Basketball/Volleyball Practice Facility
Addition to Coors Event Center
University of Colorado
Boulder, CO
University Project No.: PR002927

SCD PROJECT # 0906

OWNER
University of Colorado at Boulder
Department of Facilities Management
Research Laboratory #2
1540 30th Street, Room 158
Attn: Katherine A. Dunklau
(303) 492-8731
fax (303) 492-4082
Katherine.dunklau@colorado.edu

ARCHITECT
Sink Combs Dethlefs
475 Lincoln,
Suite 100
Denver, Colorado 80203
Attn. B. Steven King
(303) 308-0200
fax (303) 308-0222
king@sinkcombs.com

ADDENDUM #3  March 12, 2010

This Addendum becomes part of the contract documents and shall be acknowledged by the Contractor. All parts of the contract documents dated February 15, 2010, as amended by Addendum #1 and #2 shall remain in force except as modified by this addendum.

GENERAL ITEMS:

1. **Bid Question:** Per Section 4/A4.10, the Trash Area is 8” heavy weight concrete. Civil drawing C1.01 shows the 8” concrete paving stopping prior to the Trash Area. We are assuming that the 8” paving extends to the Trash Area as shown on Sheet A4.10, is this correct?
   **Response:** Correct.

2. **Bid Question:** Going through the specs on this, the overhead door opener calls out for an opener that can handle 60 cycles per hour but only 20,000 cycle springs. I would think if they are going to open these doors every minute of every day you would want to have a minimum of 100,000 cycle springs and would consider a different type of door to handle the amount of usage. Please advise.
   **Response:** The door and springs shall remain as specified.

3. **Bid Question:** Addm#1, revised bid form – Unit Prices for drilled piers say “per each”; spec 01026 says unit prices are “per each”. Also, are both additive and deductive unit prices to be provided? If so, please revise bid form to list add and deduct unit prices on a per LF basis for each caisson type.
   **Response:** CLARIFY that Price should be per LF added or deducted, no difference.

4. **Bid Question:** Please confirm all permitting is to be by the G.C. including Right Of Way permits?
   **Response:** The University will provide the building permit; all other permits, including Right of Way to be obtained by the Contractor.
5. **Bid Question:** Exterior Signage “Tickets” $ “Coors Events Center”
   a. Are both of these letter sets part of the new scope of work?
      i. If they are please provide specifications such as: Type of lighting, color of lighting, what color/material are the faces, what color/material are the letter bodies, etc.
   b. “TICKETS” are these Reverse Pan Channel Letters w/ a solid face and lit out the back? Or are the Face lit letters w/ Acrylic faces? How do the letters mount to the canopy?
   c. COORS EVENT CENTER” are the letters mounted directly to the wall?

**Response:**
   a.) No, only the “Tickets” sign is included. The “Coors Event Center” sign is N.I.C. See this addendum for specifications clarification.
   b.) See this addendum for specifications clarification.
   c.) The “Coors Event Center” sign is N.I.C.

6. **Bid Question:** Will C.A.D. files be released prior to bid for Civil? Does CU have a place for the backfill dirt to be stored and/or for the excess fill?
   **Response:** CAD files will not be released prior to bid.

7. **Bid Question:** There is no information on transformer or generator pad size, thickness, reinforcing, etc. C4.01 calls out “transformer pad, RE: Architectural Plans”. L2.03 calls out “Transformer & Generator RE: Elect”. Neither Architectural nor Electrical plans show specific information on pad details. Please advise
   **Response:** The concrete type, thickness and reinforcing was clarified in Addendum 1. Assume a footprint size of 5’x6’ for the transformer and 4’x12’ for the generator.

8. **Bid Question:** Spec. Section 07321 clay roof tiles: Does not specifically address underlayment application. Do you want Ice & Water Shield on the complete roof deck and then another ply of I&W over the first after the mason and others have completed work. Please advise
   **Response:** Underlayment application is specified in section 07321 part 3.2. Ice and water shield is not specified on this project, self adhering sheet underlayment is specified with full deck coverage in part 3.2, B and a double layer of roof felts installed full deck coverage below the self adhering sheet underlayment per part 3.2, C.

9. **Bid Question:** Spec. Section 06160 clay tile portion, 2.5 & 2.6 calls out different systems. The plans show something else all together. Please advise as to which sheathing is to be used for the clay tile roofing and provide detail. Is there a vapor barrier between the densdeck and nail base insulation? Please advise.
   **Response:** DELETE 06160 part 2.6 Nail Base Insulated Roof Sheathing, it is not intended for use on this project. See below for correction to part 2.5 Roof Sheathing.

10. **Bid Question:** These questions are about the lockers in the women’s basketball locker room:
   1. The seat pad material answer that was given to a previous RFI is not correct. My understanding is that the material used on the seat pad is Marine Vinyl. Please advise
   2. Please verify the materials used for the lockers, etc. The drawings indicate Cherry, the specs indicate Red Oak and the locker photo appears to be stained Birch. Please advise
   3. Advise the manufacturer and color of the stain. Nothing noted in the specs.
   4. The elevation drawings do not show the interior structure of the locker behind the doors, closet rods, hooks, locks, etc. Is there an interior elevation for the locker.
   5. The locker doors appear to be a slab door. Is this correct?
   6. What type of hinges are used on the locker doors?
   7. Does the trunk compartment seat open for storage? How many trunk lids? What type of locks?

   **Response:** The lockers should match the lockers in the Men’s Basketball Locker Room, except as noted below. See attached specifications and product data sheet.
   1. Marine Vinyl is acceptable.
   2. Material: Birch
   3. Stain: to be selected from manufacturers standard options.
   4. See attached product data sheet.
   5. Slab door is correct.
6. Pocket door to match the Men’s locker room as shown on the attached product data sheet. Add a door stop to the bottom of the door to prevent the bottom of the doors from bowing in when an athlete leans back on the closed doors when seated.

7. Yes, the trunk lid opens, one lid, lock hasp. See attached product data sheet.

11. **Bid Question:** For the alternates do they want the power (conduit, wire, devices, and boxes) under the alternate price? They mention conduit rough in for power under base bid. This seems unclear if they only want a box with a stub?
   **Response:** Power distribution should be included in the alternate price. The base bid should only include the panel board in an area, but no power distribution (conduit, wire, devices).

12. **Bid Question:** Will civil CAD Files be released? Apparently OA Olsson is willing to release them but the architect is directing him not to release at the time. I’m the only one to ask so far.
   **Response:** CAD files will not be released prior to the bid.

13. **Bid Question:** Does CU have a place for the backfill dirt to be stored and/or for the excess fill?
   **Response:** Dirt – the University does not have a place for excess fill. Fill stored for later reuse can be placed on the hill to the east of the site, but will need silt fencing and/or seeding as necessary to stabilize it until use.

14. **Bid Question:** In section 01010-6.1.5 C 2 states: the temporary barriers to be ½” plywood w 2x4’s on the construction side and 1/2” gyp on the public side. Would it be possible to use chain link temporary fencing in lieu of the ½” plywood with 2x4’s construction side and ½” gyp on the public side? Are these temporary barriers for interior use or exterior use?
   **Response:** Chain link is not acceptable. The barriers are for both interior or exterior.

15. **Bid Question:** What is the extent of painting in the existing building?
   a. Spec. Section 07190: Will the water repellent coating be applied to the stone veneer and/or just cast in place & precast concrete?
   b. Will the existing building require water repellent coating?
   **Response:** Touch up painting in areas affected by new fire sprinkler installation at the concourse level. Painting the locker room suite as shown on sheet A4.13. Painting the existing building areas that are impacted by the addition along the perimeter of the existing building.
   a. The water repellent coating is not intended for the stone veneer. It is required for cast in place concrete, precast concrete and cast stone.
   b. The existing building does not require water repellent coating.

16. **Bid Question:** The following details 2/A8.60, 1/A8.60, 4/A8.61 & 1/A8.61 (there are others similar to these) show a 1”x2 ½ “ ano tube. How is this to be attached to the storefront? There is concern for leakage as this is not a typical application.
   a. Standard 4-1/2” aluminum sill plate of sub-sill will no accommodate this arrangement and the 6” is ½” larger than the 5-1/2” make up of this assembly at the sill. How is this to be addressed? Would this just be break metal flashing?
   b. Are these assemblies at the interior framing systems as well?
   c. Are there deflection channels at the heads of the interior framing?
   **Response:** The aluminum tube should be mechanically fastened to the storefront framing.
   a. Use the 6” sill plate.
   b. No, the interior framing is 1-3/4”x4” standard interior aluminum storefront framing, Kawneer Trifab 400 or equal.
   c. No deflection heads are required on interior framing, unless detailed otherwise.

17. **Bid Question:** Spec. Section 07321 Clay roof tile, since the spec has changed to the Spanish S-Tile. Is there still a requirement for the Twisted Wire TYLE-TYE system? Please advise.
   **Response:** The twisted wire ties are not required with the Spanish S-tile.
18. **Bid Question:** Spec. Section 08331 2.5 vs 2.6 Power plan does not show power to door 130B @ mechanical. Is this door power operated or chain hoist?  
**Response:** This is an electrically operated door. Power should be supplied to the door.

19. **Bid Question:** Spec. Section 08361 2.6.E Obstruction safety devise photo eyes and sensor edge, 2.7.4.4 Electric operator. Obstruction safety device photo eyes. Are both photo eyes and sensor edge required? Please advise  
**Response:** Both are required.

20. **Bid Question:** Door #'s 150B & 150E both appear to be 12'-8” high per details 3/A3.45, 2/A3.41, 2/A3.20, 14/A9.42. The door schedule call Door 150B @ 12'-8” and Door 150E @ 13'-8” high. Please confirm.  
**Response:** Door 150E was changed in Addendum #2 to be the existing door shall remain in place, therefore no new door is required for door 150E. Door 150B is required to be 12'-8” high both by detail 14/A9.42 and the Door Schedule.

21. **Bid Question:** RE: Advertisement for Bids, project information item #7, “Preference shall be given to Colorado resident bidders and for Colorado labor…” – how will that preference be judged?  
**Response:** In the event identical bids are received, preference will be given to the Colorado firm.

22. **Bid Question:** Can we use MC whips for fixtures?  
**Response:** MC cable is not allowed by the University of Colorado Boulder Standards and is not allowed under the Division 16 specifications. UCB Standards and Division 16 specifications do allow flexible conduit maximum 6’ length to lighting equipment. In addition, refer to Section 16010 1.8 and 1.10 for more information regarding minimum requirements for electrical work.

23. **Bid Question:** 16010 1.6 D 1 Craftsman Regulations? Do we need to follow these Craftsman Regulations for bidding (1 to 1 ratio)?  
**Response:** Contractor must meet state regulations or specifications whichever is more stringent.

24. **Bid Question:** Also are 16010 1.6 A Bidding Requirements and B Qualifications Requirements to be submitted with the bid, or after contract award?  
**Response:** Refer to Division 01 for bidding submittal requirements as well as 16010 1.6 B.

25. **Bid Question:** Is communication conduit, wire, cable tray, etc suppose to be included in the alternates for the different areas? Example; alt 5 offices, is the cable tray and devices in this area in the base bid or under the alternate. There is no mention of communications under the alternates.  
**Response:** Communications infrastructure should be included in the alternate price. The base bid should only include stubs into the area or raceways going through the area to serve a different area. The cable tray and devices mentioned in the example should be part of the alternate bid.

26. **Bid Question:** On sheet T2.2 note 5 add alternate, there is not an alternate on the bid sheet for this item.  
**Response:** Change this item to base bid.

27. **Bid Question:** Should the fire alarm devices in the basketball and volleyball court have protective guards installed? If so, should the speakers mounted on the ceiling also have guards?  
**Response:** Yes, all of these items should have protective cage style guards.

28. **Bid Question:** At gridline B.7 and 8, there is a precast IT-beam. It appears to be about 34’ long. It appears to be a bit long and want to confirm that this is correct. If this length can work at this location, will it work at others and possible eliminate columns?  
**Response:** The increased span of the IT beam is due to additional constraints at this location. The total load at this location is 100 psf LL, 120 psf DL. This equates to a service load of 4.44 k/ft, which is within the limits provided by PCI Design Handbook for an 28IT36 (4.6 k/ft). Precaster is responsible for the final design. It is structurally acceptable for a bidder to provide longer IT beam spans (within the limits of the precast capabilities) and eliminate columns. The structural engineer will have to re-evaluate drilled pier sizes for increased loads. No additional costs shall be incurred for any changes of this type.
29. **Bid Question:** Re: Spec Section 07142 - Asphalt Waterproofing and Plaza Deck Pavers: Spec section 07142 notes asphalt waterproofing, drainage panels, insulation and plaza deck pavers. This condition is not shown in the drawings. Please clarify where this exists.
   **Response:** This section applies to vertical walls only.

30. **Bid Question:** Re: Elevator Pit Waterproofing, A7.11, S3.15: Please provide the type of waterproofing and specifications if needed for the waterproofing at the elevator pit. None is indicated in structural plans or elevator section.
   **Response:** The elevator pit shall be waterproofed with as specified in Spec Section 07142 - Asphalt Waterproofing. No drainage board is required at this location.

31. **Bid Question:** Re: 07321 Snow-Guards: Snow guards are listed in the spec as provided by owner and installed by contractor. Snow guards are not shown on the drawings, please provide location and quantity.
   **Response:** Assume that 24 snow guards will installed in the area over the main entry roof between grids E – F.

32. **Bid Question:** Re: Addendum 1 and 07321 Clay Roof Tile Spec: Is the manufacturer for the revised S-Shaped clay tile provided in Addendum 1 still Ludowici-Celadon? If not please provide.
   **Response:** Ludowici is still the specified manufacturer.

33. **Bid Question:** Re: 07321 Snow-Guards: Snow guards are listed in the spec as provided by owner and installed by contractor. Snow guards are not shown on the drawings, please provide location and quantity.
   **Response:** Assume that 24 snow guards will installed in the area over the main entry roof between grids E – F.

34. **Bid Question:** Re: Exterior Slabs - Geotechnical Report, page 14: Per the Geotechnical Report provided by Terracon, Page 14, under Exterior Slab Design and Construction, paragraph #2 it states, “Exterior slabs in critical areas be supported on a minimum of 3’ of fill…” It does state that exterior slabs adjacent to the building or other structural elements would have the greatest impact but it is unclear this statement would extend to sidewalks, stairs, the transformer area slab, etc. Please provide further clarification of the exterior concrete slabs that the GC should anticipate being classified under “critical areas” requirement set by the Geotechnical Report.
   **Response:** This shall apply to the main entrance stairs and plaza located at the upper concourse plaza, the transformer/generator pad area, the trash enclosure area and the east side sidewalk at the street level that leads from the existing building all the way to the north end of the stairs that end at the loading area. All sidewalks shall be considered critical areas as well.

35. **Bid Question:** Re: 10671 Metal Storage Shelving: Please clarify locations and provide details for the metal storage shelving, plans and finish schedule do not indicate any metal storage shelving.
   **Response:** DELETE this section. There is no metal storage shelving on the project.

36. **Bid Question:** Re: 10101 Visual Display Surfaces: After review of the drawings it appears the only marker board is indicated on A4.11 as NIC. Please clarify this is the only location and if the marker board indicated is not in contract.
   **Response:** DELETE this section. Marker boards are N.I.C.

37. **Bid Question:** Re: 10265 Impact-Resistant Wall Protection: Please clarify locations for the corner guards listed under Specification Section 10265.
   **Response:** Include 20 corner guards in the scope. Final location shall be determined in the field during the construction after coordinating with the architect and owner.

38. **Bid Question:** Re: 11132 Projection Screens, A4.11/A4.12: After review of the drawings it appears the only projection screen is indicated on A4.11. Per drawing 1/A4.11 it indicates the projection screen to be in contract; however, 4/A4.12 indicates the same projection screen to be not in contract. Please clarify this is the only location and if the projection screen is or is not in contract.
   **Response:** The projection screen is included in the project. The note “N.I.C” on plan 4/A4.12 should be deleted.
39. **Bid Question:** Re: Spec Section 10431, Type "C" and "H" Sign Locations: Please clarify locations of sign type C and H.
   **Response:** DELETE sign types "C" and "H".

40. **Bid Question:** Re: Spec Section 11000, Dishwasher/Ice Machine, A4.12/A4.20: Please clarify if the dishwasher and ice machine are CFCI, OFCI, or OFOI.
   **Response:** The dishwasher is CFCI. The dishwasher shall be a GE Profile model PDWT100RWW, or equal. The ice machine was clarified in Addendum 2.

41. **Bid Question:** Re: Existing caisson coordination, ED1.10: Can the number and diameter of caissons be verified with structural as built for the existing wall between grid lines H and G on sheet ED 1.10? Will existing caissons be in conflict with for proposed columns on grid line 8?
   **Response:** The existing building drawings are available from the owner and are also located on the Sink Combs Dethlefs FTP site.

42. **Bid Question:** Re: 07210, Protection of Insulation: Is a protection course truly needed over the insulation in specification section 07210, part 3.4 Installation of under-slab insulation, as it is not required by the manufacture?
   **Response:** Protection of insulation is required as specified.

43. **Bid Question:** Re: 07115, Waterproofing and Damproofing: Should waterproofing be installed in lieu of dampproofing at below grade foundation walls that have occupied space on the opposite side (basement condition?)
   **Response:** Yes, change the dampproofing on the below grade building foundation walls to waterproofing as specified in Section 07142. This change should be for all perimeter foundation walls including the interior walls along gridline F and gridline 1, except as noted below:
   1. The following walls shall remain dampproofed:
      a) Foundation walls along gridline A between 4-5
      b) Foundation walls along gridline 5 between A-B
      c) Foundation walls along gridline B between 5-9
      d) Foundation walls along gridline 9 between B and edge of retaining wall.
   e) The retaining walls shall all remain dampproofed

44. **Bid Question:** Re: Spec Section 07210, Rigid Insulation at Retaining Walls, Drawing Sheets A3.32, A3.42: Rigid Insulation is shown at the retaining walls in the trash area and generator area (Details 1 on sheet A3.32 and 2 on A3.42). Is rigid insulation truly needed at these retaining walls?
   **Response:** The rigid insulation in these two referenced areas is solely for the protection of the dampproofing during backfilling. The insulation board can be reduced to ¾” thick or another type of board can be used for protection as approved by the dampproofing manufacturer.

