Request for Bids	Marshall University Office of Purchasing One John Marshall Drive Huntington, WV 25755-4100 Direct all inquiries regarding this order to: (304) 696-2599	Bid # R2001202

Vendor:

For information contact:
Purchasing Contact: Angela White Negley
Phone: (304) 696-2599
Email: negley4@marshall.edu & cc: Purchasing@marshall.edu

Sealed requests to bid for furnishing the supplies, equipment or services described below will be received by the Institution. TO RECEIVE CONSIDERATION FOR AWARD, UNLESS OTHERWISE NOTED, THE BID WILL BE SUBMITTED ON THIS FORM IN ORIGINAL AND (1) COPY, SIGNED IN FULL IN INK, AND RECEIVED IN THE OFFICE OF PURCHASING TO HAVE A DATE/TIME STAMP AFFIXED, ON OR BEFORE THE DATE AND TIME SHOWN FOR THE BID OPENING. When applicable, prices will be based on units specified; and Bidders will enter the delivery date or time for items contained herein. The Institution reserves the right to accept or reject bids on each item separately or as a whole, to reject any or all bids, to waive informalities or irregularities and to contract as the best interests of the Institution may require. BIDS ARE SUBJECT TO THE GENERAL TERMS AND CONDITIONS AS SET FORTH HEREIN.

DATE 12/12/2019	DELIVERY IS REQUIRED NO LATER THAN **December 19, 2019, by 3:00 p.m.**	**DEPARTMENT REQUISITION NO.** R2001202	BIDS OPEN: 3:00 p.m. on 12/19/19	**BIDDER MUST ENTER DELIVERY DATE FOR EACH ITEM BID**

Item #	Quantity	Description	Unit Price	Extended Price
		Addendum #2 Project: Marshall University Baseball Stadium, Huntington, WV The purpose of this addendum is to modify and/or clarify project requirements, specifications, and drawings as per the attached information. The updated information must be taken into account in preparing proposals and shall become a part of the final contract documents. The questions were asked subsequent to the pre-bid meeting and answers have been provided as part of this addendum. Receipt of this addendum must be acknowledged in the space provided on this front page and the addendum acknowledgment page of the RFB packet.		
			Total	

To the Office of Purchasing,
In compliance with the above, the undersigned offers and agrees, if this offer is accepted within _____ calendar days (30 calendar days unless a different period is inserted by the purchaser) from the bid open date, specified above, to furnish any or all items upon which prices are offered, at the price set opposite each item, delivered at the designated point(s), within the time specified.

Bidder guarantees shipment from _____ within _____ days

FOB _____ After receipt of order at address shown

Terms _____

Bidder's name Vendor _____

Signed By _____

Typed Name _____

Title _____

Street Address _____

City/State/Zip _____

Date _____ Phone _____

Fein _____

BOG 43
MU Rev. 05/15/14

SOLICITATION NUMBER: R2001202

Marshall University Baseball Stadium

Addendum Number: No. 2

The purpose of this addendum is to modify the solicitation identified as ("Solicitation") to reflect the change(s) identified and described below.

Applicable Addendum Category:

[ ] Modify bid opening date and time

[X] Modify specifications of product or service being sought

[X] Attachment of vendor questions and responses

[ ] Attachment of pre-bid sign-in sheet

[ ] Correction of error

[ ] Other

Description of Modification to Solicitation:

Addendum issued to publish and distribute the attached documentation to the vendor community.

1. To provide the University's answers to vendor's technical questions and clarify specifications.

NO OTHER CHANGES.

Additional Documentation: Documentation related to this Addendum (if any) has been included herewith as Attachment B and is specifically incorporated herein by reference.

Terms and Conditions:

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.

2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which can be found in the Request for Bid, Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

ADDENDUM 02

Date of Issuance: December 12, 2019

Re: MARSHALL UNIVERSITY BASEBALL STADIUM
Requisition No. R2001202
Marshall University, Huntington WV.

AECOM Project Number: 60590790

Issued By: AECOM Technical Services, Inc.

Issued To: All bidders/plan holders of record

Acknowledge receipt of this addendum in the Bid Form. Failure to acknowledge receipt of this addendum may render your bid non-responsive, and disqualify the Bidder.

The requirements of the original Bid documents remain in effect except as modified by this Addendum. Changes made by addenda take precedence over information published at an earlier date.

Bidders are advised to call attention to all sub-bidders and suppliers of all information and changes that might affect their work.

GENERAL CLARIFICATIONS:

1. **Please see the FORM OF PROPOSAL, and the form for ADDENDA ACKNOWLEDGMENT, attached for Submission of Bid.**

   Per the Form of Proposal instructions for the Baseball Stadium Project, the bid of the Stadium Project is to include the defined allowances. Allowance No. 1 is the owner directed proposal of the scope of work in the Field & Turf RFP. This amount is provided in this addendum – see Item 2 under Specifications.

2. Please note the Field & Turf RFP has been provided as **"For Information Only"**, as noted in the Baseball Stadium Project bid documents. This includes:
   - **a.** Field & Turf RFP specifications provided at the end of Project Manual Volume 5, as indicated in the Project Manual Table of Contents
   - **b.** Field & Turf RFP drawings provided at the end of Drawing Set Volume 2, as indicated in the Sheet Index
   - **c.** Addendum F&T-01 attached to Addendum 01
   - **d.** Addendum F&T-02 attached to this addendum, Addendum 02

   Providing the RFP documents of the Field & Turf package for familiarization was deemed necessary as the successful General Contractor for the stadium will assume the scope of work of the Field & Turf RFP as instructed in the bidding documents and under Allowance No. 1 per section 012100. These "For Information Only" documents should not be confused with the Division 0 and 1 bid documents provided in Volumes 1 and 2 of the Project Manual.

INTERROGATIVES:

1. Q. In Addendum 1, Sheets G101 and G102 show which drawings have been revised. Some of the sheets are shown as "Rev. No 1" however they are not included with the addendum.

A. The (1) in the Rev. No. column of the index on Sheets G101 and G102 was provided to identify all sheets which have been amended, regardless if they were reissued or modified in narrative only. The sheets that have a (1) in the column that were not reissued, have been revised in verbiage narrative by the addendum. The sheets that were reissued were identified as such in the addendum by indicating they were superseding the previously issued sheets.

2. Q. Spec. Section 012300 outlines Alternate No.1 as Full Construction of East Parking Lot however the Form of Proposal lists Alternate #1 as Vendors Choice Turf System, please clarify.

A. The Form of Proposal is for the Field & Turf RFP and has been issued "For Information Only". Alternate #1 for the Stadium project is indeed the full build out of the East Parking Lot.

3. Q. Spec. Section 281300 Section 1.1.A states to provide a complete functioning Access Control System, however Spec. Section 012100 Allowances, list Allowance No. 2 as owner-provided access control system. Can you clarify?

A. Allowance No. 2 is for engaging Marshall's preferred security contractor to do the final install of the controllers and readers for access control system. Marshall currently has a security company under contract that must make the final installation of controllers and readers. Marshall handles this through the GC and electrical contractors and negotiates the exact scope of work for completion. The purchasing of the equipment, pathways, and cabling installation are part of the contract documents.

4. Q. Spec. Section 012100 Allowances lists Allowance No. 3 as owner-provided equipment associated with cable TV distribution system as described in the Documents however other spec. sections indicate this work is the contractor's responsibility, can you clarify?

A. The scope provided by Marshall is inclusive of CATV RF Taps and Splitters (University to furnish and install). The University is to provide the incoming CATV signal from Campus CATV system and any equipment required to receive said signal. The University will hand off an RF signal at the Head End as indicated on TA705. The University is to furnish the CATV Modulators for Contractor to install. Contractor is to provide all remaining scope, including but not limited to: Head End components, stadium fiber distribution to closets, coaxial cable, terminations, etc. as indicated in drawings and specifications. Specifically reference TA705 and Section 27 41 33. Allowance No. 3 is intended to cover costs associated with the University installed and/or furnished scope as described here.

5. Q. Drawing E601 shows Panel 2HLF being fed from Panel OLLD however Drawing E602 shoes Panel 2HLF being fed from Panel OHLD, can you clarify?

A. Panel 2HLF is to be fed from Panel 0LLD.

6. Q. There is an item #07 (lever waste w/ overflow) indicated on page FS2.01 however there is not item #07 in the Section 114000 Foodservice Equipment specifications. Can you please provide a specification?

A. See attached Food Service Specification – 114000.

7. Q. On page FS4.01, PRESS LEVEL OUTDOOR CLUB 3.L3.01 EQUIPMENT, there are two items (#138.1 & #164.1) without a written specification. The foodservice drawings reference these items on page FS5.05 with more details but can you please provide a specification of the backbar cooler? Who is to provide item #138.1 – portable bar millwork?

A.The reissued 11 40 00 foodservice specifications issued in this addendum includes the specs for these two items.

8. Q. Will the project require the KEC to have a phased installation? If so, how many phases.

A. One installation phase for the KEC, if phases are not identified then the intent is not to have phased construction/installation at this time.

9. Q. Can Mason and Barry with Andover/Schneider controls be accepted equal for Division #230900 Controls and Instruments section?

A. Yes this is acceptable.

10. Q. Can Mason & Barry with Andover/ Schneider controls be accepted equal for the following divisions?
   a. #281000 electronic security system
   b. #281300 Access Controls
   c. #282000 Video Surveillance

A. Marshall University is standardized on Transact access control and Panasonic video management. No substitutions are allowed.

11. Q. In spec section 012500 Substitution Procedures it lists a document 002600 “Procurement Substitution Procedures”, where is this document and are pre-bid substitutions being accepted?

A. See Spec. Section 012600 Contract Modification Procedures; yes they are.

12. Q. Drawing A508 notes all railing assembly is to be provided with PVDF finish. Is there a specific company who makes railing with this coating as your basis of design? If so can you please provide.

A. PVDF is the industry standard for what is typically referred to as a brand name Kynar Finish. This painting system may be replaced with the coating system specified in 099600 High Performance Coatings under Exterior Steel Substrates.

13. Q. Section 042000 - 2.4/C/1 describes “Natural White Sand”. Will white sand be required in mortar mix for Type “A” or Type “B” CMU’s or will Ohio River mason sand be sufficient?

A. For mortar please provide what is specified.

14. Q**.** Section 042000-2.6/C/1 and D/1 describes truss type joint reinforcement. Will ladder type joint reinforcement be acceptable?

A. Provide what is specified.

15. Q. Detail A3 on A521 shows flashing embedded into mortar joint approximately 1 5/8”. Detail A4 on same page shows flashing turned up face of sheathing. Spec Section 042000 3.13/D/1 describes a different installation. Would it be acceptable to attach flexible flashing to backup using a termination bar with mechanical fasteners?

A. Yes the flashing with the termination bar would be acceptable.

16. Q. Section 042000-2.10/B states “for flashing not exposed to the exterior, unless otherwise noted and 3.13/D/3 describes a (drip edge) and 3.13/D/4 describes “sheet metal flashing”. Please clarify whether metal through-wall flashing is required anywhere on this project or is 7oz copper laminated ship-lapped over 3 ½” stainless drip edge acceptable for all applications.

A. Section 2.10 notes for any flashing that is not exposed may be the copper laminated so this is not acceptable at all conditions. Section 3.13 describes how the sheet metal flashing is to be installed but 2.10 A identifies the options for the product.

17. Q. Section 042000-2.2/C/1 Type “A” medium weight hollow concrete block. C/3 weight classification: Normal weight. Is normal weight block acceptable for Type “A”?

A. As noted under item 3 it is Normal Weight.

18. Q. Detail A5 on A523 calls out “Foamed-In-Place Insulation”. Spec Section 072119 1.2/A/1 refers to a closed-cell spray polyurethane foam. Is a closed-cell spray polyurethane recommended for injection into hollow concrete block? Can an open-cell aminoplast foam be used if closed-cell polyurethane is not recommended?

A. Provide the product as currently specified for bidding purposes in the revised spec 072119. An aminoplast foam may not be used.

19. Q. 042000 2.13/A Sand: Where noted, fill block with sand. Please identify walls to be filled with sand.

A. Walls with sand as block fill are no longer in the project.

20. Q. Detail 1 on S721 “Typical Masonry Wall Reinforcement” calls for #4 @ 32” o.c. for 6” and 24” o.c. for 8” for horizontal bars. Please advise as to intent.

A. Detail 1 on S721 to be used for non-structural CMU partition walls only (for structural walls see S305 for reinforcement).

21. Q. Will all openings in masonry walls up to 8’ across with steel lintels as per Steel Lintel Schedule on S.721.

A. Lintel Schedule on S721 to be used for non-structural CMU partition walls only (for structural wall lintels see S305 and wall elevations keyed on the plans).

22. Q. Detail A3/A521 calls for “weather barrier”. Is this referring to a fluid applied air barrier? Please advise.

A. See Spec. 072500

23. Q. The elevator spec states the elevator is based upon Otis’ Gen2 which is an electric traction MRL elevator. Would a Hydraulic elevator be an option to bid? Our equipment requires a machine room of a minimum 6’ X 8’ space. Also the drawings call for a front and rear elevator and with that being said the elevator shaft is not deep enough. Our equipment requires 8’-4” Wide X 7’-9 1/2” Deep shaft size.

A. Please provide the basis of design or equal.

24. Q. Drawing FS4.01 has a portable bar item #138.1. This item is not included in specification section 114000. Please advise.

A. See specification included in this addendum.

25. How will adverse weather days be defined during the project?

A. Adverse weather is defined as weather above and beyond the normal snow fall, rain, etc. It does not mean 3 rain or snow days extend the schedule by 3 days.

26. Q. The E drawings show the (J)AC symbol at various doors. Per the Elec Door Hardware Connections schedule on E902 it indicates these doors have access control. When referring to the TN Drawings, some of these doors do not show any access control or card readers. Could you clarify what is required at these locations?

A. The card readers shown on the TN sheets were coordinated with the University and these locations are to be followed.

27. Q. Drawing TN001 General Note 1 indicates a Technology Matrix on TN000 but it is not shown on Drawing TN000. Could you please provide or clarify?

A. The technology matrix is no longer required for this project. The reference on TN001 can be disregarded.

28. Will Generac Industrial Power be an acceptable manufacturer for the Emergency Generator on this project?

A. Generac is not an acceptable manufacturer for the generator.

29. Will Generac Industrial Power be an acceptable manufacturer for the Automatic Transfer Switch?

A. Generac is not an acceptable manufacturer for the ATS.

30. Will Eaton be an acceptable manufacturer for the Automatic Transfer Switch?

A. Eaton is an acceptable manufacturer for the ATS.

31. Q. S100A - CL L10/B and L9/B show footing noted as “(*) F125.” However, this footing designation is not shown on the Footing Schedule on S701. Please provide details for this footing.

A. Assume ftg reinforcement and thickness the same as (*)F130

32. Q. S100A - CL L10/E, L8/E, and L7/E show footing noted as “(*) F95.” However, this footing designation is not shown on the Footing Schedule on S701. Please provide details for this footing.

A. Assume ftg reinforcement and thickness the same as (*)F100

33. Q. S100A - CL LC/FLL2 shows two footings supporting Field Lights. The note from the EOR states “Field Light Support and Foundation to be Coordinated with Field Lights Designer.” Please provide foundation design or criteria for estimate.

A. Field light foundation are part of field light design (by others). Structural drawings shows only place holders for the foundation – for estimate it can be assumed F75

34. Q. S100A - South of CL A.3 on CL O3, detail 4/S500 is referenced. This detail shows what appears to be a grade beam but does not provide any reference. Please provide details, including reinforcing, for this beam.

A. For estimate assume 2#6 bottom, 2#5 top, close #4 ties at 12” o.c., dowels to the 5” SOG as shown on det 1 / S702

35. Q. 9/S204 - Please provide details for 8" concrete pad at Segmented Retaining Wall.

A. Segmented Retain Wall will be design by others. Retaining wall is flexible and does not need footing – assume unreinforced concrete pad 8” x24”

36. Q. S100B - CL L4/L5 shows an 8” concrete wall. Sheet S701 provides reinforcing details for standard concrete walls with thickness of 12” and 16”. Please provide typical reinforcing details for 8” concrete walls.

A. Assume - vert reinf #5@12” o.c., and horiz reinf. #4@12” o.c., EF

37. Q. S001 - Reinforced Concrete - #17 states “Concrete Walls shall be cast in alternate panels not exceeding 60 feet in length." Please clarify whether this means the maximum pour size is 60LF or if the design intent is to pour in a checkered fashion, where for every 60LF of wall poured we will have to skip the adjoining 60LF. If the intent is the second option, is there a specified duration that the missing section of wall must remain open (ie 24hrs or 28 days). Additionally, note that if we are to follow the alternating panel design, this will have a schedule impact for backfill and follow on trades.

A. The intent is to limit pour size.

38. Q. Please confirm the plumber is installing the foundation drain.

A. Onus of separating scopes of work and how the work is performed is not on the design team.

39. Q. Please confirm the mass excavation subcontractor is handling the mass backfill.

A. Onus of separating scopes of work and how the work is performed is not on the design team.

40. Q. Please confirm the mass excavation subcontractor will be handling structural excavation.

A. Onus of separating scopes of work and how the work is performed is not on the design team.

41. Q. Per the WV Fairness in Competitive Bidding Act, the apparent low bidder on projects exceeding $250,000 shall provide a list of all subcontractors who will perform more than $25,000 of the work on the project including labor and materials. No form was provided with the bidding documents for naming the subcontractors. Please advise if there is a specific format that Marshall University would like bidders to use or provide the desired form.

A. Reference the Form of Proposal provided in this addendum.

42. Q. Drawing S506 - Column Lines L12 to L13 - There are various cuts in this area that reference drawing S506. Please provide notes/sizing/detailing of the hanging lintels shown on 4,5,6 / S506.

A. Details provided in Addenda 1 & 2.

43. Q. Drawing S103 - There appears to be rolled/curved steel channels between column lines R3 & L3. What is the radius for the C12x30 and EOS steel at this location?

A. Exact dimensions of the EOS and the bent channel radii will be provided in separately. The bent channel radius is approx. 99’-0” and 75’-5”, and EOS is 6” out of channel axis.

44. Q. Reference is made to the Vendor / Distribution List contained in Specification Volume 1, Division 00 Purchasing Documents. Are the companies listed under Sections: Electrical Subcontractor, Mechanical Contractors, Temperature Control, HVAC Equipment Suppliers and Fire Protection the only companies that may be solicited for bidding of this project or are they just a list of companies utilized by Marshall University in the past? Please advise.

A. This is a list of companies utilized by Marshall University in the past for reference.

45. Q. Reference is made to Section 230900 Controls and Instrumentation Pages 8 and 9 BMS Responsibility Matrix and Foot Notes 1,2, 3 and 6. It seems as though Foot Note 3 is not applicable as there are no electric baseboard heaters specified for the project. Please confirm that this is correct.

A. Correct

47. Q. Drawing P102A Dugout Level Plumbing Plan - Area A shows the new gas service entering the building between Columns L11 and L14. The gas line does not show until West of Column L11 and does not show at all between the entry point heading East. Please show the gas entry extending from the entry to West of Column L11. Also please identify on all Plumbing Drawings where the gas piping is to be run underground and aboveground.

A. The plan view will be adjusted so that the entire underground gas line is shown on DWG P101A. This sheet will be reissued as part of this Addendum #2

48. Q. Drawing P401 Plumbing Enlarged Plan Keynote 1. calls for the Plumbing Contractor to connect to thermostatic mixing valve (TMV) furnished by others with Division 11 Food Service Equipment. Please confirm that all TMV's will be furnished loose by the FSE Contractor for installation by the Plumbing Contractor (The referenced Note is shown 19 +/- times on Drawing P401. Also shown 3 +/- times on P407 Detail 1).

A. Plumbing contractor shall provide TMV in concession areas at hand wash sinks only. All three compartment sinks, and sinks integral with countertops in food service areas don’t require TMV’s

49. Q. Please provide Specifications for the laundry equipment.

A. This equipment is to be provided by owner; requested information is not available at this time.

50. Q. Drawings P102B and P403 Detail 3 is gas piping required for the (3) clothes dryers? Please provide a drawing if gas piping is required.

A. Drawings P102B, P403, P501, and P502 will be revised to show gas piping to the dryers in Addendum #2.

51. Q. Drawing P408 please provide a Sanitary Plan for Detail 3 Enlarged Plan at Suite Toilet Rooms & Pantry - Press Level.

A. Refer to 1/8“ scale plan P104A for sanitary piping serving press level toilet rooms.

52. Q. Drawing P408 Detail 3 Keynote 11. states that all Plumbing Fixtures this area are furnished by others and installed by the Plumbing Contractor. As the Food Service Equipment Drawings FS4, FS4.01, FS4,01E, FS4.01M and FS4.01SC show the requirements for this Pantry would it be correct to state that the Plumbing Contractor would only be responsible to provide rough-ins and final connections for the "Plumbing Fixtures" in the Pantry? (Same would be true for Electrical and HVAC) As with other food service equipment the cost to furnish and install would be by the General Contractor and the Food Service Equipment Contractor. Please confirm.

