cooling water loop temperature will be allowed to rise above interior ambient temperature and will rely on piping losses in the system to cool the loop.

The existing BMS shall be reconfigured to allow the interior cooling water loop to be enabled during shoulder seasons without enabling the exterior tower water loop. Additional BMS controls shall be provided to determine heat pump mode and enable/disable equipment.

In the event the interior loop temperature rises above 85°F, the outside air temperature is too low for cooling tower loop operation, and service corridor temperature is too high for transfer fan cooling, space temperature in the Control Room and Audio Room may rise above design cooling setpoint. Further study of the interior cooling water loop is required to determine if temperature in the loop will be expected to rise out of range during winter months.

The existing cooling water loop and tower water loop arrangement in the Practice Facility is designed for indirect cooling at main air handlers and currently operates only when indirect cooling is enabled. The addition of a water-source heat pump as part of Option 1 will require indoor cooling water loop pumps to operate during more hours throughout the year.

Option 1 Pros:
- Smaller equipment and less ductwork
- Server room temperature reliability with DX cooling
- Smaller equipment mounted on roof
- Less work on Street and Concourse levels

Option 1 Cons:
- DX cooling for server room (less efficient than indirect/direct evap cooling)
- Compressor cooling in control room/audio room (less efficient than indirect/direct evap cooling)
- High temperature excursions possible for Control Room and Audio Room
Significant BMS logic required for heat pump and cooling water loop control

Option 1 Alternate – Control Room and Audio Room DX Split System

The new Control Room and Audio Room shall be zoned together and shall be provided with a new 3.5 ton air-cooled DX split system with condensing unit located on the concourse level roof. The DX split system shall be provided with low-ambient control, and outside air shall be ducted to return ductwork from existing heating and ventilation unit C-40a located in the Conference level mechanical room.

A new 1,420 CFM transfer fan shall be provided with supply and return ductwork interconnected with split system supply and return ductwork. Control dampers shall be provided on the transfer fan supply and return as well as the split system supply duct for transfer fan mode operation, and the transfer fan shall be provided with an ECM motor for variable speed control.

This alternate provides consistent temperature control in the Control Room and Audio Room under all internal loading and outside air conditions.

Control Room, Audio Room, and Server Room – Option 2 – Rooftop Direct/Indirect VAV Air Handler

The Control Room area shall be provided with a packaged direct/indirect cooled VAV air handling unit sized to accommodate the Control Room, Audio Room, Server Room, and expected loads for the future studio area. The new unit shall be mounted on the concourse level roof and shall include hot water preheat, humidification, an indirect evaporative cooling section with dedicated fan, a direct evaporative cooling section, return fan with VFD, and supply fan with VFD. New supply and return mains shall be routed from the roof to the space, and heating hot water and domestic cold water shall be routed from the service level mains to the new roof mounted air handling unit.

The server room shall be provided with two (2) 14” VAV boxes for airflow modulation, and the Control Room/Audio Room zone shall be provided with a VAV box with hot water reheat. The server room VAV boxes will not be provided with reheat coils. Future studio and storage zones will be provided with VAV boxes with hot water reheat under separate project.

A new dedicated BMS control panel shall be provided for the new unit and shall be integrated into the existing BMS system. The new BMS control panel shall control all unit functions including direct/indirect cooling routines, heating hot water temperature routine, economizer control, supply air temperature setpoint, static pressure setpoint, supply fan airflow, return fan airflow, and occupied/unoccupied mode operation. Refer to the Option 2 Sequence of Operation located in Appendix A.

A dedicated glycol hot water loop shall be provided for the new AHU to prevent coil freezing. The new glycol heating hot water loop shall be provided with a plate and frame heat exchanger, automatic glycol feed pump, air separator, expansion tank, inline circulator, and piping accessories. All loop components shall be located in the concourse level mechanical chase.
During summer months, the new air handling unit will provide direct/indirect cooling with 100% outside air. The supply fan VFD and return fan VFD shall modulate airflow to maintain all spaces at design setpoint. During winter months, the unit will incorporate air-side economizer to provide cooling with hot water reheat for zone level temperature control.

Air handler size and location to be coordinated with structural engineer. Unit shall be located such that hot water coils may be pulled out of the unit without obstruction.

Due to the dependency of direct/indirect air handling systems on outside air conditions, high temperature excursions in spaces served by the system (including Control Room, Audio Room, Server Room, and future studio area) may occur when outside air enthalpy exceeds design conditions.

Option 2 Pros:
- High efficiency (direct/indirect cooling)
- Air-side economizer available
- Flexibility for future studio area
- Flexibility for easy connection to future central plant for less overall unit maintenance
- Less re-work of existing BMS

Option 2 Cons:
- Larger rooftop equipment
- Larger ductwork
- More work on Street and Concourse levels
- High temperature excursions possible for Control Room, Audio Room, and Server Room. High temperature excursions are expected to occur less than 1% of all hours during the year for short time durations, and room temperature will recover as outside air wet bulb temperature falls during the course of the day.

Option 2 Alternate – DX CRAC Unit in Server Room

The Server Room shall be provided with a new 5 ton air-cooled DX CRAC unit with split condensing unit located on the concourse level roof. The CRAC unit shall be provided with low-ambient control, humidification, and electric reheat. Outside air shall be ducted to the CRAC unit return ductwork from the new rooftop mounted VAV air handling unit.

This alternate provides consistent temperature and humidity control in the server room under all internal loading and outside air conditions.

Mechanical Specifications

Refer to UCB Standards for all Mechanical and Plumbing specifications.
Stadium Boards Equipment Replacement
DESIGN-BUILD CRITERIA
Department of Intercollegiate Athletics
University of Colorado at Boulder
2/07/2012

APPENDIX A – MECHANICAL DRAWINGS