45. **Bid Question:** Per sheet C5.03, the concrete pan is noted as 3000 PSI concrete reinforced with welded wire fabric. Should this be 5000 PSI concrete, for concrete exposed to weather, as listed on sheet S0.02? Also, what size wire fabric should be used for the reinforcing?
   **Response:** The concrete shall be 5000 PSI concrete for the concrete pan. The welded wire fabric shall be 6” x 6” – W2.9 x W2.9 WWF. An updated detail is shown within the addendum, CX-002.

46. **Bid Question:** City of Boulder sidewalks are 6” in residential and 8” in commercial areas per 2.02A on Sheet C5.02. Specification Section 02520.3.2.C indicates that the minimum thickness of the sidewalks not subject to vehicle traffic is 4”. Can all the walks around the building, not subject to traffic loading, be 4” thick?
   **Response:** All sidewalks will follow the City of Boulder requirement and use an 8” thickness.

47. **Bid Question:** Re: Sidewalk Paving Depth, C2.03/C5.02: Per the note on the Concrete Walk and Multi-Use Paths detail it indicates concrete sidewalks shall be 6” thick residential or 8” for commercial & public alleys. Per Thickened Edge Sidewalk Detail/C2.03 it indicates 6” thick sidewalk concrete. As this project is a commercial project please clarify if sidewalk concrete should be 8” or 6”.
   **Response:** All sidewalks will follow the City of Boulder requirement and use an 8” thickness.
48. **Bid Question:** Re: 02400, Impact Fee or Plant Investment Fee: Please provide the utility fee schedule indicated under Specification Section 02400, Part 2 - Tap Fees, 2.1. In addition please clarify what the impact or plant investment fee is for specifically.

**Response:** Per Jonathan Akins, no tap fees for this project. It may be something on future projects.

49. **Bid Question:** Re: Spec Section 02513, Cold Milling: Per Specification Section 02513 3.4. A it indicates cold milling to grades and cross sections indicates. No cold milling is indicated on the Contract Documents. Please advise if cold milling is required.

**Response:** No cold milling is required.

50. **Bid Question:** Re: Spec Section 02520 Concrete Paving Design: It is unclear which mix design should be used for concrete paving. Per Concrete Mix Table/S0.02 it states all concrete exposed to weather or deicers should follow the mix design indicated (5000 psi). Per Pavement Design Notes #1/C5.03 it indicates to follow Addendum No. 1 of the Terracon Geotechnical Report, which per sheet 3 indicates Portland cement concrete should be CDOT Class P Pavement (4200 psi). In addition Specification Section 02520 - Portland Cement Concrete Paving 2.1, C states 6 sacks per cubic yard (approx 4000 psi). Please provide clarification as to which mix design should be used for exterior concrete paving.

**Response:** The concrete shall be 5000 PSI.

51. **Bid Question:** Spec. Section 02513 2.3 D: States that “Crushed glass and roofing shingles shall not be used in the mixes. Doesn’t this conflict w/ LEED credits 4.1 & 4.2?

**Response:** References are made to CDOT specifications and glass and roofing shingles are not currently permitted. However, RAP is permitted within the project specification.

52. **Bid Question:** 10155 2.1 – Products call out steel, but A9.50 TCI&2 indicate plastic: Which is to be used?

**Response:** Change the reference in Specs Section 10155 Toilet Compartments, 2.1 to plastic units as follows:

2.1 **SOLID-POLYMER UNITS**

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hadrian Manufacturing Inc
2. Comtec Industries/Capitol Partitions.
3. Bradley Corporation; Mills Partitions
5. Santana Products, Inc.

B. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
2. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.

C. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; polymer or stainless steel.

1. Polymer Color and Pattern: Matching pilaster.

D. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, chrome-plated zamac.
53. **Bid Question:** Looking through the maintenance portion of the "Lawns and Grasses" and "Exterior Plants," I noticed a significant issue. Are we, the contractor, going to be responsible for the maintenance during that first year after completion or is it the owner’s responsibility to follow the maintenance instructions given by us?  
**Response:** Warranty and maintenance is as stated in the specifications.

54. **Bid Question:** Re: Spec Sections 09310, LEED Requirements and Tile: Ceramic Tile spec 09310 include LEED requirement MR 5.1 and 5.2, regional materials within 500 radius. The tile specified in finish schedule does not fit this criteria.  
**Response:** The specifications for each section state preference should be given to items that meet LEED Requirements. If preference cannot be given, for example with the question of ceramic tile, that's fine. The contractor is required to meet the LEED requirements, the details of HOW the contractor does it is up to him/her. The spec sections guide this principle, and as long as the contractor manages the overall project for LEED, giving preference where appropriate. This will be expanded at the contractor LEED kickoff meeting after the construction begins.

55. **Bid Question:** Re: Spec Sections 06105, 06160, 06402, LEED Requirement MR 5.1 and 5.2: LEED requirement MR 5.1 and 5.2 regional materials applies to lumber used in rough carpentry and architectural wood casework. There are no forests or lumber mills within this 500 mile radius. Please verify if it's acceptable to use a lumber manufacturer outside of this area  
**Response:** The specifications for each section state preference should be given to items that meet LEED Requirements. If preference cannot be given, for example with the question of ceramic tile, that's fine. The contractor is required to meet the LEED requirements, the details of HOW the contractor does it is up to him/her. The spec sections guide this principle, and as long as the contractor manages the overall project for LEED, giving preference where appropriate. This will be expanded at the contractor LEED kickoff meeting after the construction begins.

56. **Bid Question:** Re: Spec Sections 07321, Clay Roof Tile Manufacturer and LEED Requirements: If the manufacturer for the revised clay tile roof is still Ludowici-Celadon LEED requirement MR 5.1 and 5.2 for regional materials cannot be met. Ludowici-Celadon is based in Lexington, Ohio.  
**Response:** Ludowici is the manufacturer. The specifications for each section state preference should be given to items that meet LEED Requirements. If preference cannot be given, for example with the question of ceramic tile, that's fine. The contractor is required to meet the LEED requirements, the details of HOW the contractor does it is up to him/her. The spec sections guide this principle, and as long as the contractor manages the overall project for LEED, giving preference where appropriate. This will be expanded at the contractor LEED kickoff meeting after the construction begins.

57. **Roof Curbs and Roofing repairs for Relocated Equipment**  
GC shall provide roof curbs and roofing flashing and tie in for the relocated mechanical equipment that is to be mounted in the existing Coors Event Center roof. See sheet M2.41 for the location of the relocated equipment. See detail 5/A8.50 for roof flashing detail, except that the curbs shall be new curbs, coordinate exact size of curbs with the existing equipment. Provide 6x6x5/16” steel angle frame support below the existing roof decking, steel supports shall be located on all four sides of each curbs, see 4/S5.32 for similar detail of connections. Steel frame support shall be reviewed and approved by the structural engineer prior to construction.

58. **Bid Question:** Re: A3.13, S2.31 and S2.41: On sheet A3.13 along GL 5 there appears to be precast from GL F to GL H from elevation 5379’-6 to approximately 5394’. On structural sheet S2.31 there does not appear to be any support steel at the lower elevation. But on sheet S2.41 there does appear to be support steel. If this is correct, there is no precast below (approximate) elevation of 5394, this elevation becomes the bottom of precast. Please confirm.  
**Response:** The support structural steel is at the correct elevation. The bottom of the precast wall steps down at grid H. See SX-017 for clarification of step location and architectural drawings for updated precast elevations. Additionally, refer to REVISED architectural drawings contained in this addendum.
59. **Bid Question**: Re: S5.23: In detail 4/S5.23, precast will connect to the bottom flange of the beam during installation so the roof detail can be accomplished. If kickers for the steel are required due to the loads from the precast, they will be provided and installed "by others". Kicker design and need will be determined "by others". Question: Can steel handle loads applied to bottom flange?

**Response**: The in-place detail requires the precast to connect to the bent plate/roof deck per 4/S5.23. Per S0.02 general note 7, "the structure is designed for the loads during the structures life. Provide all required engineering and other measures to achieve the means, methods, and sequences of work such as erection procedures and temporary bracing of walls." GC to coordinate any required bracing to temporarily support the precast wall.

60. **Bid Question**: Re: S5.23: Detail 4/S5.23 shows a connection with a kwik bolt to the precast. This is provided and installed "by others" since the decking will not be there when precast is installed since it will be over the top of the precast floor. Please confirm.

**Response**: Please see item 59 above. GC to coordinate sequencing, means and methods, and subcontractor responsibilities.

61. **Bid Question**: Re: S5.22: Grouting of pocket on detail 1/S5.22 is by "others". Please confirm.

**Response**: GC to coordinate sequencing and subcontractor responsibilities.

62. **Bid Question**: What is the cost to bag a parking meter per day?

**Response**: Using meter space is to be coordinated with the Principal Representative and Parking & Transportation Services. There is a $34 set-up/take down charge per event/request (unlimited number of meters) and a cost of $10.50/meter/day.

63. **Bid Question**: Per Summary of Work section 01010-8, E..... it addresses the designated staging areas and mentions lots 420, 429 & 435, where are these located on the drawings?

**Response**: Go to the university parking map: [http://www.colorado.edu/parking/maps/documents/main_campus_parking.pdf](http://www.colorado.edu/parking/maps/documents/main_campus_parking.pdf)

64. **Bid Question**: For the redundant system alternate #7, can we get better clarification on what pieces of equipment this would include?

**Response**: Mechanical equipment included in alternate #7 includes domestic water backflow preventer BFP-3 and heating water pump HWP-2 and associated valves, accessories, and controls.

65. **Bid Question**: Vendor questions on steam conduit. Drawing M1.00 shows a cross section of the existing pipe system which we intend to match on our quote. 16" "Galva-Gard" with 1/2" Pneumatic Line, 4" Steam and 2" Condensate. However, specification section 15080 calls for Multi-Therm 500 for the steam and Polytherm for the condensate. I am still hunting for information on the location of the existing anchor(s).

**Response**: The underground piping system shall be revised to PERMA-PIPE GALVA-GARD system (or approved equivalent) to coordinate with existing conditions. Refer to revised specification section 15080 as part of Addendum 3. The locations of any existing anchors have not been able to be determined at this time based on available existing documentation.

66. **Bid Question**: The fire protection drawings, Sheet FP2.30, illustrates Fire sprinkler piping on the concourse level and provides "Note #6" and Note #9 as follows: "MODIFY EXISTING CONCOURSE LEVEL FIRE SPRINKLER PIPING AND PROVIDE NEW PIPING AS REQUIRED TO PROVIDE FULL SPRINKLER COVERAGE FOR CONCOURSE AREA AND ADJACENT AREAS AS INDICATED" "PROVIDE EXTENDED COVERAGE HORIZONTAL SIDEWALL HEADS INSIDE THE ARENA SEATING AREA AT ROOF LEVEL FOR COVERAGE AS INDICATED. PROVIDE INDIVIDUAL BRANCH PIPE TO EACH HEAD FROM CONCOURSE AREA FIRE SPRINKLER MAIN. HOLD PIPE TIGHT TO PERIMETER WALL OF ARENA" Upon visiting the site, we believe the piping illustrated is actually wet standpipe piping. Per NFPA 13, sprinklers need to be zoned separately from the standpipes. Therefore we cannot "modify existing concourse level fire sprinkler piping". Please provide a scope that connects the sprinkler system desired to a Fire sprinkler Main connection.
Response: Please refer to attached Mechanical Addendum 03 for modifications to fire sprinkler zoning for existing Concourse. Additional zones have been included in the scope of work to separate the hose valves from the sprinkler piping.

67. Bid Question: The fire protection drawings, Sheet FP2.30, illustrates Fire sprinkler piping on the concourse level and provides “Note #9” as follows: “PROVIDE EXTENDED COVERAGE HORIZONTAL SIDEWALL HEADS INSIDE THE ARENA SEATING AREA AT ROOF LEVEL FOR COVERAGE AS INDICATED. PROVIDE INDIVIDUAL BRANCH PIPE TO EACH HEAD FROM CONCOURSE AREA FIRE SPRINKLER MAIN. HOLD PIPE TIGHT TO PERIMETER WALL OF ARENA” Are there any alternatives to placing sprinklers at the roof level, such as a water curtain, consisting of sprinklers 6’ on center along the beam separating the concourse from the seating area?
Response: The current design approach, using sidewall heads, has been discussed with the campus fire marshal. The design approach proposed, using a water curtain, is not acceptable.

68. Bid Question: The fire protection drawings, Sheet FP2.30, illustrates Fire sprinkler piping on the concourse level and provides “Note #8” as follows: “PROVIDE NEW FIRE SPRINKLER COVERAGE FOR EXISTING MECHANICAL PENTHOUSE LOCATED ABOVE RESTROOM GROUP.” Upon visiting the site, we found that the penthouses appear open to the outside air and we could not determine if the area will be maintained above 40 degrees at all time as required for wet sprinkler systems.
Response: Please refer attached Mechanical Addendum 03 for clarification. SBEC believes that sprinkler coverage for areas subject to freezing conditions can be accommodated with the use of dry shaft sprinkler heads.

REVISIONS TO PROJECT MANUAL:

1. Division 0 – Procedural Documents
   Revise “Bid Alternates & Unit Prices Form”. Item 2 Unit prices, drilled pier unit of measure have been changed to reflect “Lineal Foot”, see attached revised Bid Alternate & Unit Prices Form.

2. Re: 03354 – Concrete Sealer, RE: 3.2 Water Based Sealer Application, B:
   REVISE the total number of coats to 3. “Apply a second and third moderate application spray coating…..”

3. Re: 06160 Roof Sheathing:
   DELETE 2.1 Nail Base Insulated Roof Sheathing
   REVISE part 2.5 as follows:
   A. Sloped Roofs for Clay Tile Roofing:
      1. One layer of ½ glass matt panel, Den Deck gold or equal.
      2. One layer of 5/8” fire rated gypsum board.

4. Re: 10431 Signage:
   ADD part 2.6 Exterior Signage as follows:
   2.6 Exterior Signage
   A. Reverse Channel Letters, LED Illuminated
      1. Manufacturer: Signfab, Arapahoe Sign Arts, or equal.
      2. Font: Machine BT Italicized, Size: 24” high
      3. Faces: 0.90 Aluminum, pre-finished black
      4. Returns: 0.063 Aluminum, 3” depth, pre-finished black
      5. Lighting: LED modules, Sloan or equal. Install LED’s on a lexan back facing panel inside the can letter, UL listed. LED Color: White

5. Re: 12484 Floor Mats, 2.1 B:
   REVISE the Basis of Design to Mats, Inc., Type: Ultra Entry, Color: Charcoal, full vestibule length and width. See attached drawing A9.50.
REVISIONS TO ARCHITECTURAL DRAWINGS:

1. **Re: Sheet A0.50**
   ADD general note 26 requiring the GC to coordinate and provide access doors as required for the project.

2. **Re: Sheet A1.01 Plaza Sub-Drainage**
   ADD a system of sub-drainage piping below the entry plaza as shown on attached drawing A1.01.

3. **Re: Sheet A3.13, Precast Panels on west side of East Gym, Grid 5:**
   REVISE the bottom elevation of the PC panels as shown on attached drawing AX-021 and AXR-034. REVISE the height and size of the PC panels at the mechanical room (grids F to H) as shown on the attached drawings AXR-034 and AXR-035. CLARIFY the PC panels and roof/wall interface details of the PC panels at the mechanical room (grids F to H) as shown on the attached drawings AXR-034 and AXR-035. REVISE the panels sizes grids H to existing building per attached drawing AXR-034.

4. **Re: Sheet A5.51**
   REVISE the base detail of both 1/A5.51 and 2/A5.51 as shown on attached drawing AX-020.

5. **Re: Sheet A6.11, Women's BB Shower Area**
   ADD the following note to the sheet:
   Slope the ceilings over the showers at a pitch of 1 in 12. Start the slope in line with the front edge of the shower compartment and slope down towards the wall.

6. **Re: Sheet A6.21:**
   ADD a ceiling in Service Elevator Vest CR240 per the attached drawing AXR-036. CLARIFY The room name of the hall between pre-function and the mechanical room as Mech Hall CR235 as shown on attached drawing AXR-036.

   ADD the following general note to each sheet:
   1. Patch, repair and/or replace existing ceilings as required to facilitate the installation of the fire sprinkler systems upgrades.

   REPLACE the above referenced sheets with the attached sheets. The existing ceilings types and heights have been added to the sheets for reference. Replacements sheets A6.31, A6.32, A6.33, A6.34 and A6.35 area attached.

9. **Re: Detail 4/A8.30**
   REVISE the steel support detail for the precast panel support to match the structural design per the attached drawing AX-021.

10. **Re: Sheet A9.50**
    See the attached sheet A9.50 for updates to the interior finishes. Updates are as follows:
    1) Paint colors have been added to the room finish schedule and several colors have been added.
    2) Ceiling height have been revised to match heights shown in the drawings (sections, elevations etc.)
    3) The base materials have been changed on the service level.
    4) Wall finishes in misc area have been revised to match heights shown in the drawings (sections, elevations etc.)
    5) Ticket booth flooring type has been revised.

REVISIONS TO STRUCTURAL DRAWINGS:

1. **Re: Sheet S2.31:**
   ADD a concrete equipment pad as shown on attached drawing SX-018.
2. Re: Sheet S2.41, Precast Panels on west side of East Gym, Grid 5:
REVISE the bottom elevation of the PC panels as shown on attached drawing SX-017.

REVISIONS TO ELECTRICAL DRAWINGS and SPECIFICATIONS:

1. ELECTRICAL ADDENDUM:
Refer to the attached Electrical Addendum No. 3, dated March 12, 2010, containing a narrative, specifications and drawing revisions.

REVISIONS TO MECHANICAL, PLUMBING and FIRE PROTECTION DRAWINGS and SPECIFICATIONS:

1. MECHANICAL ADDENDUM:
Refer to the attached Mechanical, Plumbing and Fire Protection Addendum No. 3, dated March 12, 2010, containing a narrative, specifications and drawing revisions.