A. The plumbing contractor would provide rough-ins and final connections for all sinks and equipment requiring plumbing piping connections. Plumbing contractor is also responsible for mounting hand wash sinks in food service areas.

53. Q. Please describe which floor drains are to be served by trap primers and which type of trap primers are to be utilized (i.e. Reference Drawing P502 Details 9 and 10).

A. Trap primers and trap seals for floor drains will be addressed in this addendum.

54. Q. Please show the standby generator on the Plumbing Drawings and also locate and size the gas piping to the generator.

A. Drawings P101A and P102A will be revised to show gas piping to generator. Drawings will be revised as part of this Addendum.

55. Q. Please provide a Schedule for the thermostatic mixing valve Tagged TMV2 shown on Drawing P501 Electric Water Heater Detail 5.

A. The thermostatic mixing valve schedule will be revised to include TMV2 as part of Addendum #2.

56. Q. Plumbing Drawing P101B Underground Plumbing Plan - Area B shows what appear to be (2) solids interceptors located near Columns R5 and L4 just outside the building, (These solids interceptors are identified as such on Civil Drawing C2-06) Section 221316 2.6 Solids Interceptor gives a description of the interceptor and lists three manufacturers but fails to give information needed to obtain pricing such as size, depth, capacity, gpm, etc. Please provide the information needed in order that we may solicit pricing for the bid.

A. Both Solids Interceptors are to be equal in E.C. Babbert Model 0-4 with a tank volume of 400 gallons. Unit to be 48” Dia ID (58” DIA. OD) with a depth of 78”. Unit to have 8” inlet/outlet. The invert elevation is noted on plans.

57. Q. Keynote 1 is added to Drawing P102B via Addendum No. 1. This Keynote calls for underground SCW piping to be pre-insulated with secondary containment. Please provide Specifications for underground "SCW" with pre-insulated secondary containment.

A. Refer to paragraph 2.2.G in spec section 221116

58. Q. Please confirm that a two (2) year maintenance bond on the roofing system is not required for this project.

A. Do not include at this time, provide maintenance agreement only per the current documents.

59. Q. On Sheet A602B indicates Visiting Team Showers, Visiting Team Grooming, and Visiting Team Toilet is to receive RF-3, however the transition from Janitor to Visiting Team Showers indicates RF-1. Please clarify if the Visiting Team Showers, Visiting Team Grooming, and Visiting Team Toilet is to receive RF-3 or RF-1.

A. RF-3

60. Q. Specification 118226 Facility Waste Compactor indicates a self-contained horizontal-type stationary compactor. In review of the Bid Set drawings, only references to the trash compactor that can be found are on E832 Electrical Site Plan - Parking and E901 Electrical Panel Schedules. Please provide direction as to the location, quantity, and how the compactor will be fed.

A. Location is shown in Civil drawings, specifically C2-03 for the (1) Compactor and E832 for elec. needs.

61. Q. Sheet A601 under "Miscellaneous" indicates LK-1 Locker – Phenolic, and to refer to Specification 102113. No specification 102113 was provided. Please provide.

A. Specification has been included herein.

62. Q. Will Interkal Seating - Aura Stadium Seating be an acceptable equal to Type 1 by 4Topps and Type 2 by American Seating as specified in126323 Stadium Seating?

A. It may be considered if it meets the specifications, and all information/paperwork required for the approval of a substitution request is provided prior to the submission deadline.

63. Q. Is Sports Graphic for padding an acceptable equal to Sportsfield Specialties as specified in 116833.40 Dugout Padding and Rail System?

A. It may be considered if it meets the specifications and is submitted as a substitution request before the deadline.

64. Q. Specification 102600 Wall and Door Protection indicates corner guards, end-wall guards, and abuse-resistant wall coverings. When referencing other Bidding Documents these items cannot be found. Please provide direction for what is to be provided for 102600 Wall and Door Protection.

A. See changes of the drawings for clarification.

65. Q. Specification 101100 Visual Display Units indicates markerboards and tackboards. When referencing other Bidding Documents these items cannot be found. Please provide direction for what is to be provided for 101100 Visual Display Units.

A. Provide a 24” x 36” markerboard for (4) coaches offices.

66. Q. On Sheet FS4.01 indicates 138.1 Portable Bar and 164.1 Back Bar Cooler - Two Door. In Foodservice Equipment Specification 114000 there is no mention of the Items 138.1 and 164.1. Please advise if there are written specifications for the referenced items.

A. Please see revised spec issued herein this addendum.

67. Q. On Sheet FS1.01U indicates 588 - Ice Dispenser, 64.2 Filter System, 122.1 Ice Bin for Ice Machines, 122.3 Ice Maker, and 122.3C Remote Condenser. In Foodservice Equipment Specification 114000 there is no mention of the Items 588, 64.2, 122.1, 122.3, 122.3C. In review of drawings no plan for Players Lounge/Nutrition and Training Room can be found. Only a utility plan for referenced rooms. Please advise if plan with schedule is available for Players Lounge/Nutrition and Training Room and if there are written specifications for the referenced items.

A. Please see revised spec issued herein this addendum.

68. Q. Specification 034800 requires the precast contractor to apply one coat of sealer before shipment to the site for erection. This will cause a problem with the adherence of the caulking sealant and will probably void the sealant manufacturer's warranty. If the idea here is to protect the precast during shipment, be aware that our precast arrives at the site clean. Also a washdown is usually required at the site prior to the sealer being applied. Based on these statements it is requested that this requirement be removed from the precasters scope of work.

A. The requirement for the one coat of sealer prior to shipment may be removed. Apply sealer on site per the specs with verification the sealer is compatible with sealants, caulking, pedestrian traffic coating, expansion joint adhesive, etc.

69. Q. The exterior main entrance precast stairs and landing slabs are noted on the drawings as architectural precast. There is no architectural precast specification, only structural spec section 034800 and these stairs are not included in this spec. The precast contractor needs to know what color, finish, and or any special aggregates that might be required for these steps. Please furnish the required information.

A. Consider these stairs and landings as structural precast at this time.

70. Q. Precast spec 034800 page 7 para. 2.5 C states that an adhesive for securing precast intermediate steps to the tread and riser units is required. Drawing A501 has numerous details showing cast in place intermediate aisle steps. We have done many stadiums in the past and it is unusual to have these small aisle steps as precast. Please clarify.

A. These are to be cast in place aisle steps.

71. Q. Drawing A312 sections A1 and A4 have a note requiring a pedestrian traffic coating applied to the precast stadia. Traffic coatings and water repellant sealers are two completely different applications. Precast spec section 034800 does not have a traffic coating requirement only a sealer application requirement. Please clarify.

A. The area shown with pedestrian coating is to have pedestrian coating provided. Verify compatibility between the two applications or you may omit the sealer where traffic coating is to be provided.

72. Q. Drawing FP101B calls for light hazard wet sprinkler coverage per Keynote 1 in the Visiting Team Locker Room. Drawing FP101C calls for dry light hazard coverage in Visiting Team Locker Room. Please clarify if coverage in the Visiting Team Locker Room is to be wet or dry.

A. In this area, all sprinklers are to be dry.

73. Q. Specification 051200 – 1.6A requires the structural steel fabricator to a member of the AISC Quality Certification Program. Is an AISC quality certified fabricator mandatory?

A. This requirement was removed through Addendum 01.

74. Q. Where is the "PCB Soil Remediation Plan" or the " Soil Removal Plan" described in the Specs Section 31-2000-3.1 located?

A. The PCB Soil Remediation Plan is part of the Environmental Workplan provided in the Potesta documents, found in Volume 1 of the Project Manual.

75. Q. Specification section 03 30 00 – page 11, under 3.11 Field Quality Control; Article A. indicates testing is by owner and Article B. Indicates Contractor is also responsible for testing. Can you please clarify?

A. Owner will choose a third party testing agency to be used, see Allowance No. 4 in Specification Section 012100 regarding this scope of work.

SPECIFICATIONS:

General: Deleted portions of specifications are struck-through and underlined. Revised portions of specifications are bolded and underlined.

1. SECTION 000100 – TABLE OF CONTENTS
    a. **ADD** – PHENOLIC LOCKERS – 10 50 50 to the Table of Contents
2. SECTION 012100 – ALLOWANCES
    a. PART 3 – EXECUTION

3.3. SCHEDULE OF ALLOWANCES

MODIFY Paragraph A to read:

A. Allowance No. 1: Lump-Sum Allowance: Include the lump sum <u>of</u> **<u>$1,075,000</u>** ~~from the awarded bid of~~ **<u>for the owner directed proposal</u>** of the Marshall Baseball Field and Turf Contract. ~~This sum will be provided by addendum prior to the bid date.~~

1. This allowance includes items defined by the FIELD & TURF PRICING DOCUMENTS, dated 11/08/19, **<u>and addenda FT-01 and FT-02.</u>** This package is included in these documents as FOR INFORMATION ONLY.

3. Section 012500 – SUBSTITUTION PROCEDURES
    a. Paragraph 1.1.B.1, replace text "002600 Procurement Substitution Procedures" with "012600 Contract Modification Procedures".

4. Section 064013 – EXTERIOR ARCHITECTURAL WOODWORK
    a. PART 2 – PRODUCTS
        2.1 MATERIALS
            B. Cedar Cladding System

        ADD Cedar – Per the Western Red Cedar Lumber Association
            a. Size: 1”x6” Nominal (11/16”x5-3/8” Dry). Exposed face = 5”
            b. Species: Western Red Cedar (WRCLA Western Red Cedar)
            c. Grade: Clear Heart
            d. Profile: Tongue and Groove
            e. Joints: Flush Joints (NOT V-Grooved)
            f. Installation: Vertical
            g. Surface to be exposed: Smooth Face
            h. Fastening: Blind fastening through “tongue”, with stainless steel (No. 304) “split-less” ring shank nails.
            i. Staining: Stain as soon as possible; apply a finish coat prior to weathering.

    b. 2.4 EXTERIOR ORNAMENTAL WORK FOR NATURAL FINISH
        A. Exterior ornamental work for natural finish includes the following:

        ADD 3. Cedar Cladding System

5. Section 072119 – FOAMED-IN-PLACE INSULATION
    a. This Specification to supersede the earlier specification dated Nov. 15th, 2019.
6. Section 105050 – PHENOLIC LOCKERS
    a. This Specification is to be added in its entirety.
7. Section 105113 – METAL LOCKERS
    a. PART 2 – PRODUCTS
        2.1 MANUFACTURERS
            A. Manufacturer:

        ADD e. Scranton Products – Tufftec Lockers
8. Section 114000 - FOOD SERVICE EQUIPMENT
    a. This Specification to supersede the earlier specification dated Nov. 15th, 2019.
9. Section 126100 – FILM STUDY SEATING
    a. PART 2 – PRODUCTS
        2.1 MANUFACTURERS
            B. Alternative Manufacturers:

        ADD 2. Irwin Seating: Model – Citation
10. Section 126323 – STADIUM SEATING
    a. PART 2 – PRODUCTS
        2.1 BASIS OF DESIGN
            B. Acceptable Manufacturers for Stadium Seating Type 2.

        ADD 2. Hussey Seating: Model – Fusion
11. Section 230900 – CONTROLS AND INSTRUMENTATION
    a. This Specification is to be added in its entirety.
12. Section 265668 - EXTERIOR ATHLETIC LIGHTING
    a. This Specification to supersede the earlier specification dated Nov. 15th, 2019.

DRAWINGS:

General: Revisions to drawings are clouded and have a delta symbol affixed to them. The order of addenda numerically will inform the mark within the delta.

GENERAL

1. Sheet(s) G101 and G102 - DRAWING INDEX
    a. This sheet supersedes the earlier submission dated 02 December 2019.

ARCHITECTURAL

1. Sheet A102A – CONCOURSE LEVEL 2 AREA FLOOR PLAN – AREA A
    a. Detail A1 – Concourse Level – Area A

    CHANGE note which reads “Galvanized chain link fence / gating with wall padding at exterior equip. storage” to read “Chain link fence / gating at exterior equip. storage is to be included in Field & Turf RFP – Wall Padding to remain in Stadium Project”.

    Note all other fencing above masonry outfield wall is to remain in Stadium Project scope of work.
2. Sheet A102B – CONCOURSE LEVEL 2 AREA FLOOR PLAN – AREA B
    a. Detail A1 – Concourse Level – Area B
    CHANGE note which reads “Line of Utility Trench below slab serving Visiting Team Dugout” to read ““Line of Utility Trench below slab serving Visiting Team Dugout – Provide 4” h. curb at opening perimeter and close with a sheet metal cap to provide a watertight enclosure ”.
3. Sheet A102F – CONCOURSE LEVEL 2 AREA FLOOR PLAN – AREA F
    a. Detail A1 – Concourse Level – Area F

    CHANGE note which reads “Black vinyl chainlink fencing with 10’ wide gate leaf and wall pads at field entrance – Center within ramp” to read “Black vinyl gating with 10’ wide leaf at field entrance is to be included Field & Turf RFP – Center within ramp and coordinate with contiguous fencing. Wall Padding to remain in Stadium Project”.
4. Sheet A151A / DUGOUT/FIELD LEVEL 1 – REFLECTED CEILING PLAN AREA A
    a. Ceiling height in Officials Locker A 1.L13.02 shall be 9’-0” AFF and gyp. soffit height shall be 8’-0” AFF.
    b. Ceiling height in Officials Tlt A 1.L12.02 shall be 9’-0” AFF.
    c. Ceiling height in Officials Locker B 1.L13.01 shall be 9’-0” AFF and gyp. soffit height shall be 8’-0” AFF.
    d. Ceiling height in Officials Tlt B 1.L12.01 shall be 9’-0” AFF.
    e. Ceiling height in Officials Lounge 1.L14.03 shall be 9’-0” AFF.
    f. Ceiling height in Food Storage 1.L11.03 shall be 9’-0” AFF.
    g. Ceiling height in Ops Office 1.L13.03 shall be 9’-0” AFF.
    h. Ceiling height in Food Service Office 1.L13.04 shall be 9’-0” AFF.
5. Sheet A213 – EXTERIOR ELEVATIONS – WEST ELEVATION OUTFIELD WALL
    a. Detail C1 – West Elevation – Outfield Wall – North End

    CHANGE note which reads “Galvanized chainlink fencing / gating with full wall pads at ext. storage” to read “Chain link fence / gating is included in Field & Turf RFP – Wall Padding to remain in Stadium Project”.
6. Sheet A322 – Wall Sections
    a. Detail A6 – Wall Section @ Grid Line L8/L9

    CHANGE Elev. at B.O. Steel from 555’-10” to read “555’-8”.

7. Sheet A401 – ENLARGED FLOOR PLANS – DUGOUT/FIELD LEVEL 1
    a. Detail A1 – Enlarged Plan – Visiting Team Dugout

       Within the 6” cmu wall in the SW corner of Room 1.R5.01, provide a 4’ wide x 7’-4” high opening in the wall with a per scheduled bond beam spanning the top of the wall. Locate the East edge of opening so it courses with block but 8” min. to the West face of the 8” cmu wall that runs perpendicular.
8. Sheet A503 – EXTERIOR DETAILS – BOWL DETAILS
    a. Detail C1 – Section @ Outfield Access Gate

       CHANGE note which reads “Black vinyl coated chainlink gate in alignment with fencing beyond” to read “Black vinyl coated chainlink gate is included in Field & Turf RFP – Wall Padding to remain in Stadium Project”.
    b. Detail C3 – Fencing Section @ Equipment Storage

       CHANGE note which reads “Galv. chainlink gate in alignment with fencing beyond” to read “Black vinyl coated chainlink gate is included in Field & Turf RFP – Wall Padding to remain in Stadium Project”.
9. Sheet A521 – EXTERIOR DETAILS – SECTIONS @ DUGOUT LEVEL
    a. Detail B1 – Slab Edge / Railing Detail @ Slab on Grade Retaining Wall

       ADD “T.O. Steel Elevation / Elev. 559’-0 ¾”” to the top of the bent plate.
    b. Detail B3 – Slab Edge / Railing Detail @ Split Slab CMU Backup

       ADD “T.O. Steel Elevation / Elev. 559’-0 ¾”” to the top of the bent plate.
    c. Detail B4 – Slab Edge / Railing Detail @ Split Slab Stud Backup

       ADD “T.O. Steel Elevation / Elev. 559’-0 ¾”” to the top of the bent plate.
10. Sheet A523 – EXTERIOR DETAILS – SECTIONS @ CONCOURSE LEVEL
    a. This sheet supersedes the earlier submission dated 02 December 2019.
11. Sheet A525 – EXTERIOR DETAILS – SECTIONS @ PRESS LEVEL
    a. This sheet supersedes the earlier submission dated 02 December 2019.
12. Sheet A601 / FINISH LEGEND
    a. REMOVE TZ-1 from scope.
    b. ADD Material tag CG-1 Corner Guard. Manufacturer basis of design shall be CS Acrovyn Stainless Steel Corner Guards CO-8, satin finish.
13. Sheet A602B / FINISH PLAN – DUGOUT/FIELD LEVEL 1 – AREA B
    a. Visiting Team Showers 1.R4.02, Grooming 1.R4.03, and Toilet 1.R3.03 shall be RF-3, as indicated on finish tag.
14. Sheet A603A / FINISH PLAN – CONCOURSE LEVEL 2 – AREA A
    a. ADD Stainless steel corner guards CG-1 to all outer corner gyp bd. walls in Lobby 2.L11.04.
15. Sheet A604A / FINISH PLAN – PRESS LEVEL 3 – AREA A
    a. ADD Stainless steel corner guards CG-1 to all outer corn gyp bd. walls in Corridor 3.L9.04 and Club/Team Meeting Room 3.L63.01.
16. Sheet A604B / FINISH PLAN – PRESS LEVEL 3 – AREA B
    a. ADD Stainless steel corner guards CG-1 to all outer corner gyp bd. walls in Corridor 3.L4.03, Corridor 3.L205, Scoreboard/Sound/Replay 3.L1.04, PA Announcer/Official Scorer 3.L1.03, TV Booth 3.L1.02, Home Radio 3.R1.01, Visiting Radio 3.R1.02, Emeritus/Visitor AD Suite 3.R1.04, Work Room 3.R2.01, and Writing Press 3.R3.01.

17. Sheet A611 – DOOR SCHEDULE
    a. CHANGE Height of Door 1.L.13.05 to 8’-4” in lieu of 8’-8”.

STRUCTURAL

18. Sheet S104 – ROOF (PRESS LEVEL) – FRAMING PLAN
    a. This sheet supersedes the earlier submission dated 02 December 2019.
19. Sheet S304 – LLRS MASONRY – SHEARWALLS 1
    a. This sheet supersedes the earlier submission dated 02 December 2019.
20. Sheet S305 – LLRS MASONRY – SHEARWALLS 2
    a. Add this sheet in its entirety.
21. Sheet S501 – SECTIONS AND DETAILS 2 (CONCOURSE)
    a. This sheet supersedes the earlier submission dated 02 December 2019.
22. Sheet S505 – SECTIONS AND DETAILS 6 (MISC. FAÇADE FRMG)
    a. This sheet supersedes the earlier submission dated 02 December 2019.
23. Sheet S507 – SECTIONS AND DETAILS (MISC. FAÇADE FRMG)
    a. This sheet supersedes the earlier submission dated 02 December 2019.
24. Sheet S721 – MASONRY – TYP. DETAILS 1
    a. This sheet supersedes the earlier submission dated 02 December 2019.

MECHANICAL

25. Sheet M001 – GENERAL INFO - HVAC
    a. This sheet supersedes the earlier submission dated 15 November 2019.
26. Sheet M101A – DUGOUT LEVEL HVAC DUCTWORK PLAN – AREA A
    b. This sheet supersedes the earlier submission dated 15 November 2019.
27. Sheet M101B – DUGOUT LEVEL HVAC DUCTWORK PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
28. Sheet M104A – CONCOURSE LEVEL HVAC DUCTWORK PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
29. Sheet M104B CONCOURSE LEVEL HVAC DUCTWORK PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
30. Sheet M105A – PRESS LEVEL HVAC DUCTWORK PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
31. Sheet M105B – PRESS LEVEL HVAC DUCTWORK PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
32. Sheet M201A – DUGOUT LEVEL HVAC PIPING PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
33. Sheet M204D – CONCOURSE LEVEL HVAC PIPING PLAN – AREA D
    a. This sheet supersedes the earlier submission dated 15 November 2019.
34. Sheet M205B – PRESS LEVEL HVAC PIPING PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.

35. Sheet M301 – MECHANICAL SECTIONS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
36. Sheet M401 – MECHANICAL ENLARGED PLANS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
37. Sheet M501 – MECHANICAL DETAILS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
38. Sheet M602 - MECHANICAL SCHEDULES
    a. This sheet supersedes the earlier submission dated 15 November 2019.
39. Sheet M801 – MECHANICAL SEQUENCE OF OPERATIONS/CONTROLS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
40. Sheet M802 - MECHANICAL SEQUENCE OF OPERATIONS/CONTROLS
    a. This sheet supersedes the earlier submission dated 15 November 2019.