THE FOLLOWING MANUFACTURERS ARE APPROVED FOR BIDDING SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS:

SECTION 08625 – Tubular Daylighting Device
  -Velux Model TCR Commercial Sun Tunnel

SECTION 08710 – Hardware
  -Hagar (hinges)

SECTION 11491 - Gymnasium Equipment
  -ADP Lemco Inc.

END OF ADDENDUM #3
Additive alternates will not be used if deductible alternates are used and deductible alternates will not be used if additive alternates are used.

1. **Additive Alternates / Unit Prices**
   
   Refer to specification section 01030 for descriptions of add alternates. If the add alternates are accepted, the base bid would be modified by the amount entered by the bidder. Refer to specification section 01026 for additional information.

<table>
<thead>
<tr>
<th>Additive No.</th>
<th>Description</th>
<th>Add</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.A. No. 1</td>
<td>West Gymnasium Tenant Finish</td>
<td>$</td>
</tr>
<tr>
<td>A.A. No. 2</td>
<td>New Women's Basketball Lock Room Tenant Finish</td>
<td>$</td>
</tr>
<tr>
<td>A.A. No. 3</td>
<td>Freight Elevator</td>
<td>$</td>
</tr>
<tr>
<td>A.A. No. 4</td>
<td>Volleyball Offices Tenant Finish</td>
<td>$</td>
</tr>
<tr>
<td>A.A. No. 5</td>
<td>Gymnasium Support Rooms Tenant Finish</td>
<td>$</td>
</tr>
<tr>
<td>A.A. No. 6</td>
<td>Roof Mounted Daylighting in Gymnasium</td>
<td>$</td>
</tr>
<tr>
<td>A.A. No. 7</td>
<td>Redundant Mechanical Systems</td>
<td>$</td>
</tr>
</tbody>
</table>
2. **UNIT PRICES**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT PRICE (Add or Deduct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Drilled pier DP18</td>
<td>$ __________/Lineal Foot</td>
</tr>
<tr>
<td>b. Drilled pier DP24A</td>
<td>$ __________/Lineal Foot</td>
</tr>
<tr>
<td>c. Drilled pier DP36A</td>
<td>$ __________/Lineal Foot</td>
</tr>
<tr>
<td>d. Drilled pier DP48A</td>
<td>$ __________/Lineal Foot</td>
</tr>
</tbody>
</table>

_______________________________________
Bidder     Date
MATCH BURIED RIPRAP SWALE FLOWLINE WITH FLOWLINE AT DEPRESSED CURB, SEE DETAIL BELOW

BURIED RIPRAP SWALE OUTLET PLAN
SCALE: 1" = 10'

DEPRESSED CURB DETAIL
SCALE: NTS

MATCH BURIED RIPRAP SWALE FLOWLINE WITH FLOWLINE AT DEPRESSED CURB

1.5' CURB TRANSITION
1.5' CURB TRANSITION

CURB FLOWLINE

MATCH BURIED RIPRAP SWALE FLOWLINE WITH FLOWLINE AT DEPRESSED CURB

BURIED RIPRAP SWALE FLOWLINE SEE SHEETS C2.01-C2.03 FOR SLOPE GRADES

PARKING LOT PAVEMENT

SEE BURIED RIPRAP SWALE SECTIONS ON SHEET C2.01 FOR MORE DETAIL

 Addendum #3
 Orig. SI. N/A
 3/10/10
 Project No. 0906
 CX-001
FORM OR CUT EXPANSION JOINTS TO 1/4 DEPTH OF SLAB AT 12 FT. O.C.

ASPHALT PAVING

4'-0" MIN.

2" MIN.

6" MIN.

WELDED WIRE FABRIC (WWF)
6"x6"—W2.9xW2.9

COMPACTED NATURAL SUBGRADE

5000 PSI CONCRETE TO BE REINFORCED WITH WWF

CONCRETE PAN
NOT TO SCALE
<table>
<thead>
<tr>
<th>Room Finish Schedule</th>
<th>Materials Key</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Room Details</strong></td>
<td><strong>Materials</strong></td>
</tr>
<tr>
<td><strong>Room Name</strong></td>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Area</strong></td>
<td><strong>Quantity</strong></td>
</tr>
<tr>
<td><strong>Finish</strong></td>
<td><strong>Information</strong></td>
</tr>
<tr>
<td><strong>Color</strong></td>
<td><strong>Notes</strong></td>
</tr>
</tbody>
</table>

**Materials Key**

- **Concrete**
- **Brick**
- **Wood**
- **Plaster**
- **Paint**
- **Glass**

**Room Finish Schedule**

<table>
<thead>
<tr>
<th>Room Number</th>
<th>Room Name</th>
<th>Area</th>
<th>Finish</th>
<th>Color</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>R101</td>
<td>Lobby</td>
<td>500</td>
<td>Concrete</td>
<td>Gray</td>
<td>New flooring.</td>
</tr>
<tr>
<td>R202</td>
<td>Hall</td>
<td>1000</td>
<td>Brick</td>
<td>Brown</td>
<td>Stained.</td>
</tr>
<tr>
<td>R303</td>
<td>Office</td>
<td>1500</td>
<td>Wood</td>
<td>White</td>
<td>Vinyl floor.</td>
</tr>
<tr>
<td>R404</td>
<td>Classroom</td>
<td>2000</td>
<td>Plaster</td>
<td>Beige</td>
<td>Painted.</td>
</tr>
<tr>
<td>R505</td>
<td>Library</td>
<td>2500</td>
<td>Paint</td>
<td>Blue</td>
<td>Custom trim.</td>
</tr>
</tbody>
</table>

**Notes**

1. Use concrete for structural support.
2. Use brick for main walls.
3. Use wood for interior walls.
4. Use plaster for walls that require a smooth finish.
5. Use paint for walls requiring a decorative finish.
6. Use glass for windows and doors.
7. Use vinyl for floors that require durability and ease of maintenance.
8. Use custom trim for a professional appearance.

**Contact Information**

- **Architect: John Doe**
- **Contractor: Jane Smith**
- **Supervisor: Bob Johnson**

**Date:** March 15, 2023

**Signature:**

---
21. ALL WOOD BLOCKING SHALL BE FIRE RESISTANT TREATED WOOD (FRTW).

22. FRAME ALL OPENINGS IN MASONRY WALLS (CLEAR OPENINGS, DOORS, LOUVERS, ETC.) WITH LINTELS ABOVE. PROVIDE CMU BOND BEAMS LINTELS AT CMU WALLS. PROVIDE STEEL ANGLE LINTELS AT BRICK WALL OPENINGS PER THE LOOSE LINTEL SCHEDULE. SEE STRUCTURAL DRAWINGS FOR LINTEL SCHEDULES AND REQUIREMENTS.

23. INSULATION REQUIREMENTS: PROVIDE A 100% FULLY INSULATED EXTERIOR ENVELOPE. SEE INSULATION TYPES AND R VALUE MIN REQUIREMENTS ON BUILDING SHELL TABLE THIS SHEET.

24. PROVIDE HORIZONTAL WINDOWS BLINDS ON THE FOLLOWING EXTERIOR WINDOWS:
   - 201
   - 202
   - 203
   - 204
   - 205

25. ALL WALLS ARE TYPE 51-F-2-U UNLESS NOTED OTHERWISE ON THE PLANS BY A WALL TAG.

26. PROVIDE ACCESS HATCHES FOR THE PROJECT AS FOLLOWS:
   a) The extent, location and size of each type of access door required is shown on the drawings and specified herein, and include the following:

      Wall or ceiling access doors.

   b) Provide access doors not indicated on the drawings but required by Codes or needed by the Work. GC Shall coordinate with sub-contractors for access hatches required. Provide access doors for all concealed work including Plumbing, Electrical, and Mechanical requiring periodic servicing or inspection.

   c) Final location and type of access doors shall be approved by the Architect prior to installation.

   d) All access doors shall be provided by one manufacturer for entire project. Cylinder locks keys or screwdriver latches shall be the same for all access doors.

   e) Provide access hatches for mechanical equipment above hard ceilings including but not limited to the following: VAV boxes, valves, dampers, and other equipment that requires servicing, coordinate with mechanical contractor.
All drawings are the exclusive property of OakWood Sports Inc. and cannot be used without express written permission.

- **Locker:** 36"W, 36"D, 88"H
- **Material:** Red Oak
- **Finish:** Clear Coat
- **Hardware:** Steel PC Black
- **Logo:** Laser w/black paint
- **Pocket Doors on both sides**

---

**University of Colorado**

- **Scale:** [ ]
- **No.** [ ]
- **Approved by:** [ ]
- **Date:** [ ]

**Drawn By:** [ ]
- [ ]

**OakWood Sports Inc.**

- **Drawing Number:** [ ]
- **Basketball Locker 1**
OakWood Sports Inc.
1025 Clark Road
Lansing, MI 48917
517-321-6852 Office
517-321-0975 Fax
oakwoodsports.com

Dear Customer,

Below are listed the materials and hardware typically used for the components of OakWood Sports Inc. locker systems. These components will vary depending on the end user specifications.

Plywood:
7 ply, wood core, rotary or plain sliced, A2 normal construction parts, Nerbord Core

Hardwood:
Plain or rotary sliced

Note: Wood products are supplied from certified forest vendors.

Hardware:

Brass (Products are solid brass)
Single Hook, Baer IV581MB3
Double Hook, Baer IV571MB3
Locking Device, OSI M1124A
Lock Hasp, McMaster 1548A11
Hasp Clip, OSI B1004A
Continuous Hinge, McMaster 1584A72

Stainless Steel:
Single Hook, Hafele 842.34.050
Double Hook, Hafele 842.34.000
Locking Device, OSI M1124B
Lock Hasp, McMaster 1304A24
Hasp Clip, OSI B1004B
Continuous Hinge, McMaster 12C75A53

Misc. Hardware:
Name Plate
Brass, Stamprite, Silver Coat, New Hermes T2230B
Cabinet Hinge, Richelieu 3SN35808180
Jersey Hook, Bear SHTY30

Locker Extras:
Laser engraved end user logo
Inset Plastic Laminate end user logo
Powder coated metal shelf cages and venting in end user colors
Finish:
Catalytic Lacquer
Semi Gloss

Chemical Tests:
Sulfuric Acid 25%, No effect
Hydrochloric Acid 37%, No effect
Nitric Acid 25%, No effect
Ammonium Hydroxide, No effect

Reagent Tests:
Orange Juice, No effect
Coffee, No effect
100 Proof Alcohol, No effect
Nail Polish Remover, No effect
Goof Off, No effect

Physical Test:
Cold Water Immersion (4 days), No effect

Sealer:
Water resistant sealer compatible with applied lacquer. All exposed surfaces are single sealed and visual parts (i.e. seat, shelves and sides) are double sealed.

Assembly:
Joinery is dadoes, rabbits and butt joints. Product parts are finished prior to assembly to enhance final coating. Parts are joined by use of yellow carpenters glue, poly glue where needed, staples and pins.

No edge banding. Solid wood products, ¾" x ¾" on exposed plywood edges to match grain direction.

Installation:
Minimum of ten (10) years of experience relating to installation of similar products utilizing qualified experienced employees. Installation of over 120 locker rooms throughout the United States and Canada

Warranty:
One-year warranty against manufacturer's defects. Warranty does not apply to damages caused by abuse and/or misuse.

Sincerely,

Gregory M. Bria
President/CEO
Oakwood Sports Inc.
PROJECT: Basketball/Volleyball Practice Facility  
University of Colorado, Boulder  
Bid Documents  
Dated: February 15, 2010  
SBEC Project #090009  

DATE: March 12, 2010  

This Addendum becomes part of the Contract Documents and shall be acknowledged by each bidder on the proposal form. All parts of the original specifications and drawings shall remain in force except as noted below:

1. Drawings:
   A. M0.02 – HVAC Schedules
      1. Fan Schedule: Add exhaust fan EF-6 to fan schedule as indicated on drawing MX-017.
      2. Duct Pressure Classification Schedule: Delete reference to internal lining for medium pressure ductwork. Medium pressure ductwork shall be externally insulated with 1-1/2” wrap insulation.
   B. M0.03 – HVAC Schedules
      1. Update Fire/Smoke Damper Schedule as indicated on drawing MX-001.
      2. Add pump CWP-5 to pump schedule as indicated on drawing MX-002.
      3. Add expansion tank ET-2 associated cooling water system as indicated on drawing MX-002.
   C. M0.05 – HVAC Schedules
      1. Temperature Control Matrix: Add “Emergency Shower Flow Switch” digital input to matrix. This flow switch shall monitor water flow at the emergency shower near the water treatment station in Mechanical 330.
   D. MD2.10 – Service Level – Mechanical Demolition Plan
      1. Remove and relocate existing drinking fountain as indicated on drawing MX-004.
   E. M1.00 – Mechanical Site Plan
1. Provide drip-tee assembly at low point of steam piping at entrance to Mechanical 156.

2. Provide two 32# anodes in close proximity of new steam piping connection to existing steam piping.

F. M2.11 – Service Level – Addition HVAC Plan

1. Modify clothes dryer vent for clothes dryer exhaust as indicated on drawing MX-015.

2. Add transfer grille 24/12 “TG-1” at Break Room 161 in wall above door. This grille shall be connected to the return air sound elbow at the ceiling return grille.

3. Provide 1” internal duct liner for portion of AHU-1 42/24 return ductwork from point of return grille to fire/smoke damper at shaft.

G. M2.21 – Street Level – Addition HVAC Plan

1. Revise fire/smoke dampers in vicinity of gridlines 4/G as indicated on drawing MX-005.

2. Provide 1” internal duct liner for portions of AHU-1 60/24 return ductwork. Liner shall be provided from point of return grille connection to 20 feet downstream.

3. Provide 1” internal duct liner for portion of AHU-3 return ductwork. Liner shall be provided for 36/24 branch ductwork to the west of the balancing damper including the elbow open to the ceiling plenum. Additionally, liner shall be provided for the 36/24 branch ductwork to the east from the point of the balancing damper to a point 20 feet upstream.

H. M2.31 – Concourse Level – Addition HVAC Plan

1. Revise low pressure ductwork downstream of TB-3-301 to 28/12 in lieu of 24/14 as indicated on drawing MX-006.

I. M3.11 – Service Level – Addition HVAC Piping Plan

1. Field coordinate exact location of cabinet unit heater (CUH-3) at door near gridlines 5/C with Architect and Electrical. CUH shall be installed north of the electrical light just inside the door.

2. Provide new steam vent piping to extend existing steam vent piping at existing Street Level mechanical room to roof as indicated on drawing MX-013.

3. Provide new steam vent piping associated with new steam PRV station and condensate lift station to roof as indicated on drawing MX-013.

J. M3.21 – Street Level – Addition HVAC Piping Plan
1. Field coordinate exact location of cabinet unit heater (CUH-2) at door at Vestibule CR201. CUH shall be installed in ceiling north of electrical light just inside the door.

K. M4.01 – Enlarged Mechanical Room Plans

1. Provide new Exhaust Fan EF-6 for clothes dryer venting and modify new dryer vent as indicated on drawing MX-007.

2. Modify domestic cold water piping to AHU-2 direct evaporative cooling as indicated on drawing MX-011.

3. Provide bypass piping and control valve for cooling water system as indicated on drawing MX-011.

L. M5.01 – Mechanical Details

1. Delete motorized ball valves and associated drain piping on Indirect Evaporative Cooling Coil Piping Detail as indicated on drawing MX-009.

2. Add Fan Coil Unit Piping Detail as indicated on drawing MX-010.

3. Add VAV Hot Water Coil Piping Detail as indicated on drawing MX-010.

M. M5.02 – Mechanical Details

1. Add Condenser Water Piping Support Detail as indicated on drawing MX-008.

2. Revise Cooling Tower Piping Detail as indicated on drawing MX-016.

3. Revise Heat Exchanger Piping Detail as indicated on drawing MX-012.

4. Revise PRV-1 Steam Pressure Reducing Station Detail as indicated on drawing MX-014.

N. M6.02 – Piping and Controls Schematics

1. Revise Fan Coil Unit FCU-1 Piping and Control Schematic based on addition of coil pump as indicated on drawing MX-003.

O. P2.11 – Service Level – Addition Plumbing Plan

1. Add domestic water piping to AHU-2 direct evaporative cooling as indicated on drawing PX001.

2. Relocate existing drinking fountain to new location as indicated on drawing PX-002.

P. FP0.01 – Fire Protection Legends and Details
1. Add Existing Mechanical Penthouse AHU Details as indicated on FPX-001 and FPX-002. These are to provide clarification regarding the sprinkler coverage in these areas.

Q. FP2.30 – Concourse Level – Overall Fire Protection Plan

1. Provide new fire sprinkler zone for new sprinkler coverage of existing building Concourse Level. Connect to new fire service riser in Mechanical 330 and extend fire sprinkler piping into existing building. Remove existing fire sprinkler piping connected to existing piping serving hose cabinets.

2. Provide new fire sprinkler zone for new sprinkler coverage of existing arena seating area. Connect to new fire service riser in Mechanical 330 and extend fire sprinkler piping into existing building to arena seating area.

3. Revise Keynote 8 to read, “PROVIDE NEW FIRE SPRINKLER COVERAGE FOR EXISTING MECHANICAL PENTHOUSE LOCATED ABOVE RESTROOM GROUP. PROVIDE DRY-SHAFT SPRINKLER HEADS FOR OUTSIDE AIR INTAKE SECTION AND MIXING SECTION UPSTREAM OF HEATING COIL.”

2. Specifications:

A. 15080 – Underground Pipe and Conduit System For Class A Soils

1. Revise underground steam and conduit piping to PERMA-PIPE GALVAGARD (or equivalent) product. For reference, a revised specification section has been included with this addendum.

B. 15241 – Vibration Control

1. Add paragraph 2.1 A 1 b to read, “Amber/Booth”. (Amber/Booth shall be an acceptable manufacturer for products.)

C. 15250 – Mechanical Insulation

1. Add paragraph 3.10 B 7 to read, “Low pressure round ductwork exposed in the space in which it serves.” (This is issued for clarification to indicate that spaces with exposed round ductwork in space it serves (e.g. gymnasiums) do not require duct insulation. Rectangular low-pressure pressure ductwork shall be internally lined and medium pressure ductwork shall be externally wrapped in all locations.)

2. Revise paragraph 3.11 A to read, “Concealed, medium pressure rectangular and round supply-air duct insulation; and outdoor air duct insulation; shall be the following: 1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5 lb/cu. ft. nominal density.”
3. Add paragraph 15250 3.12 E to read, “Heating-hot-water heat exchanger insulation shall be the following: Mineral-Fiber Pipe and Tank: 2 inches thick.”

4. Add paragraph 15250 3.12 F to read, “Provide removable insulation jackets for use on the following: All pressure-powered condensate pumps, all pressure regulators, steam traps 1” and larger, gate/globe/butterfly valves 2” and larger, and strainers 2” and larger. Refer to section 15525 “Steam Specialties” for additional information.”

5. Add paragraph 15250 3.14 I to read, “Cooling Water Supply and Return piping: Mineral-Fiber, Preformed Pipe Insulation, Type I, 1” thick for pipe sizes 1.5” in diameter and smaller, 1-1/2” thick for pipe sizes larger than 1.5” in diameter.”

D. 15411 – Domestic Water Piping

1. Add paragraph 15411 3.2 C 3 to read, “Piping upstream of fire sprinkler system backflow preventer shall be Type K copper consistent with domestic water piping requirements.”

E. 15421 – Sanitary Waste and Vent Piping

1. Add paragraph 15421 3.6 E 6 to read, “Support all horizontal cast iron pipe within 12 inches of each joint and with 5 feet maximum spacing between hangers, except where 10-foot lengths of pipe are used which shall be supported at intervals no greater than 10 feet.”

F. 15431 – Facility Storm Drainage Piping

1. Revise paragraph 15431 3.5 E 6 to read, “Support all horizontal cast iron pipe within 12 inches of each joint and with 5 feet maximum spacing between hangers, except where 10-foot lengths of pipe are used which shall be supported at intervals no greater than 10 feet.”

G. 15440 – Plumbing Fixtures

1. Revise paragraph 15440 2.13 A 2 to read, “Description: Single Bowl, undermount, stainless steel sink.”

2. Revise paragraph 15440 2.13 A 2 a to read, “Overall Dimensions: 18-1/2” x 18-1/2”.”

3. Revise paragraph 15440 2.13 A 2 f to read, “Product Reference: Elkay Model ELUHAD1616, 5-1/2” depth.”

4. Revise paragraph 15440 2.13 B 2 to read, “Description: Two compartment, undermount, stainless steel sink.”


H. 15510 – Hydronic Piping

1. Add paragraph 2.6 A 3 to read, “Armstrong (air separators only).”
   (Armstrong shall be an acceptable manufacturer for air separators.)

I. 15525 – Steam Specialties

1. Add paragraph 2.17 for “Condensate Pumps” per below:

2.17 CONDENSATE PUMPS

A. The pump package shall be provided according to the schedule and based on the following specifications:
1. The condensate pump package shall have a capacity as scheduled on the drawings with fully redundant capabilities. Provide with the ability to fully isolate each pump and/or package from the system.
2. Each pump and receiver in the package shall be an ASME 150# rated vessel.
3. The package must be a low-profile package.
4. The pumps shall sense level and activate via an electrode probe-style mechanism (no mechanical float mechanism), utilizing a pin-style Warrick relay.
5. The probe mechanism shall have a third probe for high level alarm, utilizing a two position switch.
6. Each pump package shall have its own control panel.
7. Each panel shall incorporate an electronic cycle counter and a high level alarm contact. Signal for cycle count and high level alarm shall be sent to the Andover control system. Coordinate with the temperature controls contractor.
8. Each pump shall utilize a 3-way pneumatic actuated ball valve for the motive force. Ball valve shall be carbon steel body with stainless steel trim.
9. Each pump shall have an isolation valve on the condensate inlet and outlet.
   a.) 3” and above – 150# lugged style high performance gear operated steam rated butterfly valve.
   b.) 2” and below – full port forged steel ball valve with stainless steel ball and stem, rated for 250 psig WSP.
10. Each pump shall have a check valve on the condensate inlet and outlet.
   a.) 3” and above – Durabla model WLC CI/BR wafer body check.
   b.) 2” and below – Durabla model WLC wafer style, stainless steel construction. Check valves shall be Durabla wafer style (no substitutes).
11. Each pump shall have a rising-stem, class 800, forged steel gate valve with a steel strainer and steam regulator for the steam supply. The strainer must also have a forged steel ball valve for
blowdown, all ball valves, if utilized, shall be full port carbon steel body x stainless steel ball and stem.

12. Pump tanks shall be Armstrong 300 or 400 series tanks ASME rated at 150#.

13. Each tank (pumps and receivers) must be individually drainable, utilizing forged steel ball valves.

14. Each pump trap must have high pressure gauge glass assembly and pressure gauge assembly (gauge, siphon and ¼” carbon steel isolation ball valve.

15. All pipe 2” and smaller shall be threaded ASTM type A106 seamless black steel – schedule 80.

16. All steam pipe 2 ½” and larger shall be welded ASTM type A106 seamless black steel – schedule 40.

17. All condensate pipe 2 ½” and larger be welded ASTM type A106 seamless black steel – schedule 80.

18. 250 lb malleable iron unions with brass seats and 2000 psig forged steel fittings shall be used in all threaded applications.

19. 150 psig raised face, steel weld neck flanged and steel butt weld fittings shall be used in all welded applications.

20. All flange gaskets shall be spiral-wound where the windings are manufactured with type304SS with non-asbestos filler and the outer ring (gauge ring) is manufactured with carbon steel.

21. All threaded fittings will be assembled with 100% virgin Teflon tape. No pipe joint compound will be permitted.

22. Pump packages shall be pre-fabricated on a stand with leveling pads and all interconnecting piping.

23. All components, pieces and parts, whether or not the are specifically shown or indicated on the submittal, shall be in accordance with all University of Colorado – Boulder standard mechanical specifications.

24. All welds to be done by a ASME certified welder.

25. Threads on pipe must be cut correctly. Not allowing more then 3 ½ turn by hand and a minimum of 2 ½ turns.

26. Pumps to be leveled and plumb.

27. All equipment should be set for ease of maintenance.

28. Vent piping to be taken to an outside location. 1st Choice would be the roof.

29. All piping should be individually hung to secure.

30. Motive steam should have drip trap.

31. Air lines shall use black pipe or rigid copper.

Acceptable Manufactures:

1. Armstrong

2. or prior approval equivalent

J. 15711 – Cooling Towers

1. Add paragraph 2.1 A 3 to read “Marley”. (Marley shall be an acceptable manufacturer for cooling towers.)
2. Delete reference to “galvanized” steel in section 15711 2.1 O. All personal access components shall be stainless steel.

3. Revise paragraph 15711 3.3 A to read, “Install cooling tower on structural steel framing, refer to drawings. Refer to Vibration Control specification for additional information regarding vibration isolation requirements.”

K. 15755 – Heat Exchangers

1. Revise 15755 2.1 A 2 c to read “Tranter”.

L. 15832 – Unit Heaters

1. Add paragraph 2.1 A 7 to read “Modine.” (Modine shall be an acceptable manufacturer for cabinet unit heaters.)

2. Add paragraph 2.2 A 7 to read “Modine.” (Modine shall be an acceptable manufacturer for propeller unit heaters.)

M. 15851 – HVAC Power Ventilators

1. Add paragraph 2.1 A 5 to read “Twin City” (Twin City shall be an acceptable manufacturer for fans.)

N. 15855 – Modular-Central Station Air-Handling Units

1. Add paragraph 2.1 A 4 to read “Scott-Springfield.” (Scott-Springfield shall be an acceptable manufacturer for air handling units.)

O. 15891 – Metal Ducts

1. For clarification, internal liner (specified as part of paragraph 2.7) shall apply only to rectangular low pressure ductwork. Medium pressure ductwork, outside air ductwork, and round low pressure ductwork shall be externally wrapped as specified. External wrap of low pressure round ductwork shall be omitted in locations where ductwork is exposed in the space it serves (e.g. gymnasiums).

P. 15950 – Instrumentation and Control for HVAC

1. Add paragraph 15950 2.1 C 1 f to read, “Chilled water coils ½” - 1 1/2 “ size, Belimo pressure independent or “Delta P” valves. Chilled water coils, 2” – 8” size, Delta “P” Valve, pressure independent flow control valve.”

Q. 15975 – Sequence of Operation

1. Replace entire section with revised 15975 included as part of this addendum.
END OF ADDENDUM #1

ATTACHMENTS:

Drawings: MX-001, MX-002, MX-003, MX-004, MX-005, MX-006, MX-007, MX-008, MX-009, MX-010, MX-011, MX-012, MX-013, MX-014, MX-015, MX-016, MX-017, PX-001, PX-002, FPX-001, FPX-002

Specifications: 15080 - Underground Pipe and Conduit System for Class A Soils
15975 - Sequence of Operation for HVAC Controls
## Fire/Smoke Damper Schedule

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SYSTEM/LOCATION</th>
<th>SERVICE</th>
<th>MFR.</th>
<th>MODEL</th>
<th>DUCT DAMPER CONNECTION SIZE W/H (IN.)</th>
<th>CPM AT 5300' ELEV.</th>
<th>MAX. P.D. IN. W.C. AT S.L.</th>
<th>NORMAL POSITION</th>
<th>FAIL POSITION</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSD-101</td>
<td>AHU-3 Service Level</td>
<td>SUPPLY</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>24/12</td>
<td>1600</td>
<td>0.15</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-102</td>
<td>AHU-3 Service Level</td>
<td>RETURN</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>36/18</td>
<td>4200</td>
<td>0.10</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-103</td>
<td>EF-1 Service Level</td>
<td>EXHAUST</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>24/12</td>
<td>1150</td>
<td>0.10</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-104</td>
<td>AHU-2 Service Level</td>
<td>RETURN</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>42/36</td>
<td>21000</td>
<td>0.10</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-201</td>
<td>AHU-3 Street Level</td>
<td>SUPPLY</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>30/24</td>
<td>8050</td>
<td>0.15</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-202</td>
<td>AHU-3 Street Level</td>
<td>SUPPLY</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>30/24</td>
<td>9650</td>
<td>0.15</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-203</td>
<td>AHU-3 Street Level</td>
<td>RETURN</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>36/18</td>
<td>4200</td>
<td>0.10</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-204</td>
<td>AHU-2 Street Level</td>
<td>RETURN</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>72/24</td>
<td>21000</td>
<td>0.10</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-205</td>
<td>EF-1 Street Level</td>
<td>EXHAUST</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>10/10</td>
<td>350</td>
<td>0.10</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
<tr>
<td>FSD-206</td>
<td>EF-1 Street Level</td>
<td>EXHAUST</td>
<td>GREENHEX</td>
<td>FSD-312</td>
<td>24/14</td>
<td>1500</td>
<td>0.1</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>(1)</td>
</tr>
</tbody>
</table>

(1) PROVIDE WITH END SWITCH FOR POSITION VERIFICATION.
## PUMP SCHEDULE

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>SERVICE</th>
<th>PUMP TYPE</th>
<th>MAX OPER TEMP</th>
<th>CFM</th>
<th>TOTAL DYNAMIC HEAD (FT)</th>
<th>EFF %</th>
<th>MIN HP</th>
<th>RPM</th>
<th>SKEWON SIZE (IN)</th>
<th>DESIGN SIZE (IN)</th>
<th>CONTROL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWP-1</td>
<td>BELL &amp; GOSSETT</td>
<td>1510</td>
<td>HEATING WATER</td>
<td>BASE MOUNTED</td>
<td>250</td>
<td>250</td>
<td>70</td>
<td>76</td>
<td>10</td>
<td>1750</td>
<td>3</td>
<td>2</td>
<td>2-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>HWP-2</td>
<td>BELL &amp; GOSSETT</td>
<td>1510</td>
<td>HEATING WATER</td>
<td>BASE MOUNTED</td>
<td>250</td>
<td>250</td>
<td>70</td>
<td>76</td>
<td>10</td>
<td>1750</td>
<td>3</td>
<td>2</td>
<td>2-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>HWP-3</td>
<td>BELL &amp; GOSSETT</td>
<td>SERIES 20x247</td>
<td>AHU-1 HEATING COIL</td>
<td>N-LINE</td>
<td>250</td>
<td>80</td>
<td>27</td>
<td>50</td>
<td>1.5</td>
<td>1750</td>
<td>1</td>
<td>1</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>HWP-4</td>
<td>BELL &amp; GOSSETT</td>
<td>SERIES 20x247</td>
<td>AHU-2 HEATING COIL</td>
<td>N-LINE</td>
<td>250</td>
<td>95</td>
<td>27</td>
<td>47</td>
<td>2</td>
<td>1750</td>
<td>1</td>
<td>1</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>HWP-5</td>
<td>BELL &amp; GOSSETT</td>
<td>SERIES 20x247</td>
<td>AHU-3 HEATING COIL</td>
<td>N-LINE</td>
<td>250</td>
<td>80</td>
<td>27</td>
<td>50</td>
<td>1.5</td>
<td>1750</td>
<td>1</td>
<td>1</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>TMW-1</td>
<td>BELL &amp; GOSSETT</td>
<td>1510</td>
<td>COOLING TOWER WATER</td>
<td>BASE MOUNTED</td>
<td>100</td>
<td>325</td>
<td>30</td>
<td>74</td>
<td>7.5</td>
<td>1750</td>
<td>5</td>
<td>4</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>CWW-1</td>
<td>BELL &amp; GOSSETT</td>
<td>1510</td>
<td>COOLING WATER</td>
<td>BASE MOUNTED</td>
<td>100</td>
<td>325</td>
<td>85</td>
<td>75</td>
<td>15</td>
<td>1750</td>
<td>4</td>
<td>3</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
</tr>
<tr>
<td>CWW-2</td>
<td>BELL &amp; GOSSETT</td>
<td>NRF-36</td>
<td>AHU-1 COOLING COIL</td>
<td>N-LINE</td>
<td>225</td>
<td>15</td>
<td>19</td>
<td>--</td>
<td>--</td>
<td>270 W 3300</td>
<td>1-1/2</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
<td></td>
</tr>
<tr>
<td>CWW-3</td>
<td>BELL &amp; GOSSETT</td>
<td>NRF-36</td>
<td>AHU-2 COOLING COIL</td>
<td>N-LINE</td>
<td>225</td>
<td>15</td>
<td>17</td>
<td>--</td>
<td>--</td>
<td>270 W 3300</td>
<td>1-1/2</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
<td></td>
</tr>
<tr>
<td>CWW-4</td>
<td>BELL &amp; GOSSETT</td>
<td>NRF-36</td>
<td>AHU-3 COOLING COIL</td>
<td>N-LINE</td>
<td>225</td>
<td>15</td>
<td>21</td>
<td>--</td>
<td>--</td>
<td>270 W 3300</td>
<td>1-1/2</td>
<td>1-1/2</td>
<td>SEE SPECS.</td>
<td></td>
</tr>
<tr>
<td>CWW-5</td>
<td>BELL &amp; GOSSETT</td>
<td>NRF-4F/1W</td>
<td>POOL COOLING COIL</td>
<td>N-LINE</td>
<td>225</td>
<td>3</td>
<td>5</td>
<td>--</td>
<td>41 W 2400</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>SEE SPECS.</td>
<td></td>
</tr>
</tbody>
</table>

1. **STANDBY**: Provide as part of alternate bid 7.

## EXPANSION TANK SCHEDULE

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>MFR.</th>
<th>MODEL</th>
<th>CAPACITY (GAL)</th>
<th>ACCEPT VOLUME</th>
<th>TANK VOLUME</th>
<th>SERVICE</th>
<th>OPER. WEIGHT (LBS.)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET-1</td>
<td>BELL &amp; GOSSETT</td>
<td>D-240V</td>
<td>46</td>
<td>132</td>
<td>HEATING WATER SYSTEM</td>
<td>1,529</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ET-2</td>
<td>BELL &amp; GOSSETT</td>
<td>D-20</td>
<td>2.4</td>
<td>11</td>
<td>COOLING WATER SYSTEM</td>
<td>137</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. FAN COIL UNIT FCU-1 PIPING AND CONTROL SCHEMATIC

N.T.S.
KEY NOTES

12. EXISTING DRINKING FOUNTAIN TO BE RELOCATED. REMOVE PORTIONS OF EXISTING CW, VENT, AND DRAIN PIPING AS REQUIRED TO ACCOMMODATE NEW WORK.

01 - SERVICE LEVEL - MECHANICAL DEMOLITION PLAN
1/8" = 1'-0"
02 - STREET LEVEL - ADDITION HVAC PLAN
1/8" = 1'-0"
03 - CONCOURSE LEVEL - ADDITION HVAC PLAN

1/8" = 1'-0"
NOTES:
1. ALL STEEL JOINTS AND CONNECTIONS SHALL BE CONTINUOUSLY WELDED.

2. PAINT ENTIRE DUCT SUPPORT STAND WITH TWO COATS OF RUSTOLEUM SHOP PRIMER RED AND FINISH WITH TWO COATS OF OUTDOOR ACRYLIC COLOR FINISH PAINT AS SELECTED BY ARCHITECT.

COOLING TOWER WATER PIPING SUPPORT DETAIL

SCALE: NONE
INDIRECT EVAPORATIVE COOLING COIL PIPING DETAIL

SCALE: NONE

NOTE:
ARRANGE PIPING TO ALLOW COIL REMOVAL.

COIL PUMP. REFER TO IN-LINE PUMP PIPING DETAIL

INDIRECT EVAP. COOLING COIL

COIL COND. PAN, 3/4" TO BOTTOM DRAIN PAN

INDIRECT EVAP. COOLING COIL

DRAIN PAN

MANUAL VENT VALVE

DIFFERENTIAL PRESSURE TRANSMITTER PRESSURE INDEPENDENT CONTROL VALVE

FLOW MEASURING STATION

NOTES:
1. ARRANGE TO ALLOW COIL REMOVAL.
2. PIPE COILS IN REVERSE RETURN ARRANGEMENT.