PLUMBING

41. Sheet P404 – PLUMBING ENLARGED PLANS
    a. This sheet supersedes the earlier submission dated 02 December 2019.
42. Sheet P501 – PLUMBING DETAILS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
43. Sheet P502 – PLUMBING DETAILS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
44. Sheet P503 – PLUMBING DETAILS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
45. Sheet P601 – PLUMBING SCHEDULES
    a. This sheet supersedes the earlier submission dated 15 November 2019.

ELECTRICAL

46. Sheet E101A – DUGOUT LEVEL LIGHTING PLAN – AREA A
    a. sheet supersedes the earlier submission dated 15 November 2019.
47. Sheet E101B – DUGOUT LEVEL LIGHTING PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
48. Sheet E102A – CONCOURSE LEVEL LIGHTING PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
49. Sheet E102B – CONCOURSE LEVEL LIGHTING PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
50. Sheet E102C – CONCOURSE LEVEL LIGHTING PLAN – AREA C
    a. This sheet supersedes the earlier submission dated 15 November 2019.
51. Sheet E103A – PRESS LEVEL LIGHTING PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
52. Sheet E103B – PRESS LEVEL LIGHTING PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.

53. Sheet E201A – DUGOUT LEVEL POWER PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
54. Sheet E201B – DUGOUT LEVEL POWER PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
55. Sheet E202A –CONCOURSE LEVEL POWER PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
56. Sheet E202B –CONCOURSE LEVEL POWER PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
57. Sheet E202C –CONCOURSE LEVEL POWER PLAN – AREA C
    a. This sheet supersedes the earlier submission dated 15 November 2019.
58. Sheet E203A –PRESS LEVEL POWER PLAN – AREA A
    a. This sheet supersedes the earlier submission dated 15 November 2019.
59. Sheet E203B – PRESS LEVEL POWER PLAN – AREA B
    a. This sheet supersedes the earlier submission dated 15 November 2019.
60. Sheet E301 – ENLARGED POWER PLANS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
61. Sheet E401 – DUGOUT LEVEL FIRE ALARM PLAN – OVERALL
    a. This sheet supersedes the earlier submission dated 15 November 2019.
62. Sheet E402 – CONCOURSE LEVEL FIRE ALARM PLAN – OVERALL
    a. This sheet supersedes the earlier submission dated 15 November 2019.
63. Sheet E403 – PRESS LEVEL FIRE ALARM PLAN – OVERALL
    a. This sheet supersedes the earlier submission dated 15 November 2019.
64. Sheet E502 – ELECTRICAL DETAILS
    a. This sheet supersedes the earlier submission dated 15 November 2019.
65. Sheet E601 – ELECTRICAL ONE-LINE DIAGRAM
    a. This sheet supersedes the earlier submission dated 15 November 2019.
66. Sheet E602 – ELECTRICAL RISER DIAGRAM
    a. This sheet supersedes the earlier submission dated 15 November 2019.
67. Sheet E831 – ELECTRICAL SITE PLAN – STADIUM
    a. This sheet supersedes the earlier submission dated 15 November 2019.
68. Sheet E832 – ELECTRICAL SITE PLAN – PARKING
    a. This sheet supersedes the earlier submission dated 15 November 2019.
69. Sheet E901 – ELECTRICAL PANEL SCHEDULES – SHEET 1
    a. This sheet supersedes the earlier submission dated 15 November 2019.
70. Sheet E901B – ELECTRICAL PANEL SCHEDULES – SHEET 2
    a. This sheet supersedes the earlier submission dated 15 November 2019.
71. Sheet E902 – ELECTRICAL SCHEDULES
    a. This sheet supersedes the earlier submission dated 15 November 2019.

ATTACHMENTS:

FORM OF PROPOSAL
ADDENDA ACKNOWLEDGMENT FORM
Section 072119 - FOAMED-IN-PLACE INSULATION
Section 105050 - PHENOLIC LOCKERS
Section 114000 - FOODSERVICE SPECIFICATIONS
Section 230900 - CONTROLS AND INSTRUMENTATION
Section 265668 - EXTERIOR ATHLETIC LIGHTING
Sheet G101 – SHEET INDEX
Sheet G102 – SHEET INDEX
Sheet A523 – EXTERIOR DETAILS – SECTIONS @ CONCOURSE LEVEL
Sheet A525 – EXTERIOR DETAILS – SECTIONS @ PRESS LEVEL
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Sheet E202B –CONCOURSE LEVEL POWER PLAN – AREA B
Sheet E202C –CONCOURSE LEVEL POWER PLAN – AREA C
Sheet E203A –PRESS LEVEL POWER PLAN – AREA A
Sheet E203B – PRESS LEVEL POWER PLAN – AREA B
Sheet E301 – ENLARGED POWER PLANS

Sheet E401 – DUGOUT LEVEL FIRE ALARM PLAN – OVERALL
Sheet E402 – CONCOURSE LEVEL FIRE ALARM PLAN – OVERALL
Sheet E403 – PRESS LEVEL FIRE ALARM PLAN – OVERALL
Sheet E502 – ELECTRICAL DETAILS
Sheet E601 – ELECTRICAL ONE-LINE DIAGRAM
Sheet E602 – ELECTRICAL RISER DIAGRAM
Sheet E831 – ELECTRICAL SITE PLAN – STADIUM
Sheet E832 – ELECTRICAL SITE PLAN – PARKING
Sheet E901 – ELECTRICAL PANEL SCHEDULES – SHEET 1
Sheet E901B – ELECTRICAL PANEL SCHEDULES – SHEET 2
Sheet E902 – ELECTRICAL SCHEDULES
ADDENDUM F&T-02 *Issued "For Information Only"*

END OF ADDENDUM

FORM OF PROPOSAL

DATE: _____

TO THE OWNER: **Angela White Negley**
CPO, Director of Purchasing, Marshall University
One John Marshall Drive
Huntington, West Virginia 25755

PROJECT: Requisition No: **R2001202**

Marshall University Baseball Stadium
Huntington, West Virginia 25755

The undersigned, hereinafter called the Bidder, being familiar with and understanding the Bidding Documents and also having examined the site and being familiar with conditions affecting the Project hereby proposes to furnish all labor, material, equipment, supplies and transportation, and to perform all Work in accordance with the Bidding Documents within the time set forth below for the sum listed.

Bidder, if successful and awarded a Contract, will receive a notice to proceed from Owner.

The Contractor agrees that the Work shall be Substantially Complete by March 1, 2021 and agrees to achieve Final Completion of the Work by April 1, 2021.

Contractor shall determine the required sequence of construction activities to obtain this date.

The Owner will suffer financial loss if the Work is not Substantially Complete within the Contract Time. For each calendar day of delay in achieving Substantial Completion, the Contractor shall be liable for and shall pay the Owner, not as a penalty but as liquidated damages, in accordance with the following schedule:

For each calendar day the project is not Substantially Complete, damages to be assessed at $1,000.00 (One Thousand Dollars) per day.

For each calendar day of delay in achieving Final Completion, the contractor shall be liable for and shall pay half the amount of liquidated damages stated above, plus any additional fees of the Architect and the Architect's consultants that may accrue. Allowances may be made for delays due to shortages of materials and/or energy resources, subject to proof by documentation, and also for delays due to strikes or other delays beyond the control of the Contractor. The Contractor in accordance with the Contract Documents must properly document all delays and any claim for extension of the Contract Time.

BASE PROPOSAL: _____

_____
(Amount to be shown in both words and numbers)

ADDENDA
The Bidder acknowledges receipt of all Addenda. Include with the Form of Proposal, the completed ADDENDA ACKNOWLEDGEMENT form.

ALLOWANCES
The Bidder acknowledges that the amount of the Base Proposal stated on this Form of Proposal includes the Allowance(s) described in Section 01 2100 – Allowances.

UNIT PRICES

The following Unit Price amounts shall be included in the Base Proposal if selected by the Owner in accordance with Section 01 2200 – Unit Prices.

Unit Price No. 1: Authorized Additional Excavation, including export and disposal (Per Section 31 2000 – Earth Moving)

Add: _____

_____

(Amount to be shown in both words and numbers)

Per Unit of Change: _____

Unit Price No. 2: Authorized Additional Compacted Fill and/or Backfill of Soil Materials (Per Section 31 2000 – Earth Moving)

Add: _____

_____

(Amount to be shown in both words and numbers)

Per Unit of Change: _____

ALTERNATES

The following Alternates may be added to the Base Proposal if selected by the Owner. All work shown on all drawings and/or specified is in Base Bid, except where specifically called to be an Alternate. Refer to Section 01 2300 – Alternates.

Alternate No. 1: Full Construction of East Parking Lot

Add: _____

_____

(Amount to be shown in both words and numbers)

Respectfully submitted:

Signature: _____ Date: _____

(Signature in Ink)

Name: _____

(Please Type or Print)

Title: _____ Corporate Seal (if applicable)

Firm Name: _____

Firm Address: _____

_____

Telephone: _____

Contractor's License No.: _____

LIST OF PROPOSED SUBCONTRACTORS, EQUIPMENT / MATERIAL SUPPLIERS:

List as designated below each subcontractor / supplier for this proposal who will perform more than $25,000 of work on the project. Also, provide contractor's license number for each subcontractor as required by "West Virginia Contractor Licensing Act" and FEIN number as required by "West Virginia Fairness in Competitive Bidding Act".

If the branch of work is to be completed solely by Contractor, so indicate. If acceptance of an alternate proposal changes a subcontractor or equipment and/or material supplier, indicate by notation below. Contractor is responsible for selecting or changing subcontractors and/or equipment and/or material suppliers. Owner and Architect and Engineers may indicate their concerns about any entity listed which they have reason to believe past experience indicates poor performance may be expected. Bidder may be requested to change an unsatisfactory subcontractor or equipment and/or material supplier. Contractor has full responsibility for satisfactory execution of all work in accordance with Contract Documents. Any change of proposed subcontractors or material suppliers shall be at no additional cost to Owner, as Contractor has full responsibility for execution of the work.

No.	Subcontractor/Supplier Name	Contractor License #	FEIN #

(Use additional pages as required.)

END OF FORM OF PROPOSAL

Requisition No.: **R2001202**

ADDENDA ACKNOWLEDGEMENT

I hereby acknowledge receipt of the following checked addenda and have made the necessary revisions to my proposal, plans, and/or specifications, etc.

Addenda:

No. 1 _____

No. 2 _____

I understand that failure to confirm the receipt of the each Addendum is cause for rejection of bids.

_____
Signature

_____
Company

_____
Date

AECOM

SECTION 072119 - FOAMED-IN-PLACE INSULATION

Section Record:

Issued: Addendum 02 - December 12th, 2019

Issued, 100% Construction Documents November 15, 2019

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY OF WORK

A. Scope of Work: The work covered by this section of the specifications consists in furnishing all labor, equipment, appliances, hardware, and materials necessary in performing work for and reasonably incidental to complete the installation of:

1. Spray foam components and penetrating insulation for wall cavities and core of concrete block.

B. Related Sections: The following sections contain requirements to properly perform work specified in this Section:

1. Division 4 Section “Unit Masonry.”

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM C 518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM D 2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.
3. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
5. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
6. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.
7. ASTM E 413 Standard Classification for Rating Sound Insulation.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions, including the following:

1. Product description, insulation properties, preparation, and storage requirements.

a. Note any adverse reactions product may have with common construction materials.
b. Note any human safety concerns related to the use or installation of foam insulation products.

2. Requirements and procedures for site installation, including equipment and accessories.
3. Certification by manufacturers that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
4. Provide Material Data Safety Sheets for all products to be used.

B. Quality Assurance / Control Submittals: Submit the following:

1. Test Reports: Provide product test reports upon request.
2. Certificates:

a. Manufacturer's certification that applicator is trained in installation of product and is authorized by manufacturer to install product.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Applicator Qualifications: Utilize a qualified applicator with demonstrated experience in performing work comparable to the work of this Section, and who is trained and authorized by the manufacturer to install the product.

B. Certifications: Manufacturer certification that product complies with requirements of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to applicator in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer. Product should be stored in paper sacks and protected from any water source until blending by installer.

1.7 PROJECT / SITE CONDITIONS

A. Environmental Requirements: Do not install foam insulation when product temperature is below 50 deg F.

1.8 GUARANTEE

A. Guarantee: In addition to warranty requirements, all work in this Section shall be guaranteed against any and all defects in workmanship appearing within a period of one (1) year after final completion and acceptance of the work by the Owner. Contractor shall replace, without additional expense to the Owner, any materials and workmanship which show defects within said period, with finished and new materials.

PART 2 - PRODUCTS

2.1 FOAMED-IN-PLACE BLOCK WALL INSULATION

A. Basis-of-Design Product: The product for foam insulation systems is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

B. Manufacturer: PolyMaster, Inc.

1. PolyMaster R-501 Foam Insulation:

a. Formulation: 3-part polymer foamed-in-place plastic insulation consisting of a proprietary dry powder resin, mixed by the applicator with a catalyst and foamed with compressed air.
b. Thermal Properties: K-value and R-value per inch thickness at 25 deg F (ASTM C 518): K-value 0.216 BTU (ft^2 x h x deg F). R-value 4.63 (ft^2 x h x deg F/BTU.
c. Thermal Properties: K-value and R-value per inch thickness at 75 deg F (ASTM C 518): K-value 0.244 BTU / ft^2 x h x deg F). R-value 4.09 ft^2 x h x deg F/BTU.
d. Water Vapor Transmission (ASTM E 96): 4.655 grains/ hr x ft^2.
e. Permeance (ASTM E 96): 6.631 perms/inch.
f. Average Permeability (ASTM E 96): 15.749.
g. Water Vapor Absorption (ASTM D 2842): 10% by volume at 24 hours, at 25 deg F, at 100% relative humidity.
h. Surface Burning Characteristics (ASTM E 84): Flamespread 25, smoke developed 40, thickness 1 inch.
i. Building Code Surface Burning Classification: Class I or Class A.
j. Shrinkage: 2% maximum.
k. Corrosivity: Non-corrosive.
l. Asbestos or Glass Fiber Content: None.
m. Off-Gassing or Odors: None.
n. Formaldehyde or CFC Content: None.
o. Biodegradability: Biodegradable.

C. Acceptable Manufacturers:

1. Foam Enterprises, Inc
2. Abatron, Inc.
3. FOAM-TECH division of H. C. Fennell, Inc.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the foamed-in-place building insulation manufacturer.

3.2 EXAMINATION

A. Site Verification of Conditions:

1. Ensure spaces are free of mortar or other restrictions to the free flow of foam insulation.

3.3 PREPARATION

A. Select most aesthetically pleasing locations for foam injection, including:

1. Locations to be concealed:

a. Masonry joints.
b. Wythe side of walls.
c. Covered side of walls.
d. Window jamb behind trims.

B. For pressure fill installation, drill fill holes.

1. Drill Hole Size: Maximum diameter 5/8 inch.

3.4 INSTALLATION

A. Install foam insulation in voids using top fill method to a uniform density. Completely fill all spaces, crevices, and voids.

3.5 FIELD QUALITY CONTROL

A. Site Tests: Verify insulation density of each foam batch by random sampling of foam before installation.

1. Fill a 1-gallon non-sealing plastic bag with foam.
2. The bag weight shall be between 285 – 325 grams.

B. Inspection: Verify complete filling of voids by drilling upon request.

1. Fill and point holes in masonry with mortar after inspection.

C. Correct any foam installation found not to be in compliance with manufacturer's requirements.

3.6 CLEANING

A. After foam insulation sets, remove excess insulation outside of void. Properly and legally dispose of waste with other construction waste material.

END OF SECTION 072119

AECOM

SECTION 10 5050 - PHENOLIC LOCKERS

Section Record:
Issued: Addendum 02 - December 12, 2019.

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Class B Fire Rated Phenolic Athletic Lockers.
B. Class B Fire Rated Phenolic Locker Benches.
C. Bench Pedestals, Bench Tops and Backs.
D. Locker Hardware and Accessories.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Wall backing and floor support to anchor Lockers and Bench Pedestals.

1.03 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Material
   2. ASTM D6578 Standard Practice for Determination of Graffiti Resistance
   3. ASTM D1037 Direct Screw Withdrawal Test
   4. ASTM D570 Standard Test Method for Water Absorption
   5. ASTM A167, 18-8, Type 304 Cast Stainless Steel

B. *National Fire Protection Association* (NFPA).

C. 2005 LD-3 NEMA Standard Test, Chemical Resistance, Modulus of Elasticity, Shear Strength and Compression Strength.

1.04 QUALITY STANDARDS

A. Flame Spread: When tested in accordance with ASTM E84, Athletic Lockers, and Locker Bench materials shall meet or exceed all requirements for Class B Flame Spread Rating and Smoke Developed and shall carry a Class B Fire Rating Certification in accordance with the requirements of NFPA and ICC. Class B Fire Rating Certification shall be in the name of the Locker Manufacturer and shall be less than six (6) months old.
   1. Flame Spread shall not exceed 75.
   2. Smoke Developed shall not exceed 450.

B. Locker Doors: Locker Door shall be the full width of the Locker Body and shall be frameless, allowing access to the entire width of the Locker. Framed Doors are

unacceptable. Perimeter ventilation shall provide superior ventilation properties to traditional framed doors.

C. Locker Body: Locker Body shall incorporate the Uni-Box® Locker Construction to allow for multiple Locker configurations within the same Locker Body. The Uni-Box® shall incorporate mortise and tenon construction and shall be mechanically fastened with Stainless Steel fasteners. Shelves shall be mortised into side walls of the Uni-Box® and shall be secured with Stainless Steel fasteners.

D. Graffiti Resistance Requirements: When tested in accordance with ASTM D6578, Locker materials shall prove resistant to all chemicals tested for a period of 1 to 10 minutes and shall leave no mar or blemish on the surface when cleaned. Locker materials shall have guaranteed surface clean ability from permanent markers and shall have Non-Ghosting properties.

E. Scratch Resistance Requirements: When tested in accordance with ASTM D2197, Locker materials shall prove to be scratch resistant when the maximum Load Value exceeds 10 kilograms.

F. Impact Resistance Requirements: When tested in accordance with ASTM D2794, Locker materials shall withstand an Impact Force Value in excess of 45 inch-lbs.

G. Screw Holding Strength: When tested in accordance with ASTM D1037, Direct Screw Withdrawal Test, Locker materials shall withstand a direct pull force that exceeds 2,500 lbs per fastener.

H. Tensile Strength: Locker materials shall have a Modulus of Elasticity of 1.55 Million PSI.

I. Shear Strength: Locker materials shall have a Shear Strength of 2,000 PSI minimum.

J. Compression Strength: Locker materials shall have a Compression Strength of 24,000 PSI minimum.

K. Water Absorption Requirements: When tested in accordance with ASTM D570 Locker materials shall have a Water Absorption Rate of less than 0.37%.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fasteners, and accessories in accordance with Section 01330 – Submittal Procedures.

B. Shop Drawings: Furnish Shop Drawings in quantities requested for fabrication and installation Solid Phenolic Athletic Lockers and Locker Benches. Include plans, elevations, sections, numbering, colors, details, and anchorages/ attachments to other work.

C. Samples for Initial Selection:
   1. Submit color per Finish Legend.
   2. Submit certification that materials furnished comply with requirements specified.

D. Submit two (2) 6” square Samples of each color and finish for color verification after selections have been made.

E. Maintenance Instructions: Provide manufacturer’s printed Instructions for Cleaning and Maintenance of installed Work.

F. Manufacturer's Written Warranty: Provide manufacturer’s Written Warranty as detailed herein.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and wall openings to ensure actual dimensions correspond to Established Dimensions.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer’s original packaging to protect from damage.

B. Store materials in manufacturer’s original packaging in accordance with manufacturer’s instructions. Store Lockers indoors, protected from the elements and construction hazards.

C. Handle materials in a manner that will protect the finished product.

1.08 MANUFACTURER’S WARRANTY

A. Provide manufacturer’s Twenty (20) year written limited warranty against breakage, corrosion, delamination and defects in workmanship of all Phenolic components; to be replaced without charge, excluding labor.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Columbia Lockers, a division of PSISC, is the basis of design for the solid phenolic Athletic Lockers.

B. Acceptable alternate manufacturers.
   1. Summit Lockers.
   2. Hollman Lockers.

C. Refer to Drawings for locker configurations.

2.02 MATERIALS

A. Material shall be Class B Fire Rated Solid Phenolic with a High Pressure Melamine matte finish surface made as an integral part of the core material. Laminated surfaces are not acceptable. Surface and edges shall be non-porous and shall not support fungus or bacteria. Provide material which has been selected for uniform color, surface flatness and smoothness. Exposed surfaces which exhibit discolorations, pitting, seam marks, roller marks, stains, telegraphing of core material, or other imperfections on finished units are not acceptable. Defects such as chipping along edges and corners are unacceptable. Columbia Solid Phenolic shall meet or exceed all requirements for Class B Flame Spread Rating and Smoke Developed calculated according to ASTM E84, and shall carry a Class B Fire Rating Certification. Class B Fire Rating Certification shall be in the name of the Locker Manufacturer and shall be less than six (6) months old.