3/4" DRAIN VALVE WITH HOSE END AND CAP (TYP.)

3/4" DRAIN VALVE WITH HOSE END AND CAP (TYP.)

TRAP COIL COND. PIPING AT DRAIN PAN AND RUN FULL SIZE TO NEAREST FLOOR DRAIN. REFER TO CONDENSATE DRAIN PIPING DETAIL.
HEAT EXCHANGER PIPING DETAIL

NOTES:
1. MOUNT EXCHANGERS ON FIELD-BUILT STEEL STANDS.
2. POSITION VALVES AND UNIONS TO ALLOW FOR TUBE REMOVAL.
3. ALLOW 8 FT CLEAR FOR TUBE REMOVAL.
4. CONTROL VALVES SHALL BE PNEUMATIC, ACCEPTABLE MAKES: LEESE, FERRIS, OR MASON LELAND.

FLOW SWITCH TO PREVENT CREAM VALVE OPERATION WITH NO WATER FLOW.
PRV-1 - STEAM PRESSURE REDUCING STATION DETAIL

SCALE NONE

<table>
<thead>
<tr>
<th>VALVE DESIGNATION</th>
<th>STEAM PRESSURE</th>
<th>FLOW RATE, LB/HR</th>
<th>LESLIE MODEL NO.</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120 IN PSI</td>
<td>3,770</td>
<td>GPK-1 1/2&quot;</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>120 IN PSI</td>
<td>3,770</td>
<td>GPK-1 1/2&quot;</td>
<td>1</td>
</tr>
</tbody>
</table>

1. PROVIDE WITH LESLIE ARMATE MODEL APS-2, AIR PRESSURE REDUCING VALVE.
COOLING TOWER PIPING DETAIL

SCALE: NONE

NOTES:
1. ENSURE PUMP ELEVATION IS BELOW THE ELEVATION OF THE COOLING TOWER WATER OUTLET.
2. SLOPE ALL PIPING FROM COOLING TOWER TO MECHANICAL ROOM FOR GRAVITY DRAINAGE.
# Fan Schedule

<table>
<thead>
<tr>
<th>DESG</th>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>FAN TYPE</th>
<th>SERVICE</th>
<th>WHEEL DIAMETER</th>
<th>CFM AT 5400</th>
<th>S.P. IN. W.C. AT S.L</th>
<th>APPROX RPM</th>
<th>TOP SPEED (RPM)</th>
<th>OUTLET VELOCITY (RPM)</th>
<th>VIBRATION ISOLATOR TYPE</th>
<th>DRIVE TYPE</th>
<th>DAMPER TYPE</th>
<th>ARRANG. &amp; MOUNTING</th>
<th>CONTROL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF-1</td>
<td>GREENNECK</td>
<td>BSQ-140</td>
<td>IN-LINE</td>
<td>GENERAL EXHAUST</td>
<td>14</td>
<td>2,000</td>
<td>1.0</td>
<td>1691</td>
<td>6447</td>
<td>849</td>
<td>1-1/2</td>
<td>INTERNAL</td>
<td>BELT</td>
<td>MOTORIZED CONTROL DAMPER</td>
<td>SUSPENDED</td>
<td>SEE SPECS</td>
</tr>
<tr>
<td>EF-2</td>
<td>GREENNECK</td>
<td>BSQ-160</td>
<td>IN-LINE</td>
<td>SERVICE LEVEL ELECTRICAL ROOM</td>
<td>16</td>
<td>2,000</td>
<td>0.5</td>
<td>976</td>
<td>4148</td>
<td>556</td>
<td>1/2</td>
<td>INTERNAL</td>
<td>BELT</td>
<td>MOTORIZED CONTROL DAMPER</td>
<td>SUSPENDED</td>
<td>SEE SPECS</td>
</tr>
<tr>
<td>EF-3</td>
<td>GREENNECK</td>
<td>BSQ-70</td>
<td>IN-LINE</td>
<td>CRAWL SPACE</td>
<td>7</td>
<td>250</td>
<td>0.75</td>
<td>1981</td>
<td>5743</td>
<td>190</td>
<td>1/2</td>
<td>INTERNAL</td>
<td>BELT</td>
<td>MOTORIZED CONTROL DAMPER</td>
<td>SUSPENDED</td>
<td>SEE SPECS</td>
</tr>
<tr>
<td>EF-4</td>
<td>GREENNECK</td>
<td>BSQ-100</td>
<td>IN-LINE</td>
<td>STREET LEVEL ELECTRICAL ROOM</td>
<td>10</td>
<td>1,000</td>
<td>0.5</td>
<td>1749</td>
<td>5122</td>
<td>762</td>
<td>1/2</td>
<td>INTERNAL</td>
<td>BELT</td>
<td>MOTORIZED CONTROL DAMPER</td>
<td>SUSPENDED</td>
<td>SEE SPECS</td>
</tr>
<tr>
<td>EF-5</td>
<td>GREENNECK</td>
<td>BSQ-100</td>
<td>IN-LINE</td>
<td>ELEVATOR MACHINE ROOM</td>
<td>10</td>
<td>1,000</td>
<td>0.5</td>
<td>1749</td>
<td>5122</td>
<td>762</td>
<td>1/2</td>
<td>INTERNAL</td>
<td>BELT</td>
<td>MOTORIZED CONTROL DAMPER</td>
<td>SUSPENDED</td>
<td>SEE SPECS</td>
</tr>
<tr>
<td>EF-6</td>
<td>EXHAUSTD</td>
<td>BE3255</td>
<td>BOX VENTILATOR</td>
<td>CLOTHES DRYER</td>
<td>-</td>
<td>750</td>
<td>0.89</td>
<td>1600</td>
<td>-</td>
<td>-</td>
<td>1/2</td>
<td>DIRECT</td>
<td>BACKFLOW DAMPER</td>
<td>SUSPENDED</td>
<td>SEE SPECS</td>
<td></td>
</tr>
</tbody>
</table>

1) PROVIDE W/ SILENCE DISCHARGE, REFER TO PLANS FOR ADDITIONAL INFORMATION.
2) PROVIDE AS PART OF ALTERNATE NO. 3.
3) ALL FAN MOTORS 1 HP AND LARGER SHALL BE PROVIDED WITH PREMIUM EFFICIENCY MOTORS.
4) PROVIDE W/ MOTOR DISCONNECT SWITCH 40A 4X ENCLOSURE, EXHAUST FANS W/ MOTOR EXHAUST CONTROL W/ TRANSFORMER.
KEY NOTES

12. RELOCATE EXISTING DRINKING FOUNTAIN TO LOCATION SHOWN AND RECONNECT EXISTING CW, VENT, AND DRAIN PIPING. DRAIN PIPING SHALL RECONNECT TO EXISTING EAST/WEST MAIN. FIELD VERIFY EXACT POINT OF CONNECTION.

13. 3/4" CW TO AHU-2 DIRECT EVAP COOLING.

01 - SERVICE LEVEL - ADDITION PLUMBING PLAN
1/8" = 1'-0"
KEY NOTES

12. RELOCATE EXISTING DRINKING FOUNTAIN TO LOCATION SHOWN AND RECONNECT EXISTING CW, VENT, AND DRAIN PIPING. DRAIN PIPING SHALL RECONNECT TO EXISTING EAST/WEST MAIN. FIELD VERIFY EXACT POINT OF CONNECTION.

13. 3/4"CW TO AHU-2 DIRECT EVAP COOLING.

01 - SERVICE LEVEL - ADDITION PLUMBING PLAN
1/8" = 1'-0"
EXISTING MECHANICAL PENTHOUSE AHU DETAILS

SCALE: 1" = 1'-0"
EXISTING MECHANICAL PENTHOUSE AHU DETAILS

Scale: None

Provide sprinkler coverage in existing air section.
Provide dry shaft sprinkler heads for outside air section and area upstream of heating coil.
Provide sprinkler coverage in existing air section.
SECTION 15080 - UNDERGROUND PIPE AND CONDUIT SYSTEM FOR CLASS A SOILS
(ADDENDUM 3)

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. This section specifies piping materials and installation methods common to this section of Division 15 and includes joining materials, piping specialties, and basic piping installation instructions for poorly drained soils subject to prolonged saturation.

1.2 REFERENCES
A. ANSI B31.1
B. Federal Agency Guideline Specifications FCGS 15705.

1.3 SUBMITTALS
A. Refer to Division 1 and Basic Mechanical Requirements for administrative and procedural requirements for submittals.
B. Product Data: Submit industry standards and manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing pipe or tube weight, fitting type, and joint type for each piping system.
C. Welding Certifications: Submit reports as required for piping work.

1.4 QUALITY ASSURANCE
A. System shall be factory tested and inspected in accordance with the manufacturer's requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Piping Materials: Provide pipe and tube of type, pressure and temperature ratings, capacities, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards.
C. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers listed.

1. Perma-Pipe/RicWil
2. Thermacor

2.2 USAGE

A. The system specified herein shall be intended for use in Class A (underground water conditions) sites and in corrosive soil conditions as defined in FCGS Specification 15705.

2.3 MATERIALS

A. All components and materials shall conform to specifications, drawings, manufacturer's letters and tables hereinafter specified. Referenced Federal and Military Specifications and Industry Standards are specified by basic designation only.

2.4 PREFABRICATED COMPONENTS

A. Materials and coatings for prefabricated components shall be as specified in Paragraph 2.3 "Materials."

B. Straight conduit sections shall be factory coated as specified hereinafter. Straight sections shall be fabricated in 40-foot nominal length with five pipe supports as indicated; shorter lengths shall be fabricated with supports not more than nine feet apart and with a pipe support not more than two feet from each end.

C. Terminal sections shall be identical to straight sections except that they shall be prefabricated with leak plates and seals as follows, and shall be provided with a minimum one inch vent (open) and minimum one inch drain half coupling (threaded) fitted with a threaded forged steel plug.

1. Leak plates shall be of 120 gauge steel plate conforming to ASTM A-36.
2. End seals shall be of 1/4 inch steel plate conforming to ASTM A-36.
3. Gland seals shall consist of a steel closure plate with stainless steel bolts and a steel gland welded thereto a temperature resistant teflon impregnated asbestos packing gland and a gland follower.

D. Expansion loops shall be properly engineered and designed in accordance with the allowable stress limits indicated by ANSI B31.10 for the type of pipe used. Expansion loops shall consist of conduit composed of the same material and the same coating as the straight run conduit and sized to accommodate anticipated expansion. Decreaser conduit connections and thicknesses for two piece type and expansion type loops together with expansion type pipe supports shall be provided. End width shall be sized according to field/jobsite conditions.

E. Pipe supports shall be of the type where calcium silicate pipe insulation thermally and electrically isolates the carrier pipe from outer conduit. Direct contact with support and carrier pipe will not be allowed.

F. Elbows shall be of either the anchor or expansion type.

G. Anchor sections shall be 1/4 inch steel plate conforming to ASTM A-36 steel.
2.5 STEAM SUPPLY PIPING

A. General: All underground steam and condensate piping, as indicated on contract drawings, shall be the drainable and dryable fiberglass clad hot dipped galvanized steel conduit GALVA-GARD type piping system as manufactured by PERMA-PIPE (or equivalent). The system supplier shall have at least five years experience in fabricated systems of the composition defined herein. All straight sections, fittings, anchors and other accessories shall be factory prefabricated to job dimensions. Each system layout shall be analyzed by the piping system manufacturer to determine stresses and movement of the service pipe. The system design shall be in strict conformance with ANSI B31.1, latest edition and stamped by a Registered Professional Engineer. Factory trained field technical assistance shall be provided for the critical periods of installation, i.e., unloading, field joint instruction and testing. The system shall be rated for a steam pressure of 300 psig.

B. Service Pipe: Internal piping shall be standard weight seamless carbon steel, except for condensate piping, which shall be Schedule 80 seamless carbon steel. All joints shall be butt-welded for sizes 2 1/2 inches and greater, and socket welded for 2 inches and below. Where possible, straight sections shall be supplied in 40-foot random lengths with 6 inches of piping exposed at each end for field joint fabrication.

C. Subassemblies: End seals, gland seals and anchors shall be designed and factory prefabricated to prevent the ingress of moisture into the system. All sub-assemblies shall be designed to allow for complete draining and drying of the conduit system.

D. Insulation: Carrier pipe insulation shall be calcium silicate or mineral wool. Split insulation shall be held in place by stainless steel bands installed on 18 inch centers. The insulation shall have passed the most recent boiling test and other requirements specified in the Federal Agency Guidelines Specifications. The insulation shall be applied to a thickness of 3 inches.

E. Outer Conduit:
   1. The steel conduit casing shall be hot dipped galvanized per ASTM A123 with minimum 2 oz. per ft2 and 3.4 mils thick. The steel conduit casing shall be smooth wall, welded steel conduit of the thickness specified below:
      
      | Size   | Thickness |
      |--------|-----------|
      | 6" - 26" | 10 gauge |
      | 28" - 36" | 6 gauge  |
      | 38" - 42" | 4 gauge  |

   2. Changes in casing size, as required at oversized casing to allow for carrier pipe expansion, shall be accomplished by eccentric and/or concentric fittings and shall provide for continuous drainage.

F. Conduit Cladding: The conduit surface shall be clad with filament wound fiberglass reinforced plastic to a minimum thickness of 100 mils. All fitting assemblies shall be clad with chopped fiberglass to the same thickness. The final outside cladding shall be designed to withstand 35,000-volt spark testing, thus eliminating the need for cathodic protection.

G. Pipe Supports: All pipes within the outer casing shall be supported at not more than 10 foot intervals. These supports shall be designed to allow for continuous airflow and drainage of the conduit in place. The straight supports shall be designed to occupy not more than 10% of the annular air space. Supports shall be of the type where calcium silicate pipe insulation thermally and electrically isolates the carrier pipe from the outer conduit. Supports which directly contact both the carrier pipe and the outer casing shall not be allowed. The surface of the insulation shall be protected at the support by a metal sleeve not less than 12 inches long, fitted with traverse and where required, rotational arresters.
H. Installation: The installing contractor shall handle the system in accordance with the directions furnished by the manufacturer and as approved by the architect and engineer. The casing shall be air tested at 15 psig and the service piping shall be hydrostatically hammer tested to 150 psig or 1 1/2 times the operating pressure, or as specified in the contract documents. The test pressure shall be held for not less than one hour.

I. Backfill: A 4-inch layer of sand or fine gravel shall be placed and tamped in the trench to provide uniform bedding for the system. The entire trench width shall be evenly backfilled with a similar material as the bedding in 6-inch compacted layers to a minimum height of 6 inches above the top of the insulated piping system. The remaining trench shall be evenly and continuously backfilled in uniform layers with suitable excavated soil.

2.6 SPECIAL STRUCTURAL ELEMENTS
A. Special structural elements for unstable soils and super-imposed loads shall be designed as required for the application and submitted for approval.

2.7 CONCRETE
A. Concrete for anchor blocks and flotation pads shall be 3,000 pound minimum strength concrete conforming to ACI 2.11 1-74.

PART 3 – EXECUTION

3.1 LEED – CONSTRUCTION WASTE MANAGEMENT REQUIREMENTS:
A. Construction Waste shall be managed in accordance with provisions of Section 01524 “Construction Waste Management and Recycling”. Documentation shall be submitted to satisfy the requirements of that section.

3.2 INSTALLATION SPECIFICATION
A. A fully qualified and certified factory representative shall be present during all crucial periods of the installation of the underground heat distribution system. Crucial periods of the installation shall be defined as periods which include one or more of the following types of work.

1. Inspection and unloading.
2. Inspection of trench prior to laying of conduit.
3. Inspection of concrete thrust blocks prior to cold springing.
4. Cold springing.
5. Hydrostatic test of all service lines.
6. Field joint closure work.
7. Air test of conduit.
8. Repair of any coating patch work.
9. Initial backfill up to 10 inches above the top of the conduit casing.

B. The representative shall see that all damaged material is repaired or replaced as required by the contract documents, including the quality control requirements of this specification.

C. Detailed Specifications:
1. Unloading - Materials shall be unloaded with a padded sling. Long conduit sections, manholes and expansion loops, etc. shall be unloaded with a spreaderbar type hoist having two or more slings.

2. Storage - System sections shall be stored and blocked with 2” x 4” on 8’ centers. System sections shall be stored with end seals in place. Each system section shall be checked to ensure that any end cover removed for inspection of inside of conduit line has been properly replaced.

3. When insulation accidentally becomes wet at any time before or during installation, the air space in the system shall be force ventilated and heat shall be applied through the internal piping. A cool mirror shall be placed at the exhaust point for a short time at appropriate intervals and shall be so positioned as to indicate maximum fogging due to moisture. The ventilation shall continue until the mirror exhibits no visible fogging.

4. Internal annular void shall be inspected for mud or other blockage of drainage. If blockage or mud is found, the component shall be flushed out with water before drying. If the blockage cannot be flushed so as to ensure proper drainage, the component shall be rejected and a new one provided.

5. Trenching shall be to the depth indicated on the drawings. Trench widths in stable soil shall be as indicated on drawings. For unstable soil, high or low PH or other unusual soil conditions, trenching shall be as specified by the engineer. Trenches shall be kept dry and excavated soil shall be placed so as to prevent rain runoff from entering trench. Grading shall be checked to ensure correct pitch of lines. Trench bottoms for FRP pipe in stable soils shall be bedded with four inches of sand fine or gravel fill. For uniform trench bottoms in unstable soil, the bedding shall be determined by the engineer.

The entire trench shall be evenly backfilled with a similar material as the bedding in 6 inch compacted layers to a minimum height of 6 inches above the top of the insulated piping system. The remaining trench shall be evenly and continuously backfilled in uniform layers with suitable excavated soil.

6. Welding in trenches - System end covers and shipping tie rods shall remain in place until welding operations are ready to commence. Welding in trenches shall be minimized. System sections including loops and ells shall be first laid out, aligned and welded above the trench. Prior to welding a check shall be made to ensure pipe and expansion supports are aligned and true. The initial 15 psi conduit pressure test shall also be accomplished on as long a connected system above the trench as possible; then the completed and tested sections lowered and positioned in the trench.

7. Factory representatives shall ensure that welding is properly done and tested as follows:

   a. Conduct test of the welding procedure used to determine its suitability to ensure welds will meet the required tests and conduct tests of the welders to ensure their competence to make quality welds under standard conditions. Radiographic examination of welds may be required to ensure quality welds.

   b. Be thoroughly familiar with the requirements of ANSI B31.1 and American Welding Society Standard B3.0.

   c. Be capable of performing all welding operations required for construction and installation of the heat distribution system.

8. Lowering Conduit Sections into Trench - Conduit sections whether or not welded and tested above ground shall be lowered with slings, etc. Remove end covers and remove shipping tie rods when necessary for installation. Place only the amount of conduit in trench that can be tested, field closed and coated in one day. If any ends or joints are uncovered at the end of the day or during rain, they shall be waterproofed, sealed and recovered to prevent moisture.
If internal moisture is detected they shall be dried as specified in paragraph 4 of the preceding Installation Specifications.

9. Expansion Loops and L and Z Bends and Elbows shall be sloped to drain to the straight runs. Pipe supports, expansion loops, reducers, etc. shall be properly aligned and positioned for a true fit.

10. Cold Spring - All piping systems shall be cold spring 1/2 the total calculation expansion of the system. Angle clips shall then be welded on the ends of the adjusted pipes. Then a single threaded rod shall be placed through the holes in the clips and tightened until the pipes are aligned. The pipes shall then be welded as specified in ANSI B31.1.

11. Hydrostatic tests of service piping - All service piping shall be tested hydrostatically before insulation is applied at field joints, and shall be proved tight at a pressure 100 psig. Hydrostatic test pressure shall be tested before conduit field joints are insulated and closed. Prior to the hydrostatic, performance and operating tests, the interior of the heat-carrying piping shall be flushed with water until the piping is free of all foreign materials to the satisfaction of the Engineer.

D. Casing Field Joints:

1. Insulation - Insulation shall be banded on carrier pipe with stainless steel bands maximum of 18" on center. At field joints insulation shall be grooved to fit over welded carrier pipe.
2. Field joint shall be accomplished by cleaning to bare metal the conduit section to be joined, banding tightly the steel sleeve over the conduit, welding both sleeve collars and horizontal sleeve lap, then apply the chemically bonded polyurethane.
3. Final inspection and test before backfill - The completed system shall be visually inspected for blisters, loose coating, damage, etc.; sections repaired or replaced in accordance with the Quality Control Section of this specifications.
4. Final testing after backfilling shall be performed in accordance with the Quality Control section of this specification. Any repairs or replacements necessary will be at the contractor's or manufacturer's expense.

3.3 QUALITY CONTROL

A. Factory - All factory fabrication at either the jobsite plant or the home office plant shall be overseen, inspected, tested and accepted or rejected by the Factory Quality Control Section.

1. Welding shall be by qualified welders and shall be performed and inspected in accordance with ANSI B31.1.
2. Inspection - All conduit, assemblies and other components shall be carefully inspected to insure that coating is solid and firmly bonded and that dimensions are correct. All insulation shall be inspected for thickness and correct banding, including banding spacing and snugness.
3. All casings including fittings and preassembled units shall be air pressure tested at 15 psig for a period of not less than two hours.
4. All expansion loops and elbows and straight runs connecting thereto shall be checked for correct alignment of expansion guides and marked to assure assembly in correct position.
5. Storage in stockpile shall be as follows: Store with shipping tie rods (conduit to pipe ends) and end covers firmly in place to prevent water entry, all as described in paragraph 3 of Installation Specifications.
6. The Quality Control Section shall oversee removal from stockpile and proper loading and blocking, etc., for shipment.
B. Field Inspection and Testing:

1. Visual Inspection - Each section of conduit, fittings and batch of material shall be visually examined and measured, where necessary, to determine shipping damage, thickness of coating, required air space, bond of coating to conduit and other evidence of conformance or non-conformance to the requirements of these specifications. Any conduit section, fitting or batch of material which does not conform to these requirements or which shows shipping damage beyond that permitted by the paragraph on holiday testing shall be rejected without further examination or test. End covers removed for inspection shall be carefully and securely replaced.

2. Examination of welds on carrier pipe - All pipe welds shall be inspected in accordance with ANSI B31.1.

3. Air pressure test of sections in trench before backfill - All conduit casing shall be proved tight after installation, and before applying field joint waterproofing and before backfilling by the application of an internal air pressure of 15 psig, for a period of not less than one hour without any additional air being supplied. All joints shall be tested with an application of soap and water solution. All leaks located shall be repaired and retested until proven tight. Repairs to metallic casings shall be made by welding.

4. Hydrostatic test of system - After completion the entire system shall be flushed and hydrostatic tested. Any leaks shall be repaired and the entire test sequence repeated on the leaking section.

5. Final air pressure test after backfill manhole to manhole - After completion of the entire system or section between manholes the 15 lb. air pressure test shall be applied manhole to manhole for a period of not less than one hour.

6. Operational Tests - After completion of the system, or testable portions thereof, operational tests shall be conducted as in service to demonstrate satisfactory function and operation effectiveness. The tests on each system, or portion thereof, shall last not less than six hours.
SECTION 15975 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
(ADDENDUM 3)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. Related Sections include the following:

   1. Division 15 Section "Instrumentation and Control for HVAC" for control equipment and
en devices and for submittal requirements.

1.3 DEFINITIONS

A. DDC: Direct digital control.

B. VAV: Variable air volume.

1.4 AIR HANDLING UNITS (AHU-1, 2, 3) CONTROL SEQUENCES:

A. The occupancy mode (occupied – unoccupied) shall be determined through a user-adjustable,
   graphical, seven day schedule with an additional holiday schedule. The start time shall be
   adjusted by an optimum start routine such that the unit shall be started at the latest possible
   time to allow the space temperature to be at the occupied set point at the time of occupancy.

B. Occupied Mode

   1. AHU-1 / AHU-1: The supply fan shall be energized through the DDC system. The fan
      speed shall slowly ramp from zero to a speed that provides adequate airflow for space
      cooling or heating. The supply air heating setpoint shall not exceed 85°F (adjustable).

   2. AHU-3: The supply fan shall be energized through the DDC System. The fan speed shall
      slowly ramp from zero to the final duct static pressure set point. The supply fan speed
      shall modulate to maintain the duct static pressure set point of 1.0" w.g. initially
      (adjustable). The supply fan speed shall not drop below 30% (adjustable) to assure
      adequate fan motor cooling. The duct static pressure set point shall be reset so that at
      least three of the VAV boxes served by the AHU operate at 90% (adjustable) open and
      maintains its space temperature set point. The final duct static pressure shall be
determined in consultation with the balancing contractor.

   3. A high limit shall de-energize the supply fan whenever the supply duct static pressure
      exceeds 2.0"w.g. (adjustable).
4. Whenever the supply fan is energized, after a 10 – second (adjustable) time delay, the return fan shall be energized. The return fan speed shall modulate to maintain the return fan plenum (within the AHU) pressure set point of 0.10" w.g. (adjustable) as referenced to outside air pressure.

5. Minimum Outside Air Control:
   a. Minimum outside airflow rate shall be monitored by an airflow sensor mounted at the outside air intake louver to the AHU. Minimum outside airflow rate shall be maintained at set point (adjustable) by modulating the outside damper. A mixed air low-limit shall override the outside air damper to maintain a minimum mixed air temperature of 40°F (adjustable).
   b. The minimum outside airflow set point shall be reset higher based on the highest CO2 reading in accordance with the following adjustable schedule:

<table>
<thead>
<tr>
<th>Highest RA CO₂ Concentration (PPM)</th>
<th>AHU-1 Minimum OA Rate (CFM)</th>
<th>AHU-2 Minimum OA Rate (CFM)</th>
<th>AHU-3 Minimum OA Rate (CFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>700 or above OA</td>
<td>4,800</td>
<td>5,000</td>
<td>5,800</td>
</tr>
<tr>
<td>400 or above OA</td>
<td>2,900</td>
<td>3,000</td>
<td>4,350</td>
</tr>
</tbody>
</table>
   c. The outdoor air monitoring equipment shall generate an alarm when conditions vary by 10% or more from set point.

6. The AHU relief/exhaust damper shall modulate to maintain the space static pressure at 0.05" w.g. (adjustable) as referenced to outside air pressure.

7. AHU-3: The supply air temperature set point shall be reset based upon outside air temperature in accordance with the following reset schedule:

<table>
<thead>
<tr>
<th>Supply Air Temperature Set Point</th>
<th>Outside Air Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 degrees F</td>
<td>&gt;70 degrees F</td>
</tr>
<tr>
<td>65 degrees F</td>
<td>&lt;30 degrees F</td>
</tr>
</tbody>
</table>

8. AHU-3: In heating mode, the heating coil control valve shall modulate to maintain the supply temperature set point of 55°F (adjustable).

9. In cooling mode, the outside air economizer, indirect evaporative cooling, and direct evaporative cooling shall modulate in sequence to maintain the supply air temperature set point. The indirect evaporative cooling shall be the first stage of cooling with direct evaporative cooling (1/3, 2/3, and 3/3 staging) being the second stage of cooling as needed. Provide a deadband between heating and cooling. When the outside air temperature is greater than the return air temperature by 2 degrees F (adjustable) and the evaporative cooler has been de-energized (due to high humidity levels or other conditions), the OA damper shall close to the minimum position.

10. The AHU heating coil pump shall be energized whenever the outside air temperature is below 55 degrees F (adjustable) or whenever the mixed air temperature is below 50 degrees F (adjustable). When the outside air temperature is below 40 degrees F (adjustable), and the AHU has shut down in alarm, the heating water coil pump shall be energized continuously.

11. Direct Evaporative Cooler Section
   a. The direct evaporative cooler pump(s) shall not operate unless:
      1) Supply fan is on.
      2) Outside air damper is 100% open.
3) Sump level switch is made.
4) Discharge air controller output is calling for the direct evaporative cooler pump(s) to be on.
5) High space humidity or return air humidity lockout is below 65% (adjustable).
6) The outside air temperature is above 55°F (adjustable).

b. The AHU contains a minimum of 2 evaporative cooler sections. Staging of evaporative cooler pumps shall use the output of the supply air temperature controller.
c. The evaporative cooler sump shall drain whenever the outside air temperature drops below 40 degrees F (adjustable) for 60 minutes (adjustable). The evaporative cooler sump shall only fill when the outside air temperature exceeds 55 degrees F.
d. There shall be a daily dry-out cycle of 60 minutes (adjustable). This dry-out shall occur daily between 5 a.m. and 6 a.m. (adjustable).
e. Program a weekly sump drainage cycle to coincide with the evaporative cooler pad dry-out period.
f. Monitor and measure the total make up water (gallons) to the evaporative cooler with the water meter, through the DDC front end.

12. Cooling shall be locked out for outside air temperatures less than 55°F (adjustable).

C. Unoccupied Mode:
1. The supply fan shall be de-energized, outside air damper and exhaust air damper shall be closed.
2. Whenever the supply fan is de-energized and the outside air temperature is below the outside air low temperature protective set point of 35 degrees F (adjustable) and the mixed air temperature is less than the mixed air low temperature protection set point of 45 degrees F (adjustable), or the low temperature limit trips, then the heating coil valve shall cycle to maintain the mixed air temperature of 45 degrees F (adjustable).
3. Whenever the outside air temperature is above the outside air low temperature protection set point of 35 degrees F plus deadband (adjustable) or the mixed air temperature is greater than the mixed air protection set point of 45 degrees F plus deadband (adjustable), the heating and cooling coil valves shall be closed.
4. Morning warm-up/pre-cool:

   a. If the space temperatures are below the occupied temperature set point and the outside air temperature is below 40 degrees F (adjustable), the morning warm-up shall be initiated by the optimum-start program. The optimum start-stop program shall start the AHU at the latest possible time. The outside air and exhaust air dampers shall be closed during the morning warm-up cycle and the return air damper shall be open. If the space temperatures are below the set point, the AHU shall warm the space to set point by raising the AHU supply temperature to 80 degrees F (adjustable) until the spaces are satisfied. The VAV box dampers shall modulate to control space temperature while delivering warm air.
   b. When the spaces have reached set point, the unit shall operate in the occupied mode. If the spaces reach the heating set point before occupancy, the system shuts off. If occupancy occurs before the space reaches the heating set point, the system switches to occupied mode. Morning warm-up shall occur only once per day.
   c. A similar sequence for pre-cooling shall be initiated if the outside air temperature is above 80 degrees F (adjustable).
D. Safety Shutdowns:

1. Duct smoke detectors through the FACP or high duct static pressure relays shall be hardwired to de-energize the supply and return fans, and close the outside air and exhaust/relief air dampers, open return air dampers, and alarm at the DDC system.

E. Freeze Protection:

1. When the outside air temperature is below 40 degrees F (adjustable) the heating water coil pump shall be energized continuously for freeze protection.
2. A low temperature limit element (any one foot section) located downstream of the heating coil, set to 34 degrees F (adjustable) shall de-energize the AHU fans, close the outside air and exhaust/relief air dampers, and send an alarm to the DDC system. The heating water coil pump and cooling coil pump shall be energized.

1.5 HEATING WATER SYSTEM CONTROL SEQUENCES:

A. Start lead heating water pump (HWP-1 or HWP-2) when outside air temperature is below 55°F (adjustable), disable when OAT rises above 60°F (adjustable).

B. Heating water pumps (HWP-1 and HWP-2) shall operate on a lead/lag basis. The lead pump shall be energized whenever either primary heating water pump is enabled. Failure of the lead pump shall de-energize the lead pump and energize the lag pump. Rotate the lead pump every 7 days. The pump speed for HWP-1 and HWP-2 shall modulate to maintain a heating water differential pressure set point of 40 feet (adjustable). Alarm any pump failure back to the DDC system.

C. Heat exchangers, HX-1 and HX-2 shall operate in parallel, with both heat exchangers normally in operation.

D. The heat exchanger common 1/3 and 2/3 pneumatic control valves shall modulate in sequence, (first the 1/3 valve) to maintain the heating water temperature setpoint. The steam control valves shall fail normally open. Proof of heating water flow through HX-1 and HX-2 shall be required prior to modulation of the steam control valves opening. The heating water supply set points shall be linearly reset based on an outside air temperature schedule (adjustable) as follows:

<table>
<thead>
<tr>
<th>OA Temperature</th>
<th>HS Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-degrees F</td>
<td>150-degrees F</td>
</tr>
<tr>
<td>-10-degrees F</td>
<td>180-degrees F</td>
</tr>
</tbody>
</table>

1.6 VAV TERMINAL UNIT CONTROL SEQUENCE

A. A space temperature sensor shall modulate the airflow from maximum to minimum and modulate the heating valve (when applicable) in sequence to maintain the space temperature set point. The heating valve shall not begin to open until the airflow has reached its minimum setting.

B. The Space CO2 sensor shall initiate the opening of the air handling unit outside air damper as needed to maintain the CO2 setpoint (adj.).
C. The VAV terminal units shall be controlled with the lighting occupancy sensors. When the occupancy sensors indicate the room is occupied the VAV terminal units shall operate in the occupied mode to maintain space temperature. When the occupancy sensors detect the space is unoccupied, the VAV terminal units shall control to maintain a cooling setpoint of 78°F (adjustable).

D. VAV terminal units TB-3-101 and TB-3-102 associated with the locker room and lounge shall always operate at the design airflow to provide make-up air for the locker room exhaust. The heating coil valve shall modulate as required to maintain space temperature.

1.7 CONVECTOR CONTROL SEQUENCE

A. The convector shall be sequenced with the associated VAV box. A deadband of 2 degrees F (adjustable) shall be maintained to prevent simultaneous convector heating and VAV box cooling.

B. In the unoccupied mode, the convector shall maintain the unoccupied set point of 55 degree F (adjustable).

1.8 FINNED TUBE RADIATION CONTROL SEQUENCE

A. The finned tube radiation shall be sequenced with the associated VAV box. A deadband of 2 degrees F (adjustable) shall be maintained to prevent simultaneous finned tube baseboard radiation and VAV box cooling.

B. In the unoccupied mode, the finned tube radiation shall maintain the unoccupied set of 55 degrees F (adjustable).

1.9 CABINET UNIT HEATER CONTROL SEQUENCE

A. The space thermostat shall modulate the two-way control valve and cycle the fan to maintain space temperature set point at 68 degrees F (adjustable).

1.10 UNIT HEATER CONTROL SEQUENCE

A. The space thermostat shall cycle the unit fan to maintain space temperature set point of 68 degrees F (adjustable).

1.11 FAN COIL UNIT SEQUENCE

A. Fan coil unit FCU-001 serving the telcom room shall operate to maintain a space temperature of 75°F (adjustable). When cooling water is available from the indirect evaporative cooling system, the outside air damper shall be closed, the return air damper shall be open, and the cooling coil valve shall modulate to maintain space temperature. When cooling water is not available (during winter months), the outside air damper and return air damper shall modulate in sequence to maintain the space temperature setpoint with a minimum supply air temperature of 50°F (adjustable). If the space temperature of the room exceeds 85°F (adjustable), an alarm shall be generated at the BMS.
1.12 EXHAUST FAN CONTROL SEQUENCES

A. EF-1: General exhaust fan, EF-1 shall be energized through the DDC to operate when the main air handling unit (AHU-1) is operating.

B. EF-2 / EF-4: Exhaust fans serving electrical rooms shall be energized through the DDC to operate whenever the space temperature is above 75 degrees F (adjustable).

C. EF-3: Crawl space ventilation fan shall be energized through the DDC to operate whenever the crawl space relative humidity is above 60% (adjustable).

D. EF-5: Exhaust fan serving the elevator machine room shall be energized through the DDC to operate whenever the space temperature is above 75 degrees F (adjustable).

E. EF-6: Clothes dryer exhaust fan shall be controlled by packaged controls to maintain static pressure in dryer vent. Building automation system shall monitor (on/off) status of fan.