B. Material Thicknesses:
   1. Doors, Slope, Flat Tops, End Panels, and Toe Kick Plates – Minimum .50" (13 mm) Finished Thickness.
   2. Locker Uni-Box®, Tops, Bottoms, and Shelves – Minimum .375" (10 mm) Finished Thickness. Sides and Locker Backs – Minimum .3125" (8 mm) Finished Thickness.
   3. Locker Pedestal Benches – Minimum .75" (19 mm) Finished Thickness.
   4. Locker Bench Tops – Minimum .75" (19 mm) Finished Thickness.

C. Colors: Refer to Finish Legend.

D. Locker Doors: Locker Door shall be the full width of the Locker Uni-Box® and shall be frameless, allowing access to the entire width of the Locker. Framed Doors are unacceptable. Perimeter ventilation shall provide superior ventilation properties to traditional framed doors. Doors shall be attached to the Hinge with Stainless Steel Theft Proof Torx Head with Pin fasteners.

E. Locker Body: Locker Body shall incorporate the Uni-Box® Locker Construction to allow for multiple Locker configurations within the same Locker Body. The Uni-Box® shall incorporate mortise and tenon construction and shall be mechanically fastened together with Stainless Steel fasteners. Locker Shelves shall be mortised into side walls of the Uni-Box® at location determined by Architect. Relocation of Shelves in the field shall be possible without the need for special tools or welders. The Hinge shall be attached to the Uni-Box® with Stainless Steel Theft Proof Torx Head with Pin Bolts. Lockers shall arrive at construction site fully assembled.

F. Slope, Flat Tops, End Panels, and Toe Kick Plates: Shall be manufactured of the same color, thickness and material as the Locker Doors.

2.03 HARDWARE

A. Locker Hinges: Hinges shall be concealed and shall be made of 14 Gauge Type 304 Stainless Steel and have a Satin finish. Hinge shall have five (5) knuckles and shall allow door to open 90°.

B. Locker Lock: Provide one (1) Digital Lock as manufactured by Zephyr, Model 6215 for each Locker Door. Users access their locker with a four (4) digit programmable use code. Manager Bypass Keycards shall be provided.

C. Coat Hooks: Coat Hooks shall be fabricated of 11 Gauge Type 304 Stainless Steel with a Satin Finish. All edges shall be polished and smooth. Coat Hooks shall be attached to the Locker Body with Stainless Steel Theft Proof Torx Head with Pin fasteners or Through Bolts. Provide three (4) Coat Hooks per Locker. Plastic are unacceptable.

D. Number Plates: Provide a Number Plate for each Door or opening, in the sequence as indicated on the drawings. Number Plate shall be engraved from the back side to prevent the accumulation of dirt and grime.

E. Locker Legs: Provide Locker Legs for all Lockers. Locker Leg assembly shall be structural and shall be fully adjustable to provide for leveling and plumbing of Locker Body. Provide phenolic Toe Kick Plates with all necessary hardware for attaching to the Locker Leg.

F. Bench Pedestals: Provide Bench Pedestals, Tops and Backs, bench must comply with ANSI 117.1.
   1. Black Powder Coated Aluminum: Bench Pedestal shall be 16.5" High. Center post shall extend from the floor to the bottom of the Bench Top and shall be made of 2" square tubing. Top and bottom plates shall be 6" square and shall be .250" thick and shall be welded to 2" tubing. Bench Pedestals will be secured to floor.

G. Sliding Clothes Hanger: Hafele, Synergy Elite, Valet #808.71 length shall be 14-1/8". Locate in ADA lockers at 3'-10" above finished floor and as shown on the Drawings. Finish is matte chrome.

2.05 FABRICATION

A. General: Provide factory pre-assembled Locker units. Lockers shall be complete with all hardware and accessories listed above. Knock down units are unacceptable.

PART 3 – EXECUTION

3.01 SITE INSPECTION

A. Verify that field dimensions are in accordance with Locker Shop Drawings. Inspect walls to insure that they are plumb and suitable for the installation of the Lockers.

B. Check location of built up bases, built in framing or blocking, and wall openings to insure that they are in compliance with the approved Locker Shop Drawings.

C. Have any inappropriate conditions corrected before beginning installation.

3.02 INSTALLATION

A. Comply with manufacturer's written installation instructions. Install Lockers rigid, straight, plumb, and level.

B. Through Bolt Locker Boxes together with Stainless Steel Theft Proof Torx Head with Pin, Through Bolts.

C. Anchor Locker Boxes to the wall with provided anchor devices.

D. Install Flat Tops, End Panels, Filler Strips and accessories in accordance with written instructions.

3.03 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust hardware according to manufacturer's written instructions for proper operation.

B. Provide final protection and maintain conditions that ensure Lockers are without damage or deterioration at the time of substantial completion. Clean all exposed surfaces of Lockers and hardware.

END OF SECTION

AECOM

SECTION 11 40 00 - FOODSERVICE SPECIFICATIONS

Section Record:
Issued: Addendum 02 – December 12th, 2019
Issued: 100% Construction Documents dated November 15th, 2019

PART 1 - GENERAL

1.1 SCOPE

A. The work referred to in this section consists of furnishing all labor and material required to provide and deliver all equipment hereinafter specified into the building, uncrate, assemble, hang, set in place, level, and completely install, exclusive of final utility connections.

B. Coordinate but do not install (unless specifically directed to do so in the technical specifications) Owner and Vendor-supplied equipment noted on the drawings or in the specifications as NIKEC. Show on roughing in plans the sizes, utilities, and other requirements as furnished in the Specifications, by Owner or appropriate supplier in submittals as if the equipment is contractor furnished.

C. Coordinate and show sizes, utilities, and other requirements as determined by physical inspection for equipment noted as existing to be reused. Include costs for marking, removing, storing, cleaning, redelivering and installing such equipment. All requirements within the project manual apply to reused equipment except warranty as if contractor furnished including but not limited to code compliance and accessories necessary to conform with the new application.

D. Should there be any discrepancies or inconsistencies that occur between the foodservice drawings and specifications, request written clarification; provide the better quality, and the greater quantity of work or material without any additional costs to the owner. The kitchen equipment contractor is responsible for any costs incurred by failure to clarify any conflicting requirements.

E. Secure and pay fees for permits, test, and inspections required by all authorities having jurisdiction and directly related to the construction and installation of the 11 40 00 foodservice equipment work.

1.2 RELATED SECTIONS / WORK IN THE MECHANICAL AND ELECTRICAL DIVISIONS:

A. Refer to the mechanical/plumbing divisions regarding mechanical services including, but not limited to, all water, gas, and steam rough-ins, pressure regulating valves, check valves, shut-off valves, grease traps, steam traps, drain traps, vents, valves, floor sinks, faucets, drains, floor

drains, duct work, pipes and pipe fittings, and all other materials required to complete final connections to the foodservice equipment. Additional work not included in the 114000 scope; G.C. to coordinate and provide:

1. Hood and ventilator duct work and fans upstream from the connection positions
2. Installation of floor troughs, including set-in place and final connections.

B. Refer to the electrical divisions regarding electrical services including, but not limited to, all electrical rough-ins, standard and low voltage wiring, drop cords, disconnects, breakers, shunt trip breakers, and all other materials required to complete final connections to the foodservice equipment. Additional work not included in the 114000 scope; G.C. to coordinate and provide:

1. Installation of the light fixtures furnished loose for the walk-in coolers/freezers
2. Wiring of the exhaust hood controls including, but not limited to, all low voltage interconnections.
3. Connection of hood fire suppression system building alarm system
4. Connection of walk-in cooler/freezer temperature alarm system to the building alarm system.

C. Additional work not included in the 11 40 00 Section Additional work not included in the 114000 scope; G.C. to coordinate and provide:

1. Slab depressions for walk-in coolers/freezers, floor troughs, and other applicable foodservice equipment.
2. Wall backing to support wall mounted foodservice equipment
3. Concrete pads for outdoor equipment such as refrigeration racks, compressors, etc.
4. Roof rails, roof curbs, pitch pockets, coring, flashing, and fire stopping required for roof top foodservice equipment and related refrigeration piping.

1.3 SUBMITTALS

A. Upon award of Contract, furnish the Architect with reproducible copies of the following drawings, in accordance with the approved project schedule, which shall be made on sheets equal in size and matching the bid set drawing size. Reproduced copies of bid documents will not be accepted for this purpose in any fashion.

1. Equipment specified for fabrication shall be detailed and fully dimensioned to a minimum scale of 3/4" = 1'-0" (1:20) for plan and elevation views and 1-1/2" = 1'-0" (1:10) for sections.
2. Prepare separate electrical and mechanical dimensioned rough-in drawings at 1/4" = 1'-0" (1:50) showing exact point of penetration of floors, walls, and ceilings for all services required to operate the equipment that the Contractor shall furnish, including the requirements for Contractor supplied and installed refrigerant and beverage piping line runs. These drawings shall also show exact locations of final connections to equipment. Indicate floor drains, floor sinks, receptacles, lights, and other special conditions related to the equipment known to the Contractor but provided under other Sections.
3. Dimensioned drawings shall be submitted showing the location and size of all bases, depressions, grease interceptors, special height walls, openings in walls for equipment or operations, and critical dimensions, etc. Drawings shall be drawn to a scale of not less than 1/4" = 1'-0" (1:50).

B. Manufacturers' Data: Upon award of Contract, submit bound copies of Manufacturers' Illustrations and Technical Data to the Architect for review prior to procurement. Items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to describe accurately the item to be furnished as specified, including voltage, phase, load, accessories, etc.

C. Manufacturers' List: Submit in writing a list of all manufacturers' representatives of the foodservice equipment, such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers.

D. Foundation Data: Data and drawings shall be submitted for each item, if any, requiring special foundations, structures, or supports. Such foundations, structures, or supports will be provided and installed by other appropriate trades in accordance with the drawings and specifications which shall be provided by the Contractor and reviewed by the Architect.

E. Operation and Maintenance Manuals: Provide three bound copies of operation, maintenance, and parts manuals for all equipment items of standard manufacture including standard component assemblies built into all custom-fabricated items.

F. Review by the Architect of the drawings and brochures submitted by the Contractor does not waive the responsibility of the Contractor to furnish each item of equipment in complete compliance with the specifications and contract drawings.

G. The number of copies of all submittals shall be as determined by the Architect.

H. Samples: Samples of materials, products, and fabrication methods shall be submitted for review at no additional cost, before proceeding with the work.

1.4 QUALITY ASSURANCE

A. Standard Products: Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturers' latest design that complies with the specifications.

B. Manufacturers' Qualifications: Manufacturers shall be regularly engaged in the production of the items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.

C. Installation Qualifications: Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work defined in this Section.

D. Coordination of Work: Coordinate work with the respective trades performing preparatory work for installation of equipment under this Contract, including, but not limited to: construction of

pits, trenches, receptors; rough-in of supply, waste and vent piping; electrical connections; and field verification of dimensions.

E. Product Options: Drawings indicate foodservice equipment based upon equipment specified herein. All substitutions shall be in compliance with the requirements in Division 1 (or Section I if appropriate.).

F. Conflict: Where written specifications and drawings conflict or appear to conflict, request clarification. Prior to receiving clarification use the greater quality or greater quantity.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver foodservice equipment in containers designed to protect equipment and finish until final installation. Make arrangements to receive equipment at project site at a time and place agreed with the General Contractor. If the site is not ready for delivery, then either delay delivery or arrange to hold in a secure and protected warehouse until delivery can be made to job site.

B. Store foodservice equipment in original containers and in location to provide adequate protection to equipment while not interfering with other construction operations. Coordinate with other trades so that worktables, serving counters and equipment are not used for scaffolding or as workbenches.

C. Handle foodservice equipment carefully to avoid damage to components, enclosures, and finish. Do not install damaged foodservice equipment; replace and return damaged components to equipment manufacturer.

1.6 APPLICABLE CODES AND STANDARDS

A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section. Comply with all Federal, State, and Municipal regulations and notifications which bear on the execution of this work. Call to the attention of the Owner in writing any design conflict with the requirements of the Americans with Disabilities Act (ADA) during Bid Process so resolution can be affected prior to Contract Award.
   1. NSF Standards: Comply with applicable National Sanitation Foundation standards and criteria and provide NSF "Seal of Approval" on each manufactured item and on major items of custom-fabricated work.
   2. UL / ETL / CSA Standards: For electrical components and assemblies, provide either UL / ETL / CSA listed products or, where no listing service is available, provide a complete index of the components used as selected from the UL / ETL / CSA "Recognized Component Index." For fire extinguishing systems comply with UL 300.
   3. ANSI Standards: Comply with applicable ANSI standards for electric-powered and gas-burning equipment; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers and air gaps, to prevent siphonage in water piping.

4. AGA / CGA: All gas-fired equipment shall be AGA / CGA approved, equipped to operate on the type gas available at the job site, and shall contain 100% automatic safety shut-off devices.
5. NFPA Standards: Comply with NFPA Bulletin 96 for exhaust systems; with NFPA Bulletins 13, 17, 17A and 96 for fire extinguishing systems; and with NFPA 54, National Fuel Gas Code and NFPA 70, National Electrical Code.
6. ASME Code: Comply with ASME boiler code requirements for steam-generating and steam-heated equipment; provide ASME inspection, stamps, and certification of registration with National Board.
7. SMACNA Guidelines: Provide seismic restraints for food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines", appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment", unless otherwise indicated.
8. ASHRAE: Provide mechanical refrigeration systems complying with the American Society of Heating, Refrigerating and Air Conditioning Engineers' ASHRAE 15, "Safety Code for Mechanical Refrigeration".

1.7 PROJECT CONDITIONS

A. Visit the job site to field check actual wall dimensions and roughing-in and be responsible for furnishing, fabricating, and installing the equipment in accordance with the available space and utility services as they exist on the job site for an accurate fit.

B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and, if necessary, check with the Contractor regarding the possibility of holding wall erection, placement of doorjambs, windows, etc., for the purpose of moving the equipment to its proper location. Any removal and rebuilding of walls, partitions, doorjambs, etc., necessary to place the equipment or, if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the Contractor.

C. Physically check the location and utility size of all "rough-ins" at the job site for compatibility with the equipment being installed before finished floors, walls, and/or ceilings are in place.

D. Check electrical characteristics and water, steam, and gas pressure. Provide pressure-regulating valves where required for proper operation of equipment.

1.8 GUARANTIES AND WARRANTIES

A. Self-contained or remote refrigeration systems furnished under this Contract shall be provided with start-up and a one-year service contract providing free service, 24 hours per day, seven days per week, including parts and labor. Hermetic or semi-hermetic compressors shall be covered by the manufacturers' factory warranty for an additional four years. Other equipment provided shall include a one-year warranty covering parts and labor, plus any extended warranties as normally provided by individual manufacturers. Equipment including refrigeration systems both self-contained and remote shall be warranted by the Contractor on the project for

one year as indicated in the preceding sentence. The first day of the first year commences upon the issuance of a certificate of occupancy for each area.

PART 2 - PRODUCTS

2.1 GENERAL

A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. Parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.

B. Means shall be provided to ensure adequate lubrication for moving parts. Oil holes, grease fittings, and filler caps shall be accessible without the use of tools.

C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. Guards shall provide easy access to guarded parts.

D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by Architect in lieu of rejection of items of equipment, it shall be the Contractor's responsibility to provide same at no additional cost.

E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. Gauges for sheet iron and sheet steel shall be U.S. Standard Gauges and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

GAUGE	THICKNESS	GAUGE	THICKNESS
#10	0.1406” (3.0mm)	#16	0.0625” (1.6mm)
#12	0.1094” (2.5mm)	#18	0.0500” (1.25mm)
#14	0.0781” (2.0mm)	#20	0.0375” (1.0mm)

F. Materials or work described in words which have a well-known and accepted technical or trade meaning shall be held to refer to such accepted meanings.

2.2 MATERIALS

A. Submit a certified copy of the mill analysis of materials if requested by the Architect.

B. Stainless steel sheets shall conform to American Society for Testing and Materials (ASTM) specification A240, Type 304 Condition A, 18-8, having a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view. Sheets shall be uniform throughout in color, finish, and appearance.

C. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.

D. Rolled shapes shall be of the cold-rolled type conforming to ASTM A36.

E. Galvanized sheet steel shall conform to ASTM A526; where extensive forming to take place, conform to ASTM A527; conform to ASTM A525, coating designation G115, chemical treatment.

F. Galvanized steel sheets shall be cold-rolled, stretcher leveled, bonderized, and rerolled to ensure a smooth surface.

G. Castings shall be corrosion-resisting metal containing not less than 30% nickel. Castings shall be rough ground, polished, and buffed to bright luster and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion- resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.

H. Millwork materials shall be free from defects impairing strength, durability, or appearance; straight and free from warpage; and of the best grade for their particular function. Wood shall be well seasoned and kiln dried and shall have an average moisture content of 8%, a maximum of 10%, and a minimum of 5%.
   1. Plywood and other woodwork of treatable species, where so required by the code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E84 and shall bear the testing laboratory mark on a surface to be concealed.
   2. Concealed softwood or hardwood lumber shall be of poplar, Douglas fir, basswood, red oak, birch, maple, beech, or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant treated materials are required.
   3. Plywood for transparent finish shall conform to U.S. Product Standard PS-51-71, Type I (fully waterproofed bond), with architectural grade face veneers of species as specified, free of all pin knots, patches, color streaks and spots, sapwood, and other defects. Plywood designated to have plywood cores shall be of either 5 ply or 7 ply construction. Plywood so designated on the drawings and plywood not otherwise shown shall have a particle board core, cross banding of veneers, and face and back veneers. Particle board cores shall have a 45-pound density, except where the fire-retardant treatment requires cores of lesser density.
   4. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, worm holes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book matched, center matched, and sequence matched. Surfaces shall be sequenced and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.
   5. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS-51-71, Type I, and shall have sound birch, maple, or other approved close grain hardwood faces suitable for a paint finish.

6. Perforated hardboard shall be a tempered hardboard, 1/4" (6 mm) thick, conforming to Federal Specification LLL-B-810B, Type I, SIS, Finish B (primed), Design B (perforated), with ¼" (6 mm) diameter holes spaced on 1" (25 mm) centers both ways.
7. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect. Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general-purpose), Grade HP, Class 1, 1/16" (2 mm) thick, satin finish, with rough sanded backs. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical surface), Grade HP, Class 1, non-forming, satin finish, 1/32" (1 mm) thick or heavier. Surfacing for curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish. Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general-purpose grade facing or may be .020" (0.5 mm) thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.
8. Adhesive for application of plastic laminate to wood substrates of counter tops shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C and producing a waterproof bond. Adhesive for applying plastic laminate to vertical surfaces shall be either a waterproof type or a water-resistant type such as a modified urea- formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C. Contact adhesive will not be acceptable.
9. Plywood for laminate assemblies shown or specified with plywood core shall be of the 5 or 7 ply construction with sanded close-grain hardwood face and back veneers, laminated with waterproof glue, in thickness shown, conforming to U.S. Product Standard PS-51-71. Particle board for plastic laminate assemblies shown or specified with particle board wood core shall conform to U.S. Products Standard CS-236-66, Type 1 or 2, Grade B (45-pound density), Class 2; except where fire-retardant treatment is required, the density shall conform to the treatment requirements.

I. Sealant: ASTM C 920; type S, Grade NS, Class 25, use, NT. Provide elastomeric sealant, NSF certified for end use application indicated. Provide sealant that, when cured and washed, meeting requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food. Dow-Corning #780 or General Electric "Silastic" or approved equal in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers' recommendations for smooth, sealed finish.

J. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller hearth) process and ¼" (6 mm) thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.

K. Sound Dampening: NSF-certified, nonabsorbent, hard-drying, sound deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8" (3 mm) thickness that does not chop, flake, or blister.

2.3 FINISHES

A. Paint and coatings shall be of an NSF approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking, and mildew resistant; shall comply with all governing regulations; and shall be applied in accordance with the recommendations of the manufacturer.

B. Exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, properly primed with rust-inhibiting primer, degreased, and finished with two (2) coats of epoxy-based grey Hammertone paint, unless otherwise specified.

C. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B. The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be finished to match adjacent undisturbed surfaces.

D. Galvanized shelving shall not be painted.

E. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable and shall be removed after the equipment installation is complete at the work site or, alternatively, when directed by the Architect.

F. Exposed surfaces on brass, bronze, or steel shall be plated with chromium over nickel in accordance with Federal Specifications WW-P-541, Paragraph 9.5 and Table 9.4, unless otherwise specified.

2.4 ELECTRICAL AND MECHANICAL REQUIREMENTS

A. Standard UL / ETL / CSA listed materials, devices, and components shall be selected and installed in accordance with NEMA Standards and recommendations and as required for safe and efficient use and operation of the foodservice equipment without objectionable noise, vibration, and sanitation problems.
   1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent engraved, plastic laminate signs and graphics identifying each item. Provide stainless steel cover plates at controls and signals.
   2. Each item requiring electrical power shall be equipped with either a terminal box for permanent connection or with cord and plug for interruptible connection, as indicated. Provide NEMA standard grounding type plugs, where used.
   3. Furnish foodservice equipment completely wired internally using wire and conduit suitable for a wet location, including a separate grounding wire. Provide electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a suitable terminal box (subpanel, starter, or disconnect switch if so specified) with all wires neatly tagged showing item number, voltage characteristics, and load information.

4. Receptacles for all wall- and floor-mounted outlets will be provided to be used for plug-in equipment with characteristics as noted on the drawings. Provide Hubbell three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment to match receptacles provided.
5. Electrically heated equipment shall be internally wired to a thermostatic control and an "on-off" red neon light indicator, which shall be mounted in a terminal box on a removable stainless steel access panel.
6. Only rigid steel zinc-coated conduit shall be used, painted to match adjacent surfaces where exposed. Wiring shall be run concealed wherever possible.
7. Provide on, or for, each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating.
8. Appliances shall be furnished complete with motors, driving mechanism, starters, and controllers, including but not limited to, master switches, timers, cut-outs, reversing mechanism, and other electrical equipment if and as applicable. Wiring and connection diagrams shall be furnished with electrically operated machines and for electrically wired fabricated equipment.
9. Appliances shall be of rigid construction, free from objectionable vibration. Quietness of operation of all foodservice equipment is a requirement. Remove or repair any equipment producing objectionable noise and/or vibration as directed by the Architect.
10. Motors shall be of the drip-proof, splash-proof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. Motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter from the machine on which installed shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Horsepower requirements on driven equipment shall be determined by the manufacturer based on normal operation at maximum capacity. The nominal rated motor horsepower shall be not less than the horsepower required for normal operation of the equipment at maximum capacity. Insulation shall be NEMA Class B, or better.
11. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches, etc., to match the material and finish of the equipment to which they will be fastened.
12. Switches, controls, etc., shall be conspicuously labeled as to use with plastic nameplates secured to the adjacent surface as previously specified in Article 2.01-C. Submit a sample for approval if requested by Architect.
13. Where specified for custom fabricated equipment, provide compartment with electrical sub-panel which shall be pre-wired in conduit concealed in cabinet body construction and connected to all electrical components built into or set upon the counter. Electrical sub-panel shall be UL / ETL / CSA listed, 3-phase, 4-wire circuit breaker type with a ground buss main breaker and individual breakers for each serviced load. Buss shall be copper and the circuit breakers shall be the molded case, bolt-on type with thermomagnetic quick-make, quick-break trip. Multi-pole circuit breakers shall have an internal trip bar. The circuit breakers shall have an interrupting capacity of 10,000 amperes at 120 volts and there shall be a separate breaker for each connected load. Each breaker shall be sized for 125% of the connected load and a minimum of two (2) extra, single pole, 20

amp circuit breakers shall be provided. The loads shall be connected through the breakers in a phased sequence to balance the load on each phase.

B. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be provided with the fixture to prevent siphoning. Where exposed, piping and fittings shall be chrome-plated. Where vacuum breaker piping is through equipment, provide chrome -plated escutcheon plates to cover holes.
   1. Provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes, chrome-plated where exposed. Extend to a point at least 1" (25 mm) (or as required by local or state code) above the rim of the floor drain, cut bottom on 45-degree angle and secure in position.
   2. Horizontal piping lines shall be run at the highest possible elevation and not less than 6" (150 mm) above the floor, through equipment where possible.
   3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks or more than one thread at the fitting.
   4. Steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
   5. Provide suitable gas and liquid pressure-reducing valves for equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions, including but not limited to dishwashers, booster heaters, coffee urns, ranges, steam boilers, etc.

C. Provide and install complete refrigeration systems--charged, started, and operating properly-including, but not limited to:
   compressors, condensers, racks, coils, vibration eliminators, sight glasses (moisture indicating type), expansion valves, filters, oil separators, thermostats, defrost time clocks, all controls and control wiring, liquid line driers, piping, and refrigeration grade copper tubing with all sweat joints using Safety-Silv No. 1200 or approved equal silver solder (with as few joints as possible)
   1. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the ASHRAE Standards or local authorities, whichever is the greater.
   2. Mechanically refrigerated cold pans shall have a normally closed liquid line electric solenoid valve installed before the expansion valve and wired to a silent-type toggle switch complete with an "on-off" red neon light indicator and both mounted in a terminal box on a removable access panel. This switch shall be fed by a separate control circuit and shall not to be wired into the compressor circuit so that it shall stop the flow of refrigerant to the cold pan and not turn off the compressor. The compressor shall then pump down and turn off through the action of the pressure control.
   3. Each refrigeration item specification is written to provide minimum specifications and scope of work. Refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.
      a. Walk-In Refrigerators 1.7°C / 35°F

b.	Walk-In Freezers	-23.3°C / -10°F
c.	Reach-In Refrigerators	1.7°C / 35°F
d.	Reach-In Freezers	-23.3°C / -10°F
e.	Undercounter Refrigerators	1.7°C / 35°F
f.	Undercounter Freezers	-23.3°C / -10°F
g.	Cold Pan	-17.8°C / 0°F
h.	Work Rooms	10°C / 50°F

4. Provide electrical and refrigeration components needed by the completed system and complete all refrigeration and control connections of and to said components.
5. Provide evaporator coil defrost system on all walk-in refrigerator and freezer rooms where the refrigeration systems are designed to operate at room temperature of less than 35°F (1.7°C).
6. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.
7. Verify and provide manufacturer's certification (or certification by manufacturer's authorized agent) that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
8. During check-out and initial operation, verify that:
   a. Controls are properly adjusted.
   b. Condensers are equipped with an overload protector.
   c. A competent service mechanic is on site during the first eight (8) hours of operation.
   d. Switches, starters, and controls are identified as to function.
9. Unless otherwise specified, furnish thermometers for walk-in units mounted above the exterior entrance door with suitable length armored capillary tubes to allow the sensing bulbs to be installed in the incoming air stream to the blower coil with runs fastened to the walk-in walls to prevent it from damage. This identical requirement applies to alarm systems when specified.

2.5 PRODUCT SPECIFICATIONS

A. Refer to Part 4 for complete itemized product specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Begin installing the equipment at the time the building is ready to receive the equipment and in accordance with the schedule.

B. Provide a competent foreman or supervisor for erection of equipment and to coordinate with other trades regarding connections, installation, and inspection. Coordinate delivery schedule to ensure adequate openings in the building to receive the equipment.

C. Install refrigeration work in an approved manner, using first quality fittings, controls, valves, etc. Refrigeration items shall be started up, tested, adjusted, and turned over to the Architect in first-class condition and left operating in accordance with the manufacturer's specifications.

D. Set equipment that rests on masonry bases level onto a bed of silicone rubber sealant.

E. Seal equipment that butts to a wall or against other equipment with silicone rubber sealant. Set trim strips or other items requiring fasteners in a bed of silicone rubber sealant and fastened with suitable stainless steel fasteners 48" (1200mm) or less on centers. , surfaces shall be thoroughly clean and degrease all surfaces prior to the application of sealant.

F. Install and interconnect electrical controls, switches, or other units which are separately furnished for field installation in or on equipment provided, unless otherwise specified.

G. Install and wire refrigeration systems in strict conformance with the manufacturers' instructions and recommendations. Ensure that all refrigeration condensing units are ventilated properly and are accessible for repair, maintenance, and inspection.

H. Hang evaporator coils per the manufacturer's recommendation at the locations as shown on the drawings. Mount units such that the drain pans are pitched to the drain lines. Hang the coils using nylon or other approved non-conductive, non-corrosive fasteners Furnish #12 gauge galvanized steel fish plates of suitable size and shape on the exterior ceiling of the walk-in to spread the weight of the coils adequately. Connect coils to the condensing unit and install to constitute a complete working system capable of maintaining the interior temperatures specified regardless of the heavy usage the walk-in units may receive.

I. Furnish and install a copper or PVC drainline painted silver from each coil outlet to a point 1" (25mm) above the floor drain. Trap drainlines immediately above the floor drain. Provide continuous electrified heater tape for freezer drainlines, coordinate electrical requirements and wiring with electrical division. Insulate drainline after installation.

J. Refrigeration tubing shall be the Type L, ACR hard drawn degreased, sealed copper and shall be installed with horizontal runs sloped 1" per 20 feet (1:240) toward the condensing units. Refrigerant piping shall be properly supported by adjustable hangers spaced and adjusted to the drop required. Where vertical runs of more than 5' (1500mm) occur in the suction line, trap the risers at the bottom. Install piping so that refrigerant or oil cannot drain back into the coils from the suction line.

K. Insulate suction and refrigerant lines with minimum 1/2" (13mm) Armstrong armaflex or equal cellular type insulation. Provide metal pipe sleeves where piping passes through a wall, ceiling, or floor. Fill space around the tubing with mastic insulating compound. Install a permanent suction line filter in each compressor suction line with pressure fitting ahead of the filter to

facilitate checking of pressure drop through the filter. Fully insulate and seal penetrations through walk-in cooler or freezer structures to be vapor tight to prevent condensation within any light fixtures, switch boxes, junction boxes, or any other fittings. Fully seal refrigeration and drain lines and provide escutcheon plates.

L. Furnish and completely install a thermostat to control the refrigeration temperatures for each individual compartment.

M. Mount the condensing units on a welded steel rack containing all accessories and components necessary to form a complete condensing unit package. Provide each condensing unit with a factory mounted, pre-wired control panel/disconnect switch complete with circuit breakers, contactors, and time clocks as required.

N. Furnish the refrigeration systems with a one-year refrigeration service contract, covering all parts and labor, with service available seven days per week, 24-hours per day. Provide an option for continuation of the service contract after the first year.. Warrant the refrigeration system for one year and provide the compressors with the manufacturer's extended five-year warranty.

O. Furnish four (4) copies of complete remote refrigeration system control wiring and piping diagrams. Frame one (1) copy in Plexiglas and mount at compressor location or inside the refrigeration system enclosure as appropriate.

P. Coordinate the equipment work with the respective work of other Sections so that electrical and mechanical components built into the equipment will conform and/or adapt to the type, materials, and characteristics of the building components.

Q. Install heated and motor-driven equipment so as to operate efficiently. Provide additional vents, guards, deflectors, and other accessories as needed at no additional cost. Note such additions or modifications on the shop drawings and bring to Architect's attention by special accompanying letter.

3.2 FABRICATION

A. Items of fabricated equipment shall be fabricated in the same factory and shall be similar in construction details, materials, methods, and appearance to similar types of items so fabricated under this contract.

B. Each fabricated item of equipment shall include necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and doors and drainboards shall be constructed of a single sheet of metal. Except where required to be removable, flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate buckle, warp, rattle, and wobble. Equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unac-

ceptable, and the Contractor shall add additional bracing in an approved manner to achieve acceptance.

C. Suitable pipe slots shall be provided on fabricated equipment to accommodate service and utility lines and mechanical connections. These slots shall be of proper size and shall be neatly made with turned up edges around to eliminate cutting or defacing of equipment on the job. Cabinet bases shall be provided with an inner panel duct at the ends or rear of the cabinet allowing adequate space to conceal vertical piping. Such work, when performed at the job site, shall be of the same quality as similar work performed in the shop.

D. Exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied. Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel acorn nut and stainless steel lock washer.

E. Where screw threads are not visible or readily accessible, they shall be assembled with stainless steel lock washers and nuts. Wherever bolts or screws are welded to the underside of trim or tops, the reverse side of the weld shall be finished uniformly with the adjoining surfaces. Depressions at these points shall not be acceptable.

F. Rivets shall not be permitted in any location.

G. Welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces. Welds shall be free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
   1. Spot welds shall have a maximum spacing of 3" (75mm). Tack welds shall be of at least 1/4" (6mm) length of welding material at a maximum space of 4" (100mm) from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" (50mm) centers.
   2. In no case shall soldering be accepted.
   3. Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building as one piece shall be constructed so that the field joints can be welded at the job site.
   4. Exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has been depressed by a welding operation, such depression shall be suitably hammered and peened flush with the adjoining surface and, if necessary, again ground to eliminate low spots. In all cases, the grain of rough grinding shall be removed by successive fine polishing operations.
   5. Unexposed welded joints on undershelves of tables or counters in stainless steel construction shall be suitably coated at the factory with an approved metallic-based paint.

6. After galvanized steel members have been welded, welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with U.S. Government Military Specification Number MIL-P-26915.

H. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require filler. Wherever break bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, or cracked in appearance; where such breaks do mar the uniform surface appearance of the material, such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free of burrs, fins, and irregular projections and be finished to obviate danger of cutting or laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed corners occur.

I. The grain of polishing shall run in the same direction on horizontal and on vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge. Where sinks and adjacent drainboards are equipped with backsplash, the grain of polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.

J. Component parts, whether fabricated by the Contractor or purchased for building into the fabricated equipment, shall conform to the following.

K. Bolts, screws, nuts, and washers shall be of steel, except where brass or stainless steel is fastened, in which case they shall be of brass or stainless steel, respectively. Where dissimilar metals are fastened, bolts, screws, nuts, and washers shall be of the higher-grade metal. The spacing and extent of bolts and screws shall be such as to ensure suitable fastening and prevent buckling of the metals fastened.

L. Adequate ventilation is to be provided for custom fabricated equipment with built-in or drop-in integral refrigeration systems.

3.3 CLEAN-UP

A. At completion of the installation, clean up, lubricate, and adjust where necessary items of equipment provided and turn them over in first-class condition.
   1. Where stainless steel surfaces are disturbed by the installation or fabricating process, such surface shall be finished to match adjoining undisturbed surfaces.
   2. At the completion of the installation work, stainless steel shall be gone over with a portable polishing machine and buffed to perfect surfaces. Painted surfaces shall be carefully gone over and retouched as required.

3.4 START-UP AND TESTING AND COMMISSIONING

A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train Owner's maintenance personnel as specified below.
   1. Coordinate food service equipment startup with service-utility testing, balancing, and adjustments. Do not operate steam lines before they have been cleaned and sanitized.

2. Remove protective coverings and clean and sanitize equipment, both inside and out, and relamp equipment with integral lighting. Where applicable, comply with manufacturer's written cleaning instructions.
3. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
4. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
6. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
7. Test water, drain, gas, steam, oil, refrigerant, and liquid-carrying components for leaks. Repair or replace leaking components.
8. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance for each food service equipment item.
9. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout."
10. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
11. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

3.5 SEISMIC RESTRAINTS

A. Install equipment in these contract documents according to the "SMACNA Guidelines for Seismic Restraint of Kitchen Equipment" in any State, province, or jurisdiction that has legislated this requirement as necessary for acceptance. This shall include:
   1. Identifying these items on his submittal drawings, Plans, Elevations, and Sections.
   2. Showing required SMACNA methods of restraint on his submittal drawings.
   3. Referencing the appropriate detail(s).
   4. Obtain regulatory approval for all seismic engineering details.

B. If no SMACNA detail exists for a particular situation, prepare and obtain approval for a special attachment detail:
   1. Detail must be prepared by an engineer licensed by the State having jurisdiction over the project and accompanied by the supporting calculations used in the design.
   2. Verify that the restraint design is appropriate to the building's structural conditions and the surfaces to which the equipment will be secured.

PART 4 - ITEMIZED PRODUCT SPECIFICATION

ITEM #01 PLASTIC SHELVING UNIT
Manufacturer: Cambro
Model: CPU Premier Series
Camshelving Premier Starter Unit, width x Length per plan x 72"H, 5 shelf, includes: four posts, 2 sets of post connectors, traverses

Five (5) tier; four (4) vented shelves plus one (1) solid bottom shelf, speckled gray, NSF

ITEM #01.1 DUNNAGE RACK
Manufacturer: Cambro
Model: DRS
S-Series Dunnage Rack, slotted top, 3000 lb. load capacity, 21"W x Length per Plan x 12"H, polyethylene, one-piece, seamless double wall construction, 4" square legs, speckled gray, NSF

ITEM # 06 FAUCET, BACKSPLASH MOUNTED
Manufacturer: Fisher or equal by T&S or Chicago Faucet
Model: 13269
Faucet, backsplash mount, 8" centers, 12" swing spout, lever handles with color coded indexes, 1/2" NPT male inlets, brass, CSA, ADA Compliant
1 year warranty against defects in materials or workmanship, standard
Shipped loose to plumber to install on site

ITEM # 06.2 FAUCET, BACKSPLASH MOUNTED
Manufacturer: Fisher or equal by T&S or Chicago Faucet
Model: 13218
Faucet, backsplash mount, 8" centers, 16" swing spout, lever handles with color coded indexes, 1/2" NPT male inlets, brass, CSA, ADA Compliant
1 year warranty against defects in materials or workmanship, standard
Shipped loose to plumber to install on site

ITEM # 07 LEVER WASTE W/ OVERFLOW
Manufacturer: Fisher or equal by T&S or Chicago Faucet
Model: 22322
DrainKing Waste Valve, flat strainer, overflow body, 14 x 16 tube & elbow, 12 GPM drain rate, cast red brass body
Shipped loose to plumber to install on site

ITEM # 08 MOBILE WORK TABLE, 72”x30”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: T3072SE

Work Table, open base, 72"W x 30"D x 34”H, 14/300 series stainless steel top, square edge on front & back, Uni-Lok® gusset system, 18/300 series stainless steel undershelf with marine edge, (4) stainless steel legs, NSF

Square edge table, front and/or rear, per table

All welded construction, legs, undershelf & top

Table Casters, 5"Diameter, set of (4), (2) swivel & (2) braked, 250 lb weight capacity per caster, poly cart washable with polymer tread, NSF

ITEM # 09 REFRIGERATOR RACK, ROLL-IN

Manufacturer: New Age or equal by Advance Tabco or Eagle

Model: 4338

Lifetime Series Roll-In Bun Pan Rack, heavy duty, aluminum, 64"H, (18) wide-angle runners are 1-1/2" x 3-1/4" x .100 with 3" spacing (non-adjustable), extruded aluminum guides for 12 x 20 to 18 x 26 pans, fully welded 1-1/2"x1-3/4" x .07" smooth wall D-tube uprights, (4) 5" platform swivel casters, NSF, Made in USA

ITEM # 23 HAND SINK

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: HSA-10-1FK

Hand Sink, wall mount, 13-1/2"Wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mounted faucet, single knee pedal, skirt, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

Tempering Valve, built in check valve, ASSE 1016 & 1070 listed

Left & right-side splashes

Faucet and drain shipped loose to plumber to install on site

Paper Towel Dispenser, wall-mounted, surface mount, with soap dispenser, capacity approximately 200 C-fold paper towels, stainless steel construction.

Verify the soap and paper towel dispensers match the soap and paper towel dispensers used by the operator

ITEM # 24 WALK-IN COOLER/FREEZER

Manufacturer: Bally or equal by Thermo-Kool, Imperial Brown, or Kolpak

Model: CUSTOM

Per plan x 8’-6”H

4” urethane insulation, minimum value R-25.

NSF & UL approved construction

Interior vertical panels finished with stucco embossed .040 aluminum

Floorless unit- Coordinate the recessed insulated slab with G.C.

Interior ceiling panels to be smooth white aluminum finish

Unexposed exterior vertical and ceiling panels to be stucco embossed galvanized

Exposed and exterior vertical panels to be stucco embossed .040 aluminum with 1/8” thick aluminum diamond tread plate for 48” high wainscoting.
Door: 60" x 84" horizontal bi-parting sliding freezer door, 4" thick, manual, door locks, 14” x 14” observation window, 1/8” thick aluminum tread plate for 48” high wainscoting on door interior/exterior, no wood construction. Frame: .040 stucco aluminum. Leaf: .040 stucco aluminum both sides w/ leaf heaters. Provide inside safety release. Provide a vinyl curtain
Door:

36”W x 78” high; three hinges; Provide a vinyl curtain
48”H 1/8” thick aluminum tread plate inside and out; 14” x 14” observation window. Provide inside safety release.
Provide Modularm 75LC for each door for light and alarm control, recessed into panel.
Automatic door closer

1/8” thick aluminum tread plate for 48” high wainscoting exposed exteriorand full interior.
Provide five (5) 4’-0” LED light fixture per compartment to meet health department and 2009 standards with efficacy of no less than 40 lumens per watt.
Matching trim strips and enclosure panels as required to adjacent walls and ceiling.
Provide reinforcement where the security shelving is to be located within the walk-in cooler section

Walk-ins and refrigeration to meet requirements of the Energy Security and Independence Act of 2007 and the Department of Energy’s Walk-in Cooler and Freezer ruling of 2017.