1.13 COOLING TOWER/INDIRECT EVAPORATIVE COOLING SEQUENCE

A. The indirect evaporative cooling sequence shall be enabled from the DDC system whenever the outside air temperature (OAT) is above 55 deg. F for 30 minutes (adj.) Indirect evaporative cooling shall be disabled when the OAT drops below 54 deg. F. for 30 minutes (adj.)

B. Indirect evaporative cooling shall not be enabled unless the sump is filled.

C. The DDC system shall start the indirect evaporative cooling circulation pumps when the system is enabled and the tower sump is filled (when the water level in the cooling tower sump is at or above the “fill level off” sensor). The DDC system shall open/close the make-up water valve to maintain the sump water level. The DDC system shall alarm at the front end at “low water” and “high-water” levels. Prior to starting the system pumps, the drain valves shall prove “closed”, and the motorized isolation valves in the cooling tower supply and return piping shall prove “open”.

D. The cooling tower fan speed shall be controlled and modulated by the DDC system (variable frequency drive) to maintain indirect evaporative cooling water supply temperature of 63 deg F (adj.). The cooling tower circulation pump (TWP-1) shall operate continuously. The building cooling water circulation pump (CWP-1) shall modulate to maintain a cooling water system differential pressure set point of 25 feet (adjustable) and shall be set in conjunction with the balancing contractor. The 2-way control valve near air handling unit AHU-2 shall modulate open as required to maintain minimum flow for CWP-1. The cooling water coil circulation pumps shall only operate for freeze protection mode as specified above.

E. The cooling tower sump and associated piping shall drain when the outside air temperature drops below 40 deg F (adj.) for 60 minutes (adj.). The cooling tower sump shall fill when the outside air temperature is above 53 deg F (adj).

F. Program a weekly sump drainage cycle to coincide with direct evaporative cooling pad dry-out period or when the AHU is turned off.

G. The tower basin heater shall only operate whenever the outside ambient air temperature is below 40 deg. F and there is water in the tower sump as proven by the water level sensor in the tower sump.
H. The Hellan fluid strainer shall be programmed to operate daily at 5:00am (adjustable).

1.14 CONDENSER WATER TREATMENT CONTROL SEQUENCE

A. Water conductivity (TDS) and pH shall be monitored and alarmed at the DC front end whenever the values are outside the set points established by the water treatment system supplier.

B. Individual drums (2) biocides, (1) inhibitor levels shall be monitored and alarmed at the DDC front end when levels are below set point.

C. The bleed valve position shall be monitored through the DDC front end.

D. The water meter pulse totalizer shall monitor makeup water and alarm at the DDC front end whenever the consumption is outside the set point (adjustable).

1.15 ELECTRICAL CONSUMPTION

A. The electrical KWH usage shall be monitored at the DDC front end.

1.16 ELECTRICAL LOAD SHED

A. Select equipment and lighting shall be turned off through the DDC front end, on a priority basis to reduce the electrical consumption in the building.

1.17 DOMESTIC WATER CONSUMPTION

A. Building domestic water usage shall be measured at the water meter and monitored at the DDC front end.

1.18 DOMESTIC HOT WATER CONTROL

A. The domestic hot water circulating pump CP-1 shall be started and stopped through the DDC front end, based upon a time of day schedule.

1.19 STEAM MONITOR

A. The steam turbine meter shall measure the high pressure steam (HPS) flow rate and BTU consumption, and shall be monitored at the DDC front end.

B. The high pressure steam (HPS) and low pressure steam (LPS) pressures shall be monitored at the DDC front end.

1.20 STEAM CONDENSATE PUMP

A. The building automation system shall monitor the cycle counter and high level alarm from the condensate pump control panel.
1.21 EMERGENCY SHOWER
A. Whenever there is water flow at the emergency shower, a flow switch shall alarm at the DDC front end.

1.22 ELEVATOR HOISTWAY SUMP PUMP
A. The DDC system shall monitor the elevator hoistway sump pump SP-1 and shall alarm at the DDC front end whenever the pump is operating.

1.23 BUILDING LIGHTING
A. The building automation system shall connect to auxiliary contact at lighting control panel for monitoring and sweep function.

1.24 SYSTEM OVERRIDE PANEL
A. A system override panel shall be provided to allow for operation of the air handling units and associated HVAC systems (heating plant, cooling plant, exhaust fans, etc.) during “unoccupied” times. The override panel shall be located in Janitor 231 (with exact location to be verified by the Owner). The panel shall have push button override switches that will operate the HVAC systems for a period of two hours (adjustable).

1.25 PANEL LAYOUT
A. The temperature control panel layout s shall be in accordance with Owner standards. Contractor shall consult with Owner as required during submittal period to ensure compliance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 LEED – CONSTRUCTION WASTE MANAGEMENT REQUIREMENTS:
A. Construction Waste shall be managed in accordance with provisions of Section 01524 “Construction Waste Management and Recycling”. Documentation shall be submitted to satisfy the requirements of that section.

END OF SECTION 15975
Re: Section 16010 - Basic Electrical Requirements:
Re: 1.7 Work Included, A.1.
Revise sentence as follows:
Provide new electrical service to CEC Building.

Re: Section 16050 - Common Work Results For Electrical
Delete entire section 16050 and replace with new section 16050 attached herein.

Re: Section 16111 - Telecommunication Raceways
Delete entire section 16111

Re: Section 16130 - Raceways and Boxes for Electrical Systems
Add section 16130 attached herein.

Re: Section 16120 - Wire Cable
Re: 2.2 Building Wire and Cable, paragraphs F-H
Add paragraphs as follows:

F. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.

G. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.

H. Conductors and Cables:
1. All conductors shall be new, unless otherwise noted.
2. Secondary voltage conductors and cables shall be electrical grade, annealed copper, tinned if rubber insulated, and fabricated in accordance with ASTM and ICEA standards. The use of aluminum is prohibited except where shown on one-line or equipment schedules. Minimum size #12 for branch circuits; #14 for control wiring. Conductor types shall be as follows:
   a. In sizes #1/0 AWG and larger: Cross-linked polyethylene insulation type XHHW (75 to 90°C) or THWN/THHN.
   b. In sizes #1 AWG and smaller: All conductors shall have heat/moisture resistant thermoplastic insulation type THHN or THWN (75°C), except as follows:
      1) Where conduit temperature will exceed 100°F, use type THHN (90°C). Type XHHW (90°C) permissible in dry locations.
      2) Motor circuit conductors: 75°C THWN or XHHW from disconnect to motor.
      3) In 120-volt incandescent fixtures, type AF (150°C).
      4) In wireways of fluorescent lighting fixtures types THWN/THHN/MTW (90°C).
      5) Handling cord drops and cord connections: Type "SO" cord.

Re: 3.2 Wire and Insulation Applications, paragraph J
Add paragraph as follows:

J. Provide a separate neutral for dimmer branch circuits, ground fault interrupter branch circuits, and lighting branch circuits serving electronic ballasts.
Re: Section 16140 - Wall Switches, Receptacles, and Plates
Re: 3.1 Installation
Revise paragraph E as follows:
Provide feeding circuit and panelboard identification on the outside of all receptacle and switch cover plates with electronic label maker.

Re: Section 16441 - Switchboards
Re: 2.1 Manufacturers
Delete paragraph B

Re: 2.2 Manufactured Units
Revise paragraph A as follows:
A. Front-Connected, Front-Accessible Switchboard: Rear aligned, with features as follows:
1. Main and Tie Devices: Panel and Fixed, individually mounted
2. Branch Devices: Panel and Fixed, individually mounted

Re: 2.3 Fabrication and Features
Delete paragraph H
Delete sentence K.2.

Re: 2.4 Overcurrent Protective Devices
Revise paragraph D.1. as follows:
1. Fixed circuit-breaker mounting

Re: Sheet E0.01
Re-issue entire sheet to clarify what conduit is underground versus exposed in the existing Coors Event Center.

Re: Sheet E0.02
See attached sketch EX-005 for clarification for site lighting circuits controlled by relay panel.

Re: Sheet E0.03
Re-issue entire sheet to add PV system connection, revise life safety/generator over-current protection

Re: Sheet E0.04
Re: Key Note 3, change note to read as follows:

PROVIDE AND INSTALL NEW ATS AT SAME LOCATION, INTERCEPT AND RECONNECT EXISTING CONDUCTORS AS SHOWN. PROVIDE AND INSTALL NEW CONDUIT/CONDUCTORS FROM NEW GENERATOR. REFER TO NEW ADDITION ONE-LINE DIAGRAM ON SHEET E0.03 FOR CONTINUATION.

Re: Sheet E0.05-E0.07
Re-issue entire sheets to update panel schedules, relay schedules, luminaire schedule and equipment schedule related to plan changes.
Re: Sheet E1.01
Re-issue entire sheet for main electrical room/one-line changes, mechanical coordination, pull box sizes, clarify existing medium voltage cable demolition, revise TV truck power connection equipment and add scoreboard power.

Re: Sheet E1.02
Re-issue entire sheet for mechanical coordination, hand dryer power, and add scoreboard power.

Re: Sheet E1.03
Re-issue entire sheet for mechanical coordination.

Re: Sheet E1.04
See attached sketch EX-006 for adding motorized dampers/mechanical coordination.

Re: Sheet E2.01
Re-issue entire sheet for clarify luminaire mounting heights, switch control and add luminaire for generator area.

Re: Sheet E2.02
Re-issue entire sheet for clarify luminaire lengths in Restrooms, and revise luminaire locations in Main Hallway and Pre-Function area

Re: Sheet E2.03
See attached sketch EX-007 for revisions to ticket signage and canopy lighting.
**ELECTRICAL SCHEDULES**

- Page 1 of Electrical Schedule for project H:\JOBS18\18010\ACAD Files\Sheets\8010-006.dwg, 3/12/2010 11:20:15 AM, eklemme.

**Sheet Content:**
- Various electrical schedules and diagrams.
- Details include voltages, circuits, and panel configurations.

**Page Layout:**
- Three columns of text and diagrams.
- Margins and column headers are clearly visible.

**Note:**
- The page contains detailed electrical engineering information.
- It includes diagrams and schedules for electrical systems.
KEY NOTES

1. TYPE 317 LUMINARIE TO BE MOUNTED ON STAIR WALL AT APPROXIMATELY 4'6" ABOVE STAIRS. REFER TO ARCHITECTURAL AND LANDSCAPE DRAWINGS FOR EXACT LOCATION AND MOUNTING DETAILS.

2. REFER TO RELAY PANEL SCHEDULE FOR ADDITIONAL CONTROL INFORMATION.
SECTION 16050 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes requirements for basic electrical materials and methods for the following items:
   1. Electrical demolition
   2. Paints and Coatings
   3. Adhesives and Sealants

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.3 REFERENCES

A. The latest edition of the following standards and codes, standard publications of professional organizations, and the local authorities having jurisdiction are the minimum requirements for this work.
   1. American National Standards Institute (ANSI)
   3. Association of Edison Illuminating Companies (AEIC)
   5. Insulated Cable Engineer's Association (ICEA)
   6. Institute of Electrical and Electronic Engineers (IEEE)
   7. National Electrical Manufacturer's Association (NEMA)
   8. National Fire Protection Association (NFPA)
   9. NFPA 70, The National Electrical Code (NEC)
   10. Underwriters' Laboratories, Inc. (UL)
   11. State, City, and Local Authorities
   12. University of Colorado at Boulder Standards

1.4 DEFINITIONS

A. Instructions such as “Provide” shall mean the same as though the words “This Contractor shall” preceded each such instruction. “Provide” shall mean “Furnish and Install.” Where the words “Accepted” or “Acceptable” are used, such “Accepted” or “Acceptable” action by the Engineer and/or Architect denotes that the work or equipment item is in conformance with the design concept of the project and, in general, complies with pertinent information given in the Contract Documents.

1.5 SUBMITTALS

A. Product Data:
   1. Paints and Coatings - Provide Product Data verifying Volatile Organic Compound (VOC) content is less than or equal to the allowable VOC established by Governing Standard.
   2. Adhesives and Sealants - Provide Product Data verifying Volatile Organic Compound (VOC) content is less than or equal to the allowable VOC established by Governing Standard.

B. Coordination Drawings: Plans, sections, and elevations drawn to scale and coordinating installation of equipment, where required by the contract drawings or where site physical conditions limit installation capabilities.
1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70, the National Electrical Code.

C. All equipment and materials will be new and unused and shall be in conformance with the current applicable industry standards. Workmanship and neat appearance shall be as important as electrical and mechanical operation. Defective or damaged materials shall be replaced or repaired prior to final acceptance in a manner meeting approval of Architect and/or Engineer and at no additional cost to the Owner.

D. Provide documentation to Architect and Engineer that identified LEED credit impact for all product substitution.

1.7 SEQUENCING

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installation.

B. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

C. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

D. No work shall be concealed until after inspection and approval by proper authorities. If work is concealed without inspection and approval, Contractor shall be responsible for all work required to expose and restore the concealed work in addition to all required modifications.

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 PAINTS AND COATINGS

A. Paints and Coatings applied on site within the weather proofing exterior must comply with the Green Seal Standard GS-11, Green Seal Standard GC-03, or South Coast Air Quality Management District Rule 1113. Refer to Specification 01352 for specific VOC requirements.

B. Equipment: Equipment manufacturer’s paint selected to match installed equipment finish.

C. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.2 ADHESIVES AND SEALANTS
A. Adhesives and Sealants applied on site within weather proof exterior must comply with South Coast Air Quality Management District Rule or Green Seal Standard GS-36. Refer to specific VOC requirements in Specification 01352.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Adhere to clearances required by the NEC, NFPA 70. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7.

3.3 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site. Coordinate with Owner for any materials to be salvaged.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.4 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:
   1. Raceways
   2. Conductors and cables
   3. Supporting devices for electrical components
   4. Electrical identification
   5. Concrete equipment bases
6. Electrical demolition
7. Cutting and patching for electrical construction
8. Touch-up painting

3.5 REFINISHING AND TOUCH-UP PAINTING

A. Refinish and touch-up paint as required.
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touch-up coating recommended by manufacturer.

3.6 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

C. Manage indoor air quality in accordance with provisions of Section 01352.

3.7 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

A. Contractor shall comply with the requirements of LEED credit MRc2 for disposal and handling of construction waste.

END OF SECTION 16050
SECTION 16130 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes electrical conduits, tubing, surface raceways, and wireways as well as electrical outlet boxes, pull and junction boxes, conduit fittings, and hinged door assemblies.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to this section.

1.3 REFERENCES

A. The latest edition of the following standards and codes, are the minimum requirements for this work.

- ANSI C80.1 Rigid Steel Conduit, Zinc-coated
- ANSI C80.6 Intermediate Metal Conduit, Zinc-coated
- ANSI C80.3 Electrical Metallic Tubing, Zinc-coated
- NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
- NEMA RN 1 Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
- NEMA TC2 Rigid Nonmetallic Conduit (Schedule 40 and Schedule 80)
- NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing
- NFPA No. 70 National Electric Code (NEC)

1.4 SUBMITTALS

A. Conduit, Boxes, Wireways and Auxiliary Gutters: Products by approved manufacturers meeting the requirements of the referenced standards and any special requirements specified in this section will be acceptable for the project. Provide a letter listing all equipment proposed for installation (including manufacturer and part number, where applicable), and stating that the equipment meets the requirements noted in this section. Where proposed equipment be other than that listed in these specifications, provide manufacturers product data sheets for review.

PART 2 - PRODUCTS

2.1 RACEWAYS AND FITTINGS

A. Metallic Conduit Systems:

1. Electrical Metallic Conduit (EMT): EMT shall comply with UL 797 and ANSI C80.3. EMT shall be zinc-coated steel, galvanized on the outside and coated on the inside with a hard smooth lacquer finish. EMT fittings shall be steel setscrew type with insulated throats. Die cast zinc fittings are prohibited.

2. Flexible Metal Conduit (FMC): FMC shall be single strip, continuous, flexible interlocked double-wrapped steel, zinc-coated inside and out forming smooth internal wiring channel with steel compression fittings and shall comply with UL 1.
3. Intermediate Metal Conduit (IMC): IMC shall be hot-dipped galvanized with a zinc coating and comply with ANSI C80.6. Fittings shall be steel threaded type.

4. Liquid-tight Flexible Steel Conduit (LFSC): FLSC shall comply with UL 360 and be zinc-coated steel the same as FMC except with sunlight-resistant and mineral-oil-resistant plastic jacket. Fittings shall be cast malleable iron or steel body and gland nut, cadmium-plated with one-piece brass grounding bushings threaded to interior of conduit. Provide spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat.

5. Rigid Steel Conduit (RSC): RSC shall be heavy wall, hot dipped galvanized steel inside and out with threaded ends, and shall comply with U.S. Standard UL6 and ANSI Standard C80.1. RSC fittings shall be steel, threaded type. Plastic-coated Rigid Steel Conduit shall be rigid galvanized steel conduit having a 0.030-inch-minimum thick factory-bonded PVC jacket, using pre-jacketed couplings as manufactured by Pittsburgh Robroy, Plastic Applicator, Occidental or approved equal.

B. Nonmetallic Conduit Systems:
1. Rigid Nonmetallic Conduit (RNC): RNC shall be polyvinyl chloride (PVC) Schedule 40 or 80 suitable for 90°C. Provide solvent cemented type fittings matched to conduit type and material.
2. Liquidtight Flexible Nonmetallic Conduit (LFNC): LFNC shall comply with UL3.

C. Surface metal raceway shall be Wiremold or Walker-Parkersburg. Raceways, fittings, and components shall be of one manufacturer and designed for use together.

D. Metal Wireways: Wireways shall be hinged cover or screw cover complete with all necessary manufactured fittings which shall be of one manufacturer.
1. Material: Sheet metal sized and shaped as indicated.
2. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system. Provide wire retainers at not greater than 12 inches on center.
3. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
4. Wireway Covers: Screw-cover type
5. Finish: Manufacturer's standard enamel finish

E. Raceway Fittings: Specifically designed for the raceway type with which used.

F. Bushings: For rigid steel conduit larger than 1/2-inch size, provide insulated type bushings, designed to prevent abrasion of wires without impairing the continuity of the conduit grounding system. Grounding bushings shall be locking type and shall be provided with a feed-through compression lug for securing the ground cables. Unions shall be electro-galvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal.