Reference foodservice drawing FS5.01 for additional details

ITEM # 24.1 EVAPORATOR COOLER
Included with item 39

ITEM # 24.3 EVAPORATOR - FREEZER
Included with item 39

ITEM # 30 SHELVING, WALL-MOUNTED, 96”x12”
Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide
Model: WS1296-14/3
Shelf, wall-mounted, 96"W x 12"D, rolled frontedge, 1-1/2"H up-turn on sides & rear, includes stainless steel mounting brackets stud welded to shelf, 14/304 stainless steel construction, NSF
Two tier, mount first at 54” AFF

ITEM # 34 WORK TABLE W/ SINK, 96”x30”
Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide
Model: T3096STE-BS
Work Table, open base, 96"W x 30"D x 34”H, 14/304 stainless steel top with 6" backsplash and sides turned down 90 degrees, square front edge, square turndown ends, heavy gauge stainless steel 1-1/4" O.D. side & rear crossrails, (6) 1-5/8" O.D. legs, 1" adjustable stainless steel bullet feet, Uni-Lok® system, NSF

Provide 1” turndown at backsplash
Secure the worktable to the wall using 16ga. Stainless steel “Z” clips
Square edge table, front and/or rear, per table
Fabricated sink welded in place, 16" x 20" x 14" bowl
Stainless steel bullet feet
All welded construction, legs, undershelf & top
Left hand side splash, fully enclosed if exposed

ITEM # 36.8 COFFEE BREWER
Manufacturer: Bunn or equal by Fetco or Curtis
Model: 38700.0008

AXIOM®-DV-3 Coffee Brewer, large 200 oz. capacity tank, with 1 lower brewer and 2 upper warmers, hot water faucet, SplashGard® funnel, LCD display, digital temperature, automatic warmer shut-off, can operate at dual voltages, cord attached, UL, NSF

EQ-17-TL EasyClear® Quick Connect Water Quality System, low volume multi-purpose, taste/odor & chlorine reduction @ 0.5 gpm, 1,500 gallons of sediment, scale inhibitor, 5 micron, designed for one/two 1/2 gallon coffee brewers, NSF

ITEM # 37 WORK TABLE W/ SINK, 84”x30”
Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide
Model: T3084STE-BS

Work Table, open base, 84"W x 30"D x 34”H, 14/304 stainless steel top with 6" backsplash and sides turned down 90 degrees, square front edge, square turndown ends, heavy gauge stainless steel 1-1/4" O.D. side & rear crossrails, (4) 1-5/8" O.D. legs, 1" adjustable stainless steel feet, Uni-Lok® system, NSF

Provide 1” turndown at backsplash
Secure the worktable to the wall using 16ga. Stainless steel “Z” clips
Square edge table, front and/or rear, per table
Fabricated sink welded in place, 16" x 20" x 14" bowl
Stainless steel bullet feet
All welded construction, legs, undershelf & top
Left and right end side splashes, fully enclosed if exposed

ITEM # 39 REFRIGERATION RACK
Manufacturer: RDT Refrigeration or equal by ColdZone or Omni
Model: CUSTOM

Reference foodservice drawing FS5.03 for additional details

ITEM # 47.4 MOBILE HOLDING CABINET
Manufacturer: Cres Cor or equal by Winston, FWE, or Carter-Hoffman
Model: H-135-WUA-11-R

Cabinet, Mobile Heated, with humidity, insulated, bottom-mount heater assembly, recessed push/pull handles, (11) sets of chrome plated wire universal angle slides on 4-1/2" centers ad-

justable 1-1/2" centers, (4) 5" swivel casters (2) braked, anti-microbial latches, analog thermometer, aluminum construction, red dutch doors, 1920watt, cCSAus, CSA-Sanitation

ITEM # 49 WALK-IN COOLER
Manufacturer: Bally or equal by Thermo-Kool, Imperial Brown, or Kolpak
Model: CUSTOM

Per plan x 8'-6" H
4" urethane insulation, minimum value R-25.
NSF & UL approved construction
Interior vertical panels finished with stucco embossed .040 aluminum
Hard Rail Construction
Heavy duty structural floor design with internal support structure 12" o.c, with a ¾" thermalite overlay. The interior floor surface shall be foamed-in-place 1/8" aluminum tread plate with coved interior corners.
Interior ramp with non-skid strips
Interior ceiling panels to be smooth white aluminum finish
Unexposed exterior vertical and ceiling panels to be stucco emobssed galovanized
Exposed and exterior vertical panels to be stucco embossed .040 aluminum with 1/8" thick aluminum diamond tread plate for 48" high wainscoting.
Doors: 36"W x 78" high; three hinges; 48"H 1/8" thick aluminum tread plate inside and out; 14" x 14" observation window. Provide inside safety release. Provide a vinyl curtain
Provide Modularm 75LC for each door for light and alarm control, recessed into panel.
Automatic door closer
1/8" thick aluminum tread plate for 48" high wainscoting full interior and exposed exterior.
Provide two (2) 4'-0" LED light fixture per compartment to meet health department and 2009 standards with efficacy of no less than 40 lumens per watt.
Matching trim strips and enclosure panels as required to adjacent walls and ceiling.
Provide reinforcement where the security shelving is to be located within the walk-in cooler section

Refrigeration system provided by Item #49.1 & 49.2

Walk-ins and refrigeration to meet requirements of the Energy Security and Independence Act of 2007 and the Department of Energy's Walk-in Cooler and Freezer ruling of 2017.

Reference foodservice drawing FS5.01 for additional details

ITEM # 49.1 EVAPORATOR COIL-COOLER
Manufacturer: RDT Refrigeration or equal by ColdZone or Omni
Model: CUSTOM

Included with item #49.2

Reference foodservice drawing FS5.04 for additional details

ITEM # 49.2 COMPRESSOR-COOLER
Manufacturer: RDT Refrigeration or equal by ColdZone or Omni
Model: CUSTOM

Reference foodservice drawing FS5.04 for additional details

ITEM # 51 THREE COMPARTMENT SINK
Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide
Model: FN2860-3-30-14/3

Spec-Master® FN Series Sink, three compartment, 126"W x 35"D, 14/304 stainless steel top, coved corners, 20" wide x 28" front-to-back x 14" deep compartments, 30" drainboards on left & right, 9-1/2"H backsplash, (2) sets of 8" OC splash mount faucet holes, rolled edges on front & sides, includes 3-1/2" basket drains, stainless steel crossbracing on all sides, stainless steel legs & adjustable bullet feet, NSF

Provide 1” turndown at backsplash
Secure the worktable to the wall using 16ga. Stainless steel “Z” clips
Individual fabricated sink bowls welded in place-14/304
All welded construction

ITEM # 64.1 WATER FILTRATION SYSTEM
Manufacturer: Everpure or equal by 3M or OptiPure
Model: EV932421

Insurice Single PF-i2000² System, 9,000 gallon capacity, 1.67 gpm flow rate, 0.5-micron precoat filtration, (1) I2000² cartridge, with self-contained scale inhibitor feed, (1) EC210 sediment prefilter Cartridge, for cubers up to 750 lbs/day or flakers up to 1,500 lbs/day, pressure gauge, flushing valve, NSF, ANSI

ITEM # 64.2 WATER FILTRATION SYSTEM
Manufacturer: Everpure or equal by 3M or OptiPure
Model: EV932523

INSURICE Triple PF-i4000² System, 36,000 gallon capacity, 5 gpm flow rate, 0.5-micron precoat filtration (3) I4000² Cartridges, with self-contained scale inhibitor feed (1) EC210 sediment prefilter Cartridge, pressure gauge, flushing valve, high flow rate 5.0 gpm

ITEM # 68 SHELVING, WALL-MOUNTED, 120”x12”
Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide
Model: WS12120-14/3

Shelf, wall mount, 120"W x 12"D, rolled frontedge, 1-1/2" upturn on rear & ends, includes stainless steel mounting brackets stud welded to shelf, 14/304 stainless steel construction, NSF

ITEM # 70 WORK TABLE W/ SINK, 72”x30”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: T3072STE-BS

Work Table, open base, 72"W x 30"D x 34”H, 14/304 stainless steel top with 6" backsplash and sides turned down 90 degrees, square front edge, square turndown ends, heavy gauge stainless steel 1-1/4" O.D. side & rear crossrails, (4) 1-5/8" O.D. legs, 1" adjustable stainless steel bullet feet, Uni-Lok® system, NSF

Provide 1” turndown at backsplash
Secure the worktable to the wall using 16ga. Stainless steel “Z” clips
Square edge table, front and/or rear, per table
Fabricated sink welded in place, 16" x 20" x 14" bowl
Stainless steel bullet feet
All welded construction, legs, undershelf & top
Right end side splash, fully enclosed if exposed

ITEM # 71 SHELVING, WALL-MOUNTED, 48”x12”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: WS1248-14/3

Shelf, wall mount, 48"W x 12"D, rolled frontedge, 1-1/2" upturn on rear & ends, includes stainless steel mounting brackets stud welded to shelf, 14/304 stainless steel construction, NSF

Two tier, mount first at 54” AFF

ITEM # 76 UNDERBAR GLASS RACK, 24”

Manufacturer: Glastender or equal by Perlick

Model: DBGR-24

Underbar Glass Rack Storage Unit, drainboard top, 24"W, open front base, holds (2) 20" x 20" glass racks, 7"H backsplash, adjustable intermediate shelf & fixed bottom shelf, drain pan with removable perforated insert & 1/2" drain, stainless steel construction, stainless steel legs with adjustable stainless steel bullet feet, NSF

ITEM # 77 TRASH CAN – BY OWNER

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 81 GREASE TRAP INTERCEPTOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 100 FRONT COUNTER, STAINLESS STEEL

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: CUSTOM

Constructed in accordance with the front-end specifications and drawings.
14/304 top; 18 ga/304 stainless steel legs.
All welded construction
Provide cut-outs for ice/soda station per plan, 26”W and POS cords/cables.

Reference foodservice equipment layout drawing FS5.02 for additional front counter details.

ITEM # 101 ICE/SODA STATION-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided

ITEM # 102 CO2-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 103 SODA SYSTEM-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 104 CUP HOLDER, STAINLESS STEEL

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, or Nationwide

Model: CUSTOM

Cup Holder-s/s - Mount to ice bin

Reference foodservice drawing FS5.02 for additional details

ITEM # 105.1 WARMING DRAWER,

Manufacturer: Hatco or equal by FWE

Model: HDW-2

Warming Drawer Unit, Free Standing, narrow, two drawers, includes (1) standard 6" deep food pan per drawer, stainless steel construction, thermostatic controls, 4" legs, NSF, cULus, Made in USA

2-yr warranty on drawer warmer heating elements against burnout, standard
2-yr warranty on drawer slides & rollers against breakage, standard
Stainless Steel Drawer Front, standard
Casters, 5 diameter, two swivel; two locking

ITEM # 106 CASH REGISTER/POS SYSTEM-BY FOODSERVICE OPERATOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 107 BEVERAGE CONDUIT

Manufacturer: Kelly Bev-Way or BevStream,
Model: CUSTOM

Beverage conduits
6” or 8” diameter, depending on quantities of soda lines to be contained
PVC where below or in slab, aluminum above slab and in ceilings
Verify all routing
Provide pull boxes where needed.
Provide expandable connections where conduit crosses an expansion joint
All turns are to be broad radius sweep elbows, no 45 or 90 degree fittings are allowed
Provide sleeves through walls and floors where needed
Schematic plans only shown on drawings. Actual length and run to be coordinated with equipment needs, existing structure and infrastructure.

ITEM # 108 MENU BOARD

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 110 REACH-IN REFRIGERATOR-TWO DOOR

Manufacturer: Continental Refrigerator or equal by Victory, Beverage Air or True
Model: 2RNSA

Refrigerator, reach-in, two-section, self-contained refrigeration, stainless steel exterior, aluminum interior, standard depth, full-height solid doors, electronic control with digital display, hi-low alarm, electric condensate evaporator, 1/3 HP, cETLus, NSF, Made in USA, ENERGY STAR®

Doors hinged per plan
Casters, swivel, with brakes (5" diameter rubber tires) set of 4 (6" height)
Two (2) extra shelves per section, epoxy coated, plated steel with clips

ITEM # 114 PRETZEL CABINET-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 114.1 PRETZEL WARMER-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 115.1 POPCORN POPPER

Manufacturer: Gold Medal Products or equal by C Cretors
Model: 2001ST

Citation Popcorn Machine, electric, countertop, 16 oz. Unimaxx kettle, forced air popcorn crisping system, stainless steel dome, cULus, NSF

2 year parts and 6 months labor warranty, standard

ITEM # 116 BOTTLED BEVERAGE REFRIGERATOR-ONE DOOR-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 116.1 REFRIGERATED MERCHANDISER, ONE DOOR

Manufacturer: True

Model: GDM-26-HC-TSL01

Refrigerated Merchandiser, one-section, True standard look version 01, (5) shelves, powder coated steel exterior, white interior with stainless steel floor, (1) Low-E thermal glass hinged door, LED interior lights, R290 Hydrocarbon refrigerant, 1/3 HP, cULus, UL EPH Classified, MADE IN USA, ENERGY STAR®

- Doors hinged per plan
- Barrel locks
- 6” casters

ITEM # 117 NACHO CHEESE DISPENSER-BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 118 THREE COMPARTMENT SINK

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: 312-14-3-12

312 Series Three compartment Sink, three compartment, 72"W x 23"D, 304 stainless steel construction, 16" Wide x 14" front-to-back x 12" Deep fabricated deep-drawn bowls, 12" Drainboards on left & right, 9-/12" splash with 1" turn down, rolled edges on front & sides, 8" O.C. splash mount faucet holes, 1-1/2" I.P.S basket drains, 12-gauge leg gussets, galvanized steel legs & side crossbracing, adjustable bullet feet, NSF

- Secure the worktable to the wall using 16ga. Stainless steel “Z” clips
- 14 ga. top and sink bowls
- 18 ga. stainless steel legs with front-to-back crossbracing
- Bullet Feet, stainless steel, each
  - All welded construction

ITEM # 119 SHELVING, WALL-MOUNTED, 72”x12”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: WS1272-14/3

Shelf, wall mount, 72"W x 12"D, rolled frontedge, 1-1/2" upturn on rear & ends, includes stainless steel mounting brackets stud welded to shelf, 14/304 stainless steel construction, NSF

ITEM # 122.1 ICE BIN FOR ICE MACHINES
Manufacturer: Follett Corporation
Model: SG1350S-56

Upright Ice Bin, single door, 1360 lb. bin storage capacity, stainless exterior, poly liner, Smart-GATE™ ice shield, poly door with PowerHinge, and corrosion-resistant ABS/poly top custom cut for ice machine, includes 82 oz. plastic ice scoop, NSF

Provide any necessary top reinforcement to mount ice maker on top of bin.

ITEM # 122.3 ICE MAKER
Manufacturer: Scotsman or equal by Manitowoc or Hoshizaki
Model: C1448MR-32

Prodigy Plus® Ice Maker, cube style, air-cooled, no condenser (remote), production capacity up to 1357 lb/24 hours at 70°/50° (1258 lb AHRI certified at 90°/70°), stainless steel finish, medium cube size, cULus, NSF, CE

3 year parts & labor warranties
5 year parts & labor warranties on Evaporator
5 year parts on compressor & condenser
Mount on top of bin

Verify ceiling height with equipment and manufacturer required clearances

ITEM # 122.3C CONDENSER UNIT, REMOTE
Manufacturer: Scotsman or equal by Manitowoc or Hoshizaki
Model: ERC311-32

Condenser Unit, Remote Refrigeration, designed for outdoor installation, temperature range -20°F to 120°F, galvanized finish, use with C0630xR, C0830xR, C1030xR, & C1448xR, cULus

5 year parts on compressor & condenser

ITEM # 130 HEATED SHELVES FOR PASS-THRU
Manufacturer: Hatco
Model: GRSDS/H-41D

Glo-Ray® Merchandising Warmer, countertop, (16) rods, pass thru design, (2) shelves, top shelf horizontal, lower shelf forward-slanted, stainless/aluminum construction, 4" legs, cULus, UL EPH Classified, ANSI/NSF 4, Made in USA

ITEM # 131 PASS-THRU SHELF

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: Custom

Shelf, pass-thru, width per plan x 24"D, 12" maximum wall thickness, square edge, 16/304 stainless steel construction

KEC to frame opening in 18 ga. Stainless steel, provide 1” returns around perimeter of opening, Provide fully welded corners

Reference foodservice drawing FS5.02 for additional details

ITEM # 135.1 CONVEYOR OVEN, VENTLESS

Manufacturer: Ovention or Equal by Lincoln Impinger or Turbochef

Model: CONVEYOR C2600-3 SINGLE BELT

Precision Impingement™ Conveyor Cook Oven, ventless, 21” X 26-1/2” cavity dimension, independent top/bottom blowers, 48.10” Belt (without wings), 26" W single belt, one-touch display, (36) conveyor presets, USB port, (80) 12" pizza per hour capacity, grease scrubbing catalyst, stainless steel front, top, sides and back cool touch exterior, stainless steel interior, UL, cUL, UL EPH Classified, Made in USA

Equipment Stand, 24"H x 36"W, no-drip v-edge on front, 1" splash on sides & back, adjustable undershelf, stainless steel construction, casters

ITEM # 138.1 PORTABLE BAR

Manufacturer: Gallery or equal by IRP or Ikoniq

Model: Custom

Mobile Bar, 35"W x 65-1/2"L x 42"H, 9” x 67” 2CM quartz serving countertop, 14/300 stainless steel working countertop, 14ga. metal tubular frame body construction, laminate front and sides, base shall support a back bar cooler, black rubber skirt, 14/300 corner trim, 5" heavy duty casters (2 with locks), 8’ power cord

Reference foodservice drawing FS5.05 for additional details

ITEM # 138.2 PASS-THROUGH SHELF – NIKEC BY MILLWORK

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

KEC to frame opening in 18 GA. Stainless steel, provide 1” returns around perimeter of opening, Provide fully welded corners

ITEM # 142 UNDERBAR ICE BIN, 24”
Manufacturer: Glastender or equal by Perlick
Model: IBA-24-CP10

Underbar Ice Bin, with 10-circuit cold plate, 24"W x 19"D, 67 lbs. ice capacity, 7"H backsplash, 10-1/2" deep bin liner, ABS plastic breaker strip around ice bin liner, includes sliding stainless steel bin cover, stainless steel construction, stainless steel legs with adjustable stainless steel bullet feet, ETL Sanitation

1 year parts & labor warranty

ITEM # 144 SINGLE SPEED RAIL, 24”
Manufacturer: Glastender or equal by Perlick
Model: SSR-24

Single Speed Rail, 24"W, stainless steel construction, open step-and-rail design, ABS sound-deadening covers, clear snap-on liquor identification label cover, field installed, NSF

1 year parts & labor warranty

Speed Rail Locking Cover, single, 24"W, stainless steel construction, NSF

ITEM # 147 SODA GUN

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 149 MOP SINK CABINET
Manufacturer: Eagle Group or equal by Advance Tabco, John Boos, or IMC Teddy
Model: F1916-VSCS

Mop Sink Cabinet, 25"W x 22-1/4"D x 84-1/4"H, 300 stainless steel cabinet body with solid back, slanted top, holds (2) mops, 12" center shelf, 20 gauge stainless steel hinged doors with transverse rod handles & keyed locks, 8" deep bowl with 3" radius corners, 2" NPS drain, includes service faucet, spray hose & spray hose bracket, NSF

Provide stainless steel back panel

Upgrade to type 300 stainless steel cabinet

ITEM # 153 MOBILE WORK TABLE, 36”x30”
Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide
Model: T3036STE-BS

Work Table, open base, 36"W x 30"D, 14/304 stainless steel top with 6" backsplash, square front edge, square turndown ends, heavy gauge stainless steel 1-1/4" O.D. side & rear crossrails, (4) 1-5/8" O.D. legs, Uni-Lok® system, NSF

Square edge table, front and/or rear, per table

All welded construction, legs, undershelf & top

Table Casters, 5"Diameter, set of (4), (2) swivel & (2) braked, 250 lb weight capacity per caster, polymer tread, NSF

ITEM # 164 BACK BAR COOLER-TWO DOOR
Manufacturer: Perlick or equal by Glastender
Model: BBS60

Refrigerated Back Bar Cabinet, two-section, 60"W, self-contained refrigeration, 16 cu.ft. internal volume, digital thermostat, LED interior lighting, front vented, automatic defrost & condensate evaporator, includes floor drain, stainless steel interior, side mount compressor, 1/4 HP, R290 Hydrocarbon refrigerant, NSF, cULus

1 year parts & labor warranty, 5 year compressor warranty
6' cord & plug, standard
NSF7 listed for food in open containers
Door Locks
Refrigeration compartment per plan
Stainless glass door
Stainless steel top - no tapping holes
Provide a 14/300 series stainless steel top worktop in lieu of standard
Doors hinged per plan
Casters (set of six), 4"

ITEM # 164.1 BACK BAR COOLER-TWO DOOR
Manufacturer: Perlick or equal by Glastender
Model: BBS60

Refrigerated Back Bar Cabinet, two-section, 60"W, self-contained refrigeration, 16 cu.ft. internal volume, digital thermostat, LED interior lighting, front vented, automatic defrost & condensate evaporator, includes floor drain, stainless steel interior, side mount compressor, 1/4 HP, R290 Hydrocarbon refrigerant, NSF, cULus

1 year parts & labor warranty, 5 year compressor warranty
6' cord & plug, standard
NSF7 listed for food in open containers
Door Locks
Refrigeration compartment per plan
Black vinyl clad doors
Stainless steel top - no tapping holes
Doors hinged per plan

Mount in the portable bar, item #138.1
Reference foodservice drawing FS5.05 for additional details

ITEM # 165.1 ICE BIN FOR ICE MACHINES
Manufacturer: Follett Corporation or equal by ice machine manufacturer
Model: SG700S-30

Upright Ice Bin, single door, 680 lb. bin storage capacity, stainless exterior, poly liner, Smart-GATE™ ice shield, poly door with PowerHinge, and corrosion-resistant ABS/poly top custom cut for ice machine, includes 82 oz. plastic ice scoop, NSF

Provide any necessary top reinforcement to mount ice maker on top of bin.

ITEM # 165.4 ICE MAKER
Manufacturer: Scotsman or equal by Manitowoc or Hoshizaki
Model: C0630MR-32

Prodigy Plus® Ice Maker, cube style, air-cooled, no condenser (remote), production capacity up to 614 lb/24 hours at 70°/50° (540 lb AHRI certified at 90°/70°), stainless steel finish, medium cube size, cULus, NSF, CE, ENERGY STAR®, Made in USA3 year parts & labor warranties

5 year parts & labor warranties on Evaporator

5 year parts on compressor & condenser

Verify ceiling height and required clearances are met

ITEM # 165.4C ICE MAKER
Manufacturer: Scotsman or equal by Manitowoc or Hoshizaki
Model: ERC311-32

Condenser Unit, Remote Refrigeration, designed for outdoor installation, temperature range -20°F to 120°F, galvanized finish, use with C0630xR, C0830xR, C1030xR, & C1448xR, cULus

ITEM # 167 UNDERBAR POS CABINET
Manufacturer: Glastender or equal by Perlick
Model: PCB-18

POS Work Center, 18"W, 26"H work surface with cord access hole, louvered locking door with integral handle, splashes on sides & rear, stainless steel construction, adjustable bullet feet

ITEM # 170 PIZZA PREPARATION REFRIGERATOR
Manufacturer: Continental Refrigerator or equal by Beverage Air or True
Model: CPA43

Pizza Prep Table, 43"W, one-section, 12.0 cu ft capacity, forced air, 300 series stainless steel work top with 19" poly cutting board, (1) full & (1) half height field rehingeable doors, electric condensate evaporator, stainless steel front & end panels, aluminum interior, electronic controller with digital display, side-mounted refrigeration, 1/2 HP, cETLus, NSF, Made in USA

Standard warranty (for the United States & Canada Only): 3 year parts and labor; 5 year compressor, standard

Condensing unit located per plan

Refrigerated drawer compartment, in lieu of door over the condensing unit compartment

Casters, swivel, with brakes, (4" diameter rubber tires) set of 4 (5" height)

ITEM # 195 LEVER WASTE
Manufacturer: Fisher or equal by T&S or Chicago Faucet
Model: 22209

DrainKing Waste Valve, with flat strainer, 12 GPM drain rate, dual teflon seals, stainless steel ball, cast red brass body

Shipped loose to plumber to install onsite

ITEM # 264.1 MOBILE WORK TABLE, 60”x30”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: T3084STE

Spec-Master® Series Work Table, 84"W x 30"D, 14/300 series stainless steel top, square edges on front & back, Uni-Lok® gusset system, stainless steel crossrails on side & rear, (4) stainless steel legs & adjustable bullet feet, NSF

Square edge table, front and/or rear, per table

All welded construction, legs, undershelf & top

Table Casters, 5"Diameter, set of (4), (2) swivel & (2) braked, 250 lb weight capacity per caster, poly cart washable with polymer tread, NSF

ITEM # 284 SECURITY FENCING

Manufacturer: New Age

Model: CUSTOM

Custom Security Fence, slotted panel construction, size and height determined by plan, 36"W door hinged per plan, units are mounted to floor & ceiling, aluminum construction, NSF

ITEM # 321.1 MOBILE WORK TABLE, 48”x30”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: T3048STE

Spec-Master® Series Work Table, 48"W x 30"D, 14/300 series stainless steel top, square edges on front & back, Uni-Lok® gusset system, stainless steel crossrails on side & rear, (4) stainless steel legs & adjustable bullet feet, NSF

Square edge table, front and/or rear, per table

All welded construction, legs, undershelf & top

Table Casters, 5"Diameter, set of (4), (2) swivel & (2) braked, 250 lb weight capacity per caster, poly cart washable with polymer tread, NSF

ITEM # 357 PORTABLE GRILL – NIKEC – EXISTING - BY OWNER

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 420 HIGH SPEED OVEN – NIKEC - FUTURE

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

ITEM # 455 WORK TABLE, 72”x30”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: T3072SE-BS

Spec-Master® Series Work Table, 72"W x 30"D, 6"H backsplash, 14/300 series stainless steel top, square front edge, 18/300 series stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs & adjustable bullet feet, NSF

- Square edge table, front
- All welded construction, legs, undershelf & top
- Bullet Feet, stainless steel, each
- Enclosed side splash when exposed

ITEM # 456 WORK TABLE, 96”x30”

Manufacturer: Eagle Group or equal by Advance Tabco, Aero, Atlanta Custom Fab, Universal Stainless, IEI, John Boos, or Nationwide

Model: T3096E-BS

Spec-Master® Series Work Table, 96"W x 30"D, 6"H backsplash, 14/300 series stainless steel top, square front edge, 18/300 stainless steel undershelf, Uni-Lok® gusset system, (6) stainless steel legs with adjustable stainless steel bullet feet, NSF

- Square edge table, front
- All welded construction, legs, undershelf & top
- Bullet Feet, stainless steel, each
- Enclosed side splash when exposed

ITEM # 484 WORKTOP REFRIGERATOR

Manufacturer: Continental Refrigerator or equal by Beverage Air or True

Model: RA60NBS

Refrigerated Base Worktop Unit, 60"W, 300 series stainless steel work top with 6"H backsplash, stainless steel front & end panels, galvanized steel rear & grill, aluminum interior, (2) full & (1) half height field rehingeable doors, electronic controller with digital display, 1/3 HP, side-mounted refrigeration, cETLus, NSF, Made in USA

- Refrigerated drawer compartment, in lieu of door over the condensing unit compartment
- Doors hinged per plan
- Condenser located per plan

ITEM # 588 ICE DISPENSER

Manufacturer: Hoshizaki

Model: DM-200B

Ice & Water Dispenser, 30"W, counter model, air-cooled, 200-lb. ice capacity, accommodates KM-340, KM-515, KM-600, KM-650 or KML Series ice machines or manual fill, dispenses 7-1/2 lb. ice/minute, auger agitator dispenses individual cubes, stainless steel exterior, cULus, ETL-Sanitation

- Leg Kit, 4", black die cast

ITEM # 636 COUNTERTOP CONVECTION STEAMER
Manufacturer: Accutemp or equal by Groen or Cleveland
Model: S62083D120

Steam'N'Hold™ Boilerless Convection Steamer, countertop, electric, holds (6) 12"x 20"x 2-1/2" deep pans, vacuum cooking, manual mechanical timer controls, NO water or drain connections required, ENERGY STAR®

1 year parts & labor warranty, standard

ITEM # 667.1 ICE MERCHANDISER – BY OWNER

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

END OF SECTION 11 40 00

AECOM

SECTION 230900 – CONTROLS AND INSTRUMENTATION

Section Record:

Issued: Addendum 02 - December 12, 2019

Issued: 100% Construction Documents - November 15th, 2019.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All work of this Division shall be coordinated and provided by the single BMS Contractor.

B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the applicable sections for details.

C. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.

D. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.2 DEFINITIONS

A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.

B. Binary: A two-state system where an “on” condition is represented by one discrete signal level and an “Off” condition is represented by a second discrete signal level.

C. BMS: The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division BMS Contractor and to be interfaced to the associated work of other related trades.

D. BMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the BMS work.

E. Control Sequence: A BMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.

F. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the BMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

G. BMS Network: The total digital on-line real-time interconnected configuration of BMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.

H. Node: A digitally programmable entity existing on the BMS network.

I. BMS Integration: The complete functional and operational interconnection and interfacing of all BMS work elements and nodes in compliance with all applicable codes, standards and ordinances to provide a single coherent BMS as required by this Division.

J. Provide: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.

K. Furnish: The term “Furnish” and its derivatives when used in this Division shall mean supply at the BMS Contractor’s expense to the designated third party trade contractor for installation. BMS Contractor shall connect furnished items to the BMS, calibrate, test, commission, warrant and document.

L. Wiring: The term “Wiring” and its derivatives when used in this Division shall mean provide the BMS wiring and terminations.

M. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.

N. Protocol: The term “protocol” and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between BMS network nodes.

O. Software: The term “software” and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BMS industry for real-time, on-line, integrated BMS configurations.

P. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.

Q. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

R. The following abbreviations and acronyms may be used in describing the work of this Division:

AHJ	Authority Having Jurisdiction
AI	Analog Input
AO	Analog Output
AWG	American Wire Gauge
BTL	BACnet® Testing Laboratories
CPU	Central Processing Unit
DDC	Direct Digital Control
DI	Digital Input

DO	Digital Output
EEPROM	Electronically Erasable Programmable Read Only Memory
EMI	Electromagnetic Interference
HD	High Definition
HOA	Hand-Off-Auto
I/O	Input/Output
IT	Information Technology
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCC	Motor Control Center
NC	Normally Closed
NO	Normally Open
OAT	Outdoor Air Temperature
OEM	Original Equipment Manufacturer (Private label)
OWS	Operator Workstation
PC	Personal Computer
ppm	parts per million
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RH	Relative Humidity
ROM	Read Only Memory
RTD	Resistance Temperature Device
TCP/IP	Transmission Control Protocol/Internet Protocol
UPS	Uninterruptible Power Supply
VAC	Volts, Alternating Current
VAV	Variable Air Volume

VDC Volts, Direct Current

VPN Virtual Private Network

VSD Variable Speed Drive

WAN Wide Area Network

1.3 BMS SYSTEM DESCRIPTION

A. The BMS shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.

B. Any and all components of the BMS that are connected via field bus or IP network, including the network controllers, field controllers, application specific controllers, server and user interface software, system and controller programming tools and software applications shall be designed, engineered, and tested to work together as a complete building management system, and shall be manufactured by the same BMS manufacturer. Systems that use or require network controllers, field controllers, application specific controllers, server and user interface software, programming tools and software from more than one BMS manufacturer shall not be accepted.

C. All points of user interface shall be on standard computing devices that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these devices will be a standard Web Browser and will be integrated in to the existing Johnson Controls Metasys System.

D. Where necessary and as dictated elsewhere in these Specifications, Servers shall be used for the purpose of providing a location for extensive archiving of system configuration data, and historical data such as trend data and operator transactions. All data stored will be through the use of a standard data base platform: Microsoft SQL Server Express or Microsoft SQL Server as dictated elsewhere in this specification. This project is designed to use the existing Johnson Controls server on campus.

E. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.

F. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.

G. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.

H. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as not to impede or delay the work of associated trades.

I. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:

1. Operator information, alarm management and control functions.
2. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
3. Diagnostic monitoring and reporting of BMS functions.
4. Energy management.
5. Standard applications for terminal HVAC systems.
6. Enterprise-wide information and control access.
7. Offsite monitoring and management access.

1.4 QUALITY ASSURANCE

A. General

1. The BMS Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated BMS.
2. The BMS Contractor shall be a recognized national manufacturer, installer and service provider of BMS.
3. The BMS installer shall be a BMS manufacturer-owned branch office, or an independent controls contractor who is factory trained and authorized by the BMS manufacturer to sell, service and support the BMS specified herein.
4. Independent controls contractors who are authorized by the BMS manufacturer must provide a letter written and signed by a company officer of the specific BMS manufacturer. This document must be dated within the 30 days prior to bid submittal and must state that they are currently a “direct authorized representative” in good standing for the BMS manufacturer for the building management system products described and listed in this specification, that they have “direct purchasing access” to all of the BMS manufacturer’s controllers, servers, software and components and technical support, and that they will continue to be an Authorized representative with this access for the duration of the installation and warranty phases of project.
5. If an independent controls contractor is to be considered via addendum, the contractor must provide a letter written by a company officer of the specific BMS manufacturer with the following verbiage; “should this contractor fail to provide a complete and operational system (as judged by the owner/engineer), the Manufacturer will complete the project to the Engineer’s satisfaction at no additional cost to the Owner”. This letter must be dated within 30 days prior to bid submittal and provided to the engineer along with the other supporting documentation at the time of request for equivalence.
6. The BMS Contractor shall have a branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. The BMS Contractor shall have, at this facility, a trained, directly employed and full time technical staff, spare parts inventory, and all necessary test and diagnostic equipment.
7. As evidence and assurance of the contractor’s ability to support the Owner's system with service and parts, the contractor must have been in the BMS business for at least the last ten (10) years and have successfully completed total projects of at least 5 times the value of this contract in each of the preceding five years.
8. The BMS architecture shall consist of the products of a manufacturer regularly engaged in the production of BMS, and shall be the manufacturer’s latest standard of design at the time of bid.

B. Workplace Safety and Hazardous Materials

1. Provide a safety program in compliance with the Contract Documents.
2. The BMS Contractor shall have a corporately certified comprehensive Safety Certification Manual and a designated Safety Supervisor for the Project.
3. The Contractor and its employees and subtrades shall comply with federal, state and local safety regulations.
4. The Contractor shall ensure that all subcontractors and employees have written safety programs in place that covers their scope of work, and that their employees receive the training required by the OSHA rules that have jurisdiction for at least each topic listed in the Safety Certification Manual.
5. Hazards created by the Contractor or its subcontractors shall be eliminated before any further work proceeds.
6. Hazards observed but not created by the Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The Contractor shall be required to avoid the hazard area until the hazard has been eliminated.
7. The Contractor shall sign and date a safety certification form prior to any work being performed, stating that the Contractor's company is in full compliance with the Project safety requirements.
8. The Contractor's safety program shall include written policy and arrangements for the handling, storage and management of all hazardous materials to be used in the work in compliance with the requirements of the AHJ at the Project site.
9. The Contractor's employees and subcontractor's staff shall have received training as applicable in the use of hazardous materials and shall govern their actions accordingly.

C. Quality Management Program

1. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manager shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:

    a. Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
    b. Manage the financial aspects of the BMS Contract.
    c. Coordinate as necessary with other trades.
    d. Be responsible for the work and actions of the BMS workforce on site.

1.5 REFERENCES

A. All work shall conform to the following Codes and Standards, as applicable:

1. National Fire Protection Association (NFPA) Standards.
2. National Electric Code (NEC) and applicable local Electric Code.
3. UL listing and labels.
4. UL 864 UUKL Smoke Control.
5. UL 268 Smoke Detectors.
6. UL 916 Energy Management.
7. NFPA 70 – National Electrical Code.
8. NFPA 90A – Standard For The Installation Of Air Conditioning And Ventilating Systems.
9. NFPA 92A and 92B Smoke Purge/Control Equipment.
10. Factory Mutual (FM).
11. American National Standards Institute (ANSI).
12. National Electric Manufacturer's Association (NEMA).
13. American Society of Mechanical Engineers (ASME).

14. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
15. Air Movement and Control Association (AMCA).
16. Institute of Electrical and Electronic Engineers (IEEE).
17. American Standard Code for Information Interchange (ASCII).
18. Electronics Industries Association (EIA).
19. Occupational Safety and Health Administration (OSHA).
20. American Society for Testing and Materials (ASTM).
21. Federal Communications Commission (FCC) including Part 15, RF Devices.
22. Americans Disability Act (ADA).
23. ANSI/EIA 909.1-A-1999 (LonWorks®).
24. ANSI/ASHRAE Standard 195 (BACnet).

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.6 WORK BY OTHERS

A. The demarcation of work and responsibilities between the BMS Contractor and other related trades shall be as outlined in the BMS RESPONSIBILITY MATRIX.

BMS Responsibility Matrix

Work	Furnish	Install	Low Volt. Wiring/Tube	Line Power
BMS low voltage and communication wiring *1 (note 1)	BMS	BMS	BMS	N/A
VAV box controller (note 2)	BMS	23*2	BMS	26
BMS conduits and raceway	BMS	BMS	BMS	BMS
Automatic dampers (non factory)	BMS	23	N/A	N/A
VAV boxes	23	23	N/A	N/A
Pipe insertion devices and taps including thermowells, flow and pressure stations.	BMS	23	BMS	BMS
BMS Current Switches.	BMS	BMS	BMS	N/A
BMS Control Relays	BMS	BMS	BMS	N/A
Power distribution system monitoring interfaces	26	26	BMS	26
Concrete and/or inertia equipment pads and seismic bracing	23	23	N/A	N/A
Condenser controls interface with BMS	23	23	BMS	26
All BMS Nodes, equipment, housings, enclosures and panels.	BMS	BMS	BMS	BMS
Smoke Detectors ~~(note 4)~~	26	26	26	26
Fire Dampers	23	23	N/A	N/A
VSDs	BMS	26	BMS	26
~~Computer Room A/C Unit field-mounted controls~~	~~23~~	~~23~~	~~BMS~~	~~26~~
VRF factory-mounted controls	**23**	**23**	**BMS**	**26**
VRF space mounted controls	**23**	**BMS**	**BMS**	**26**
VRF field-mounted controls	**BMS**	**BMS**	**BMS**	**26**
Fire Alarm shutdown relay interlock wiring	26	26	26	26
Fire Alarm smoke control relay interlock wiring	26	26	BMS	26
Fan Coil Unit controls	BMS	BMS	BMS	26
~~Cabinet/Unit Heater controls (note 6)~~	~~BMS/23*6~~	~~26/BMS*6~~	~~BMS~~	~~26~~
Air Handling unit field-mounted controls	**BMS**	**BMS**	**BMS**	**26**
Air Handling unit factory-mounted controls	**23**	**23**	**BMS**	**26**
Exhaust Fan controls	**23**	**23**	**BMS**	**26**
Unit Heater/Infrared Heater controls (note 6)	**BMS/23*6**	**26/BMS*6**	**BMS**	**26**
Packaged RTU/MAU space mounted controls	23	BMS	BMS	26
Packaged RTU/MAU factory-mounted controls	23	23	BMS	26
Packaged RTU/MAU field-mounted controls	BMS	BMS	BMS	26

Starters, HOA switches	26	26	N/A	26
Control damper actuators	BMS	BMS	BMS	26
Water Softener System	22	22	BMS	26
Sewage Ejectors	22	22	BMS	26
Gas Water Heaters	22	22	BMS	26
Domestic Water Service	22	22	BMS	N/A
Generator	26	26	BMS	26

Footnotes:

*1. BMS low voltage and communications wiring: BMS Ethernet communications cable and IP infrastructure furnish and install by BMS Contractor or Division 26 Electrical Contractor as per options in Paragraph 2, A6 above.

*2. VAV box controller factory installation would normally be by Division 23 Mechanical who furnishes the VAV boxes; could be by BMS for field installation of special controllers, see item.

~~***3. Electric Baseboard Heating Controls – for line voltage stand-alone controls: furnished by Division 23 Mechanical Contractor who finishes the baseboard units; line voltage controls installed and connected by Division 26 Electrical Contractor. Alternately, controls may be furnished and installed by BMS Contractors for projects requiring Baseboard Heating controls to be integrated into the BMS.**~~

*6. ~~**Cabinet/Unit Heater Controls**~~ **Unit Heater/Infrared Heater Controls** – for line voltage stand-alone controls: furnished by Division 23 Mechanical Contractor who furnishes the Cabinet/Unit Heaters; line voltage stand-alone controls installed and connected by Division 26 Electrical Contractor. Alternately, controls may be furnished and installed by BMS Contractors for projects requiring ~~**Cabinet/Unit Heater controls**~~ **Unit Heater/Infrared Heater controls** to be integrated into BMS.

1.7 SUBMITTALS

A. Shop Drawings, Product Data, and Samples

1. The BMS contractor shall submit a list of all shop drawings with submittals dates within 30 days of contract award.
2. Submittals shall be in defined packages. Each package shall be complete, shall only reference itself, and previously submitted packages. The packages shall be as approved by the Architect and Engineer for Contract compliance.
3. Allow 15 working days for the review of each package by the Architect and Engineer in the scheduling of the total BMS work.
4. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
5. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
6. The BMS Contractor shall correct any errors or omissions noted in the first review.
7. At a minimum, submit the following:

    a. BMS network architecture diagrams including all nodes and interconnections.

b. Systems schematics, sequences, and flow diagrams.
c. Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
d. Samples of Graphic Display screen types and associated menus.
e. Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
f. Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including Code Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.
g. Room Schedule including a separate line for each VAV box and/or terminal unit indicating location and address.
h. Details of all BMS interfaces and connections to the work of other trades.
i. Product data sheets or marked catalog pages including part number, photo and description for all products including software.

B. Existing Systems Inventory

1. Where applicable, provide a complete and current BMS site inventory for all existing field and supervisory controllers to be integrated into the new BMS including manufacturer, model number, firmware version, available updates, battery condition, integrations, controlled equipment, and point counts.
2. Site inventory shall be provided on a separate, new USB compatible flash drive.