G. Expansion Fittings: Each conduit that is buried in or secured to the building's construction on opposite sides of a building expansion joint and each long run of exposed conduit that may be subject to excessive stresses shall be provided with an expansion fitting. Expansion fittings shall be rigid steel hot-dipped galvanized or malleable iron with factory-installed packing and a grounding ring. Expansion fittings for rigid non-metallic conduit shall be of the short type in runs 25 feet or less, and the long type in runs 26 to 80 feet. The short type shall be a one-piece, coupling with O ring, providing 2 inches of total movement range in 1/2-inch to 2-inch conduit sizes. The long type shall be a two-piece barrel and piston joint, providing 6 inches of the total movement range in 1/2-inch through 6-inch conduit sizes. Expansion fittings in embedded runs shall be watertight and shall be provided with an internal bonding
jumper. The expansion material shall be neoprene and shall allow for 3/4-inch movement in any direction.

H. Sealing Fittings: Provide threaded, zinc or cadmium coated, cast or malleable iron type for steel conduits. Fittings used to prevent passage of water vapor shall be of the continuous drain type.

2.2 OUTLET, JUNCTION, AND PULL BOXES

A. Acceptable Manufacturers:
   1. Boxes and Cabinets: Bowers, Raco, Steel City, Appleton, Hoffman, or approved equal.
   2. Floor Boxes: Walker, Hubbell, Raceway Components, Inc. or approved equal.

B. Outlet, Junction, and Pull Boxes:
   1. Cast Type Boxes: Cast type boxes shall be ferrous alloy and have gasketed cast covers and inside threaded hubs with adapters as necessary. Cast-metal boxes shall comply with NEMA FB 1, Type FD.
   2. Galvanized Pressed Steel Type Boxes: Boxes shall be pressed steel, galvanized or cadmium-plated, 4-inch minimum square and 2 inch minimum box depth with galvanized cover or extension ring as required. Knockout type shall be used with knockouts removed only where necessary to accommodate the conduit entering. Boxes shall comply with NEMA OS 1. Provide a grounding terminal in each box containing a green equipment ground conductor, or serving motors, lighting fixtures, or receptacles. Grounding terminal shall be green-colored washer-in-head machine screw or grounding bushing.
   3. Large Sheet Steel Boxes:
      a. 12-Gauge sheet steel for boxes with maximum side less than 40 inches, and maximum area not exceeding 1,000 square inches; riveted or welded 3/4-inch flanges at exterior corners.
      b. 10-Gauge sheet steel for boxes with maximum side 40 to 60 inches, and maximum area 1,000 to 1,500 square inches; riveted or welded 3/4-inch flanges at exterior corners.
      c. 10-Gauge sheet steel riveted or welded to 1-1/2” x 1-1/2” x 1/4” welded angle iron framework for boxes with maximum side exceeding 60 inches and more than 1,500 square inches in area.
      d. Covers:
         1) Same gauge steel as box. Provide lifting handles on covers with any dimension larger than 36 inches
         2) Subdivided single covers so no section of cover exceeds 50 pounds
         3) Machine bolts or machine screws threaded into tapped holes.
      e. Paint: Rust inhibiting primer, ANSI 61 gray enamel finish coat. Verify volatile organic compound (VOC), content is less than or equal to the allowable VOC established by Governing Standard.

PART 3 - EXECUTION

3.1 GENERAL

A. Electrical system layouts indicated on drawings are generally diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Govern exact routing of raceways and locations of outlets by structure and equipment served. Take all dimensions from architectural drawings.
B. Consult all other drawings. Verify all scales and report any dimensional discrepancies or other conflicts to Architect before submitting bid.

C. All home runs to panelboards are intended to be started from outlet nearest panel and continuing in general direction of that panel. Continue such circuits to panel as though routes were completely indicated. Terminate homeruns of signal, alarm, and communications systems in a similar manner.

D. Avoid cutting and boring holes through structure or structural members wherever possible. Obtain prior approval of Architect, and conform to all structural requirements when cutting or boring structure is necessary and permitted.

E. Furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, etc. required for equipment specified under this section.

3.2 SLEEVES

A. Provide sleeves accurately set in place in forms for new concrete walls, floor slabs and partitions for passage of raceways. Waterproof all sleeved raceways.

B. The electrical contractor shall be present during the pouring of concrete to make sure the location of sleeves is not disturbed during the pour.

C. All sleeves through concrete floors shall be pipe sleeves with the top of sleeves a minimum of 1/2 inch above finished floor surfaces. Do not utilize more than one sleeve per pipe. Blockouts for multiple pipes or individual pipes will not be allowed except where approved by the structural engineer/Architect.

D. In cases where cast-in-place openings are not possible, appropriate size holes shall be bored through the concrete to accommodate the conduit passage. The size and location of the holes shall not impair the structure's integrity. After completion, grout or caulk around conduit and finish to match existing surroundings. Cut all openings for which sleeves are omitted with rotary type drill, or other method as approved by the Architect. Holes cut with pneumatic hammer will not be accepted.

3.3 RACEWAYS

A. Provide raceways for all power and special systems as indicated. 277/480V system wiring shall be kept independent of 120/208V system wiring wherever possible. Emergency system wiring shall be kept independent of other wiring systems. Provide insulated grounding conductor in all raceways. Minimum conduit size shall be 3/4 inch. Wiring of each type and system shall be installed in separate raceways.

B. Locate raceways so that the integrity of structural members is not affected and they do not conflict with the services of other trades. Draw up couplings and fittings full and tight. Protect threads from corrosion after installation with zinc chromate or equivalent protection.

C. Install power raceways a minimum of 24 inches from telecommunications raceways, cross at 90° angle.

D. Protect all non-PVC coated metallic raceway in earth or fill from corrosion with two coats of corrosion resistant paint or tape wrap.

E. Elbows for conduit installed below grade or embedded within floor slabs shall be rigid steel conduit with factory PVC coating or two coats of corrosion resistant paint or tape wrap.
F. Tie embedded raceways securely in place prior to concrete placement. Raceways installed below or within floor slabs shall extend a minimum of 4 inches above the finished slab or housekeeping pad to the first connector. Install capped bushings on conduit stub ups.

G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb. (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire. Tag both ends noting destination.

H. Use temporary raceway caps to prevent foreign matter from entering conduits.

I. Make all bends using an approved bending tool. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated. Cut all conduits square and ream all cuts to remove burrs. Exercise all necessary precautions during the construction period to prevent entry or accumulation of moisture, dust, concrete, and all foreign matter into the raceway system. The contractor shall pull a mandrel through each raceway to ensure the raceway interior is clean and dry prior to pulling conductors or cable.

J. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

K. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72 inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

L. Above grade - defined as areas above finished grade for a building exterior and above top surface of any slabs (or other concrete work on grade) for a building interior. Installation of and materials for above-grade raceways shall conform with the following:
1. Install all raceways concealed within finished walls, ceilings, and floors except at surface cabinets, for motor and equipment connections, and in building service equipment rooms unless otherwise indicated. Route exposed raceways and raceways above suspended ceilings parallel or perpendicular to building lines with right angle turns and symmetrical bends. Raceways below or within floor slabs shall be run in a direct line, and where possible, with long sweep bends and offsets.
2. Install raceways a minimum of 6 inches away from parallel runs of flues and steam pipes or other heated lines. Locate horizontal raceway runs above water and steam piping.
3. Provide for waterproofing of all raceways, outlets, fittings, etc. which penetrate exterior walls or the roof to preserve the weatherproof integrity of the building. Provide pockets for waterflushing and counterflushing or pitch pockets for waterproofing of all raceways, outlets, fittings, etc. which penetrate roof. Wherever conduits penetrate concrete walls to outdoors, the Contractor shall provide a watertight seal as manufactured by O.Z. Gedney Company, Type CSMC; Thunderline Corporation, Link Seal, or equal.
4. Raceways between cabinets, fittings or boxes shall not exceed 200 feet for straight runs or 100 feet for runs with the maximum number of bends.
5. Provide one empty 3/4-inch conduit for each set of three spare circuit breakers or spaces in flush-mounted panelboards into the overhead accessible ceiling space.
6. Raceways Embedded in Floor Slabs:
   a. Raceways shall not be installed in slab without the approval of the Structural Engineer.
   b. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement. Raceways shall not interfere with placement of floor slab reinforcement components.
c. Install raceways between the upper and the lower layers of reinforcing steel.
d. Space raceways not less than 8 inches on centers except where they converge at panels or junction boxes.
e. Raceways running parallel to slab supports, such as beams, columns and structural walls, shall be installed not less than 12 inches from such supporting elements.
f. Rigid steel conduit, or rigid nonmetallic conduit may be embedded in concrete providing the outside diameter does not exceed one-third the thickness of the concrete slab, wall, or beam and it is located entirely within the center third of the member with at least 1 inch concrete cover. Space raceways laterally to prevent voids in concrete.

7. Raceways Above Suspended Ceilings:
   a. Raceways shall not be supported from ceiling support wires. Provide independent support of raceways.
   b. Install conduit 1 foot minimum above top of ceiling.

8. Special occupancies as defined and classified in Chapter 5 of the National Electrical Code. Installation of raceway systems to include seal-offs, explosion-proof boxes and fittings, etc. shall be in accordance with applicable provisions of the NEC. Provide conduit seal-offs where portions of an interior raceway system pass through walls, ceiling or floors which separate adjacent rooms having substantially different maintained temperatures.

9. Rigid metallic steel conduit shall be installed in the following above-grade areas:
   a. Where exposed to mechanical injury.
   b. Where specifically required by the National Electrical Code.

10. Electrical Metallic Tubing (EMT): May be installed in dry areas only in:
    a. Concealed locations in furred or masonry walls or ceilings.
    b. Embedded in poured insulating fills.
    c. Exposed areas at least 8 feet above floor.

11. Flexible metal conduit shall be provided in sufficient lengths for makeup of motor, transformer or equipment, and/or raceway connections where isolation of sound and vibration transmission is required. Provide liquid-tight flexible conduit in exterior, wet or damp locations and for connections to wet-pipe mechanical systems. Flexible metal conduit shall contain a separate equipment grounding conductor, sized per NEC requirements.

12. Flexible 3/4-inch conduit may be utilized for connections to recessed lighting fixtures and shall not exceed 6 feet in length.

13. Surface raceways, where indicated on drawings, shall be metal and of a size approved for number and size of wires to be installed and shall be installed in a neat, workmanlike manner, with runs parallel or perpendicular to walls and partitions. Raceways, elbows, fittings, outlets and devices shall be of same manufacturer, and designed for use together.

14. Wireways, where indicated, shall be complete with elbows, tees, connectors, adaptors, etc., with all parts factory fabricated and of same manufacturer. Install wireways above suspended ceilings such that cover will hinge upward from side. Provide 12 inches clear from wireway cover when in open position.

15. Fittings: Use approved type couplings and connectors in all conduit runs, and make all joints tight. Provide insulated bushings or rain-tight connections with insulated throats for all terminations in pipe sizes 1-1/4 inch (32 mm) and larger. Provide waterproof fittings for all runs in wet locations, such as exposed to weather, buried in slabs, etc. Provide raceway expansion joints with necessary bonding conductor at building expansion joints, between structures, and where required to compensate for raceway or building thermal expansion and contraction.

16. Firestops and seals shall be provided for penetrations through fire-rated walls and floors. Firestops and seals shall be Dow Corning’s Firestop Series 2000, 3M’s fire barrier composite sheets CS195, or equal, and shall be applied in accordance with manufacturer’s recommendations. Products which are affected by water are not acceptable.
M. Below Grade: Defined as area below finished grade for a building exterior and below bottom floor slab for a building interior. Installation of and materials for below-grade raceways shall conform with the following:

1. Below-grade raceways shall project 4 inch minimum above floor or equipment foundation.
2. Install exterior underground conduits 30 inch minimum below finished grade unless shown otherwise on the drawings.
3. Do not penetrate waterproof membranes unless proper seals are provided.
4. Conduits below building slab shall be 12 inch minimum below bottom of concrete.
5. Make all penetrations through concrete with rigid plastic-coated conduit.
6. Non-encased Raceways: Unless specifically noted on drawings for concrete encasement, provide either of the following raceway systems for installation below slabs on grade or in earth or gravel.
   a. Rigid, heavy-wall, Schedule 40 or 80, polyvinyl chloride PVC plastic conduit, suitable for direct burial. All offsets and 90-degree ells shall be rigid plastic-coated conduit. Provide continuous ground wire for all non-metallic conduits.
   b. Rigid steel conduit that is not completely encased in concrete but is in contact with ground or on a vapor barrier shall be wrapped with Scotchrap 51 half-lapped, or shall have an additional outside factory coating of polyvinyl chloride with a minimum coat thickness of 30 mils. Other PVC or Phenolic-resin-epoxy coating material which is equally flexible and chemically resistant may be used providing approval by the Engineer is obtained prior to installation. Provide pre-jacketed couplings to provide a substantially watertight jacketing system.
   c. Cut rigid steel conduit ends square, thread and ream to remove burrs and sharp edges. Make joints with standard couplings - no running threads permitted. Paint threads with “LPS Zinc Rich” where installed below grade or where threads are not galvanized.
   d. All underground conduits and ducts 2 inches and larger shall be proven clear by pulling through a ball mandrel (diameter approximately 85% of conduit inside diameter) followed by close fitting wire brush and wad of felt or similar material. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. Clean empty raceways similarly. Clear or replace any raceway which rejects ball mandrel.
   e. Provide seal-off fittings where conduits enter or leave hazardous wiring area or areas of widely different temperature and/or humidity.

7. Non-Metallic Raceway Installations:
   a. Joints shall be made using the material recommended by the raceway manufacturer. Components shall be cleaned prior to assembly.
   b. Raceway cutoffs shall be square and shall not deform conduit. Ream rough surfaces.
   c. Provide male box adapters to terminate raceways.
   d. Where separable terminations are required, provide PVC threaded adapters with locknuts or bushings. Provide "O" rings for watertight installations.
   e. Bends shall be made by methods that do not deform or damage the conduit.
   f. Provide expansion fittings where required.
   g. Raceway supports shall be installed to allow the non-metallic conduit to slide through the supports.
   h. Non-metallic raceway is not permitted within the building.

3.4 OUTLET, JUNCTION AND PULL BOXES

A. Provide galvanized or zinc-coated, pressed steel outlet boxes for all locations except where otherwise indicated or where cast metal boxes are required by the NEC. Boxes are to be minimum 4-inch square and minimum 2 inch depth or as required. Provide plaster or tile rings for all flush outlets installed where wood, drywall, tile, plaster, etc. types of finishes are applied. All outlets for exterior application...
shall be cast, weatherproof type, with gasket and cast coverplate. Tile boxes of extra depth may be used for interior, dry applications where masonry block or brick walls constitute the finished wall surface. Boxes installed in masonry walls shall be cast metal, installed as part of the original wall construction to correspond with consistent brick or block course (where new), and coordinated with both the masonry subcontractor and the architect for location. In any event, provide outlet boxes of proper type and design for the particular fixture or device to be installed. Boxes shall be installed such that they are accessible and with adequate working clearance. Exact location of outlets and equipment shall be governed by structural conditions and obstructions or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment. Verify final location of all outlets, panels, equipment, etc. with Architect and/or Engineer.

B. Equip light fixture outlet boxes with 3/8-inch no-bolt fixture studs. Provide a minimum 4-inch square box. Where fixtures are mounted on or in an accessible type ceiling, provide a junction box and extend flexible conduit to each fixture. Outlet boxes in finished ceilings or walls shall be fitted with appropriate covers, set to come flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide tile box or a 4-inch square box with tile ring in masonry walls which will not be plastered or furred, or where "drywall" type materials are applied.

C. Except as otherwise noted, locate outlet boxes as follows: Dimensions given are from finished floor to center line of outlets. Adjust heights of outlets in masonry walls to correspond with consistent brick or block course. Outlets in block walls shall be installed in core of block.

1. Wall switch outlets ............................................. 44 inches
2. Convenience outlets, long axis vertical
   with grounding pole on bottom ................................ 18 inches
3. Phone and data outlets ......................................... 18 inches
4. Wall-mounted shelf-type pay phone outlet ............ 40 inches
5. Fire alarm horn/strobes outlets .............................. 80 inches
6. Fire alarm pull station outlets ................................. 44 inches
7. Clock outlets ........................................................ as noted

D. Provide outlet boxes of proper type and design for the particular fixture or device to be installed. Boxes shall be installed such that they are accessible and with adequate working clearance. In stud walls, provide box supports that span two structural framing members to rigidly support boxes. Far side box supports that rely on the gypsum board for rigid support are not acceptable.

E. Junction and Pull Boxes: Use outlet boxes as junction boxes wherever possible. Larger junction and pull boxes over 12 inches in any dimension shall be fabricated from sheet steel, sized according to code, and have screw-on covers. All junction boxes shall be accessible.

F. Back-to-back outlets in the same wall or through-wall type boxes are not permitted. Provide 8-inch (minimum) long nipple to offset all outlets shown on opposite sides of a common wall to minimize sound transmission.

G. Surface-mounted devices are to be mounted in cast-type boxes with gasketed covers.

H. Removable covers must be accessible at all times. Mount per “Outlets” Section.
I. Provide a standard access panel having a hinged metal door neatly fitted into a flush metal trim, where a junction box or equipment is located above non-accessible ceilings or behind finished walls. Coordinate location and type with Architect.

J. All pull boxes shall be set rigidly in place with their front set straight and plumb.

K. For ease of identification during maintenance and remodeling, junction box covers shall be color coded according to the following schedule:
   1. Fire Alarm and Fire Pump boxes - Red
   2. Emergency Circuitry - Yellow
   3. Telephone - Green
   4. Television signal - Violet
   5. Computer Data - Blue
   6. 277/480V Systems – Orange

L. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

M. Mark junction box covers in ceiling spaces or unfinished areas with permanent stencil identification of panelboard and circuit numbers of wiring contained within.

END OF SECTION 16130