1.8 RECORD DOCUMENTATION

A. Operation and Maintenance Manuals.

1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media or USB Flash Drive, and include the following for the BMS provided:

a. Table of contents.
b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
c. Manufacturer’s product data sheets or catalog pages for all products including software.
d. System Operator’s manuals.
e. Archive copy of all site-specific databases and sequences.
f. BMS network diagrams.
g. Interfaces to all third party products and work by other trades.

B. On-Line documentation: After completion of all tests and adjustments the contractor shall provide a copy of all as-built information and product data to be installed on a customer designated computer workstation or server.

1.9 WARRANTY

A. Standard Material and Labor Warranty:

1. Provide a one-year labor and material warranty on the BMS.

2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of
3. the BMS Contractor at the cost of the BMS Contractor.
4. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during BMS Contractor's normal business hours.

PART 2 - PRODUCTS

2.1 GENERAL DESCRIPTION

A. The BMS shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

B. The BMS shall consist of the following:

1. Network Engine(s)
2. Field Equipment Controller(s)
3. Input/Output Module(s)
4. Local Display Device(s)
5. Portable Operator's Terminal(s)
6. Distributed User Interface(s)
7. Other components required for a complete and working BMS

C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.

D. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

1. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
2. The System shall maintain all settings and overrides through a system reboot.

E. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

F. The System shall comply with the following International Code Council (ICC) Codes:

1. Building Officials and code Administrators International (BOMA) model code.
2. International Conference of Building Officials (ICBO) model code.
3. Southern Building Code Congress International (SBCCI) regulations.

G. Acceptable Manufacturers

1. Johnson Controls, Metasys installed by JCI Nitro Office. ~~**No substitutions allowed.**~~

a. Contact John Bowen (304)-541-8836 for Pricing
John.m.bowen@jci.com

2. **Controls by Mason & Barry Inc**.

2.2 BMS SYSTEM ARCHITECTURE

A. Automation Network

1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
2. The BMS shall network multiple user interface clients, application and data servers, automation engines, system controllers and application-specific controllers including but not limited to:

    a. Network Automation Engines
    b. Network Integration Engines
    c. Network Control Engines

3. Select Field Equipment Controllers
4. Select VAV Modular Assemblies
5. Third Party BACnet controllers and peripheral devices with compatibility listed by BACnet International
6. Application and Data Server.
7. All BMS devices on the automation network shall be capable of operating at a minimum communication speed of 100 Mbps, with full peer-to-peer network communication.
8. Network Security – To protect the BMS from unauthorized users and computer hackers the Automation Network shall support HTTPS with TLS 1.2 between components, including the Application and Data Server(s), Network Engines, Mobile User Interface and Site Management Portal. Self-signed certificates are installed on supported products, with the option of configuring trusted certificates. Computing devices supplied by the BMS vendor will automatically shut down unused ports to deter unauthorized access.
9. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network

1. Network Engines (NAE, NIE, NCE) shall provide supervisory control over the control network and shall selectively support the following communication protocols:

    a. BACnet Standard Master-Slave/Token-Passing (MS/TP) Bus Protocol ASHRAE SSPC-135:

        1) The NAE shall be BTL certified and carry the BTL Label.
        2) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).

    b. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
    c. The Johnson Controls N2 Field Bus.
    d. Modbus® TCP and RTU.

2. Control networks shall provide either “Peer-to-Peer”, Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.
3. Control network shall support digital controllers as indicated in plans and specifications.

4. Default control network communication protocol for this project shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.
5. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.
6. The PICS shall be submitted 10 days prior to bidding.

C. Integration

1. Hardwired

   a. Analog and digital signal values shall be passed from one system to another via hardwired connections.
   b. There will be one separate physical point on each system for each point to be integrated between the systems.

2. Direct Protocol (Integrator Panel)

   a. The BMS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BMS system and third party manufacturers' control panels. The BMS shall have the ability to receive, react to, and return information from multiple building systems, including but not limited to the variable frequency drives, power monitoring system, etc.
   b. All data required by the application shall be mapped into the Automation Engine's database, and shall be transparent to the operator.
   c. Point inputs and outputs from the third party controllers shall have real-time interoperability with BMS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and LAN Communications.

3. BACnet Protocol Integration – BACnet

   a. The neutral protocol used between systems will be BACnet IP and comply with the ASHRAE BACnet standard 135.
   b. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.
   c. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.3 USER INTERFACE

A. Dedicated Web Based User Interface

1. Where indicated on plans the BMS Contractor shall use the existing JCI ADX server to access the system, information management, network alarm management, and database management functions. Real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines and existing Data Server(s) to facilitate greater fault tolerance and reliability.
2. Dedicated User Interface Architecture – The architecture of the computer shall be implemented to conform to industry standards, so that it can accommodate applications provided by the BMS Contractor and by other third party applications suppliers, including but not limited to Microsoft Office Applications. Specifically it must be implemented to conform to the following interface standards.

   a. Microsoft Internet Explorer 11.0 or Edge for user interface functions.

b. Microsoft Office Professional for creation, modification and maintenance of reports, sequences other necessary building management functions.
c. Microsoft Outlook or other e-mail program for supplemental alarm functionality and communication of system events, and reports.
d. Required network operating system for exchange of data and network functions such as printing of reports, trends and specific system summaries.

3. Graphics

a. The user interface shall display an equipment visualization or graphic within the context of its associated space (building, floor, room, etc.) or equipment dashboard.
b. Graphics shall include the ability to define individual information layers for operator selection in order to clarify systems status and simplify operation on mobile devices. Where desired a master layer may be defined to include important information about the facility on all graphic screens.
c. Graphics shall support the use of photo-realistic symbols as well as color change and animation to match the status of the related system control point.
d. It shall be possible to export a time stamped .pdf file of the graphic being viewed in order to communicate the current conditions in the space or the equipment being viewed and to provide a historic record.
e. An integral graphic manager shall be provided including the following features and capabilities:

1) Creation and modification of graphics from any HTML5 capable browser without the need for additional plug-ins or software packages.
2) Access to a full suite of pre-defined templates for air sourced HVAC applications as well as the ability to add custom templates as created for other use. Pre-aliased graphic templates may be defined and saved for repetitive representations of common mechanical and electrical equipment.
3) A full suite of pre-defined three dimensional symbols for mechanical and electrical systems as well as all line, text and shape tools required for integration into a graphic with zoom and pan capabilities on multiple platforms and in multiple browsers.
4) The ability to search and replace items in multiple graphics with a single command.
5) The ability to import and insert photos and images into the graphic.
6) The ability of the graphics manager to create and edit graphics including the ability to bind graphic elements to the values and conditions of system points in both an on-line and off-line mode.

f. As required, the BMS Contractor shall provide software licenses in the name of the owner for programming, configuration and graphics building tools to allow designated representatives to make changes, modifications or additions to the system. While future updates or revisions may require an update fee, the owner shall incur no additional cost if they choose not to update. Systems that require any annual or time-limited licensing fees shall not be permitted.

4. Scheduling

a. The user interface shall provide the capability to display, in a singular view, all of the effective schedules in the context of the space (building/floor/room, etc.) or equipment that the schedule effects. The software should have the ability to display an effective schedule, for the present, or a future date.
b. The user interface shall provide a report of all schedules affecting a space or equipment. The report shall provide the user details of events that comprise the

weekly schedule and exception schedule(s). The report shall provide a means of viewing individual breakout scheduling elements for Weekly Schedule, Exceptions and Default Commands.

c. The user interface shall provide the capability to efficiently change or modify schedules in mass quantities. This includes the capability to add, in bulk, exceptions to schedules, in addition to assigning, in bulk, weekly schedules.

5. Command and Control

a. It shall be possible to command system analog and binary points via a dropdown menu accessed by clicking or tapping on the value shown in any equipment summary or graphic display and completing the task in the resultant menu including an optional annotation.

b. Commanding multiple points shall be possible on displays where multiple like system elements can be chosen.

6. Search

a. Typing a text string in the Search box shall display a list of all occurrences of that string in the mobile user interface. When a string is represented in the description of a space or network element, selecting it shall display its default dashboard.

b. Clicking or tapping on the Advanced Search Icon shall display the Advanced Search dialog box permitting the following:

1) Search by Space and Equipment, Equipment Definition or Network Reference.
2) Filter the search by wildcard name or object type.
3) Multi-selection of objects for commanding or the creation of reports including Trend, Alarm, Audit and Activity for a specific period of time.

7. Offline Operation

a. The mobile user interface shall have the ability to operate in an offline mode in order to create or edit graphics and dashboard elements.

b. Content created offline shall be available to all authorized users for inclusion of an operating user interface later.

B. Site Management Portal and Associated Application Components

1. General – The Site Management Portal and its user interface shall serve as the primary tool for creation and maintenance of the BMS.
2. All features and functions of the Site Manager and associated user Interface defined in this document shall be available on any computer connected directly or via a WAN/VPN to the automation network and conforming to the following specifications.
3. The software shall run be accessible and operational on a Microsoft Internet Explorer (11.0 or higher) browser and support the following functions:

a. Configuration.
b. Commissioning.
c. Data Archiving.
d. Monitoring.
e. Commanding.
f. System Diagnostics.

4. Minimum hardware requirements for client devices:

a. 8GB RAM.
b. 3.0 GHz Clock Speed Intel Microprocessor.
c. 100 GB Hard Drive (free space for cut and paste/screen captures.)
d. SVGA 1024x768 resolution display with 64K colors and 16 bit color depth.
e. Mouse or other pointing device.

5. Operator Interface

a. An integrated browser based client application shall be provided as the user interface program for operators familiar with the detailed operation of the BMS and charged with the maintenance and optimization of the mechanical/electrical systems in the facility.
b. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.
c. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
d. The user interface software shall provide help menus and instructions for each operation and/or application.
e. The system shall support customization of the user interface configuration and a home page display for each operator.
f. The system shall support user preferences in the following screen presentations:

1) Alarm.
2) Trend.
3) Display.
4) Applications.

g. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
h. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

1) User access for selective information retrieval and control command execution.
2) Monitoring and reporting.
3) Alarm, non-normal, and return to normal condition annunciation.
4) Selective operator override and other control actions.
5) Information archiving, manipulation, formatting, display and reporting.
6) BMS internal performance supervision and diagnostics.
7) On-line access to user HELP menus.
8) On-line access to current BMS as-built records and documentation.
9) Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications.

i. The system shall support a list of application programs configured by the users that are called up by the following means:

1) The Tools Menu.
2) Hyperlinks within displays.
3) Key sequences.

j. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

6. Navigation Trees

a. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum, provide a tree that identifies all systems on the networks.
b. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.
c. The navigation trees shall be “dockable” to other displays in the user interface. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.

7. Alarms

a. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

1) Log date and time of alarm occurrence.
2) Generate a “Pop-Up” window, with audible alarm, informing a user that an alarm has been received.
3) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.
4) Provide an audit trail on hard drive for alarms by recording user acknowledgment, deletion, or disabling of an alarm. The audit trail shall include the name of the user, the alarm, the action taken on the alarm, and a time/date stamp.
5) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.
6) Configuration of which NAE offline alarms are seen by each user.
7) Any attribute of any object in the system may be designated to report an alarm.

b. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.
c. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined .wav files.
d. The BMS shall annunciate application alarms at minimum, as required by Part 3.

8. Reports and Summaries

a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:

1) All points in the BMS.
2) All points in each BMS application.
3) All points in a specific controller.
4) All points in a user-defined group of points.
5) All points currently in alarm.
6) All points locked out.
7) All user defined and adjustable variables, schedules, interlocks and the like.

b. Summaries and Reports shall be accessible via standard user interface functions and not dependent upon custom programming or user defined HTML pages.
c. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.
d. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

9. Schedules

a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:

1) Weekly schedules.
2) Exception Schedules.
3) Monthly calendars.

b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.
c. It shall be possible to define one or more exception schedules for each schedule including references to calendars.
d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.
e. Changes to schedules made from the User Interface shall directly modify the schedule database stored in an engine or server.
f. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.
g. The Calendar object supports an option to add a reference to another Calendar Object that is designated to be the master for the facility. Any Supervisory and BAC calendars can be configured to reference a single master Global Calendar. Changes to the master global calendar are automatically synced with all calendars that are referenced.
h. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.
i. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history.
j. The system Solar Clock shall support the scheduling and energy management functions. The Solar Clock will calculate the sunrise, sunset, and sun angle values

for a specified latitude and longitude. A time offset can also be specified allowing the Solar Clock object to be used as a master for control at a specified interval before or after sunset and sunrise.

10. Security/Passwords

    a. Multiple-level passwords access protection shall be provided via roles and permissions. The feature will allow the system to base access on a user's job title or role and allow the user/manager access interface control, display, and database manipulation capabilities based on an assigned password.
    b. Roles may be copied and altered to meet specific roles and permissions based on the particular policies.
    c. Each user shall have the following: a user account name (with a maximum of 30 characters), a complex password or passphrase (with a min of 8 characters and a max of 50 characters), other user account policies (such as session timeout), timesheet access based on day of the week and time of day, and specific user view.
    d. The system shall allow each user to change his or her password at will.
    e. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.
    f. A maximum of 150 categories may be used to determine or assign areas of responsibilities to each user account. A maximum of 13 (of the 150) named categories which are specifics such as "No Access, View, Advanced Review, Operate, Intervene, Diagnostic, Manage Item Events, Manage Every, and Configure Items".
    g. A minimum of 100 unique passwords shall be supported.
    h. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.
    i. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.
    j. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.
    k. The system shall have the ability to provide a Department of Defense (DoD) specific warning banner for applicable sites that warns the user they are accessing a restricted site.
    l. After successful login to the Site Management Portal (SMP) the last time and date that user name was previously logged in is shown on the screen.
    m. Each login attempt is recorded in the system Audit Log with the option to record the IP address of the PC that made the login.

11. Screen Manager

    a. The system will allow a customized image on the login screen (e.g. organization name, logo).
    b. User View navigations can be displayed as either a set of tabs or a drop down list.
    c. Allows user preference for assigning of a background color for when an object is Out of Service which will enable the operator to quickly distinguish points that have been commanded to this state.

d. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

2.4 NETWORK AUTOMATION ENGINES

A. General

1. The Network Automation Engine (NAE) shall be a fully user-programmable, supervisory controller. The NAE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Engines.
2. Automation network – The NAE shall reside on the automation network and shall support a subnet of system controllers.
3. User Interface – Each NAE shall have the ability to deliver a web based User Interface using the Site Management Portal functionality previously described. All computers connected physically or virtually to the automation network shall have access to the web based user interface.

    a. The web based user interface software shall be embedded in the NAE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
    b. The NAE shall support a minimum of two (2) concurrent users.
    c. The web-based user shall have the capability to access all system data through a single NAE.
    d. Remote users connected to the network through an Internet Service Provider (ISP) or telephone dial up shall also have total system access through one NAE.
    e. Systems that require the user to address more than one NAE to access all system information are not acceptable.
    f. The NAE shall have the capability of generating web based user interface graphics. The graphics capability shall be embedded in the NAE.
    g. Systems that only support user interface graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
    h. The web based user interface shall support the following functions using a standard version of Microsoft Internet Explorer:

        1) Configuration
        2) Commissioning
        3) Data Archiving
        4) Monitoring
        5) Commanding
        6) System Diagnostics

    i. Systems that require workstation software or modified web browsers for system queries are not acceptable.
    j. The NAE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

4. Processor – The NAE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NAE size and capability shall be sufficient to fully meet the requirements of this Specification.
5. Memory – Each NAE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.

6. User Authentication – The NAE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).
7. Password Security – Access to the embedded user interface shall require a password of 8 to 50 characters including a minimum of one lower case letter, one upper case letter, one number, and one special character. An alarm shall be generated after three unsuccessful attempts within 15 minutes and the user shall be denied access until permission is renewed by a system administrator.
8. Network Security – Communication between the NAE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.
9. Hardware Real Time Clock – The NAE shall include an integrated, hardware-Based, real-time clock.
10. Diagnostics – The NAE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Automation Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
11. Power Failure – In the event of the loss of normal power, The NAE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

    a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
    b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

12. Certification – The NAE shall be listed by UL.
13. Controller network – The NAE shall selectively support the following communication protocols on the controller network:

    a. The NAE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.

        1) The NAE shall support Remote field bus integration via a BACnet IP to MS/TP router.
        2) The NAE shall be BTL certified and carry the BTL Label.
        3) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
        4) A BACnet Protocol Implementation Conformance Statement shall be provided for the NAE.
        5) The Conformance Statements shall be submitted 10 days prior to bidding.

B. Network Automation Engine – Large, Dual Trunk

1. The NAE shall support a minimum of:

    a. One Hundred (100) BACnet Standard MS/TP controllers per trunk (200 total).

2. The NAE shall include troubleshooting LED indicators to identify the following conditions:

    a. Power – On/Off.

b. Ethernet Traffic – Ethernet Traffic/No Ethernet Traffic.
c. Ethernet Connection Speed – 10 Mbps/100 Mbps/1000 Mbps.
d. FC Bus A – Normal Communications/No Field Communications.
e. FC Bus B – Normal Communications/No Field Communications.
f. Peer Communication – Data Traffic between NAE Devices.
g. Run – NAE Running/NAE in Startup/NAE Shutting Down/Software Not Running.
h. Bat Fault – Battery Defective, Data Protection Battery Not Installed.
i. 24 VAC – 24 VAC Present/Loss of 24 VAC.
j. Fault – General Fault.
k. Modem RX – NAE Modem Receiving Data (as required).
l. Modem TX – NAE Modem Transmitting Data (as required).

3. Communications Ports – The NAE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.

a. Two (2) USB port.
b. Two (2) RS-232 serial data communication port.
c. Two (2) RS-485 port.
d. One (1) Ethernet port.

4. Provide Johnson Controls NAE-55 or approved equal as indicated on plans.

2.5 NETWORK CONTROL ENGINES

A. Network Control Engines

1. The Network Control Engine (NCE) shall be a fully user-programmable, supervisory controller. The NCE shall monitor the network of distributed application-specific controllers, provide global strategy and direction, and communicate on a peer-to-peer basis with other Network Automation Engines.
2. The NCE shall be a fully user-programmable, digital controller that includes a minimum of 33 I/O points.
3. Automation Network – The NCE shall reside on the automation network and shall support a subnet of 32 Field controllers.
4. User Interface – Each NCE shall have the ability to deliver a web based user interface as previously described. All computers connected physically or virtually to the automation network shall have access to the web based user interface.

a. The web based user interface software shall be embedded in the NCE. Systems that require a local copy of the system database on the user's personal computer are not acceptable.
b. The NCE shall support a minimum of two (2) concurrent users.
c. The NCE shall have the capability of generating web based user interface graphics. The graphics capability shall be embedded in the NCE.
d. Systems that only support user interface graphics from a central database or require the graphics to reside on the user's personal computer are not acceptable.
e. The web based user interface shall support the following functions using a standard version of Microsoft Internet Explorer:

1) Configuration
2) Commissioning
3) Data Archiving
4) Monitoring
5) Commanding
6) System Diagnostics

f. Systems that require workstation software or modified web browsers are not acceptable.
g. The NCE shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems.

5. User Authentication – The NCE shall support local users, Active Directory users, Microsoft Office 365 users and Remote Authentication Dial-in User Service (RADIUS).
6. Password Security – Access to the embedded user interface shall require a password of 8 to 50 characters including a minimum of one lower case letter, one upper case letter, one number, and one special character. An alarm shall be generated after three unsuccessful attempts within 15 minutes and the user shall be denied access until permission is renewed by a system administrator.
7. Network Security – Communication between the NCE and other system networked devices including additional Network Engines, Application and Data Servers, Open Data Servers (BACnet listed OWS), and user interface clients shall be encrypted and support HTTPS with Transport Level Security (TLS) Version 1.2. Self-signed certificates are to be provided with the option of configuring trusted certificates.
8. The NCE shall employ a finite state programming to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.
9. The NCE shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only, shall not be acceptable.
10. The NCE shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
11. The NCE shall support the following number and types of inputs and outputs:

    a. Ten Universal Inputs – shall be configured to monitor any of the following:

        1) Analog Input, Voltage Mode
        2) Analog Input, Current Mode
        3) Analog Input, Resistive Mode
        4) Binary Input, Dry Contact Maintained Mode
        5) Binary Input, Pulse Counter Mode

    b. Eight Binary Inputs – shall be configured to monitor either of the following:

        1) Dry Contact Maintained Mode
        2) Pulse Counter Mode

    c. Four Analog Outputs – shall be configured to output either of the following:

        1) Analog Output, Voltage Mode
        2) Analog Output, Current Mode

    d. Seven Binary Outputs – shall output the following:

        1) 24 VAC Triac

    e. Four Configurable Outputs – shall be configured to output either of the following:

        1) Analog Output, Voltage Mode
        2) Binary Output, 24 VAC Triac Mode

12. The NCE shall have the ability to monitor and control a network of sensors and actuators over a SA Bus.

    a. The SA Bus shall be a MS/TP Bus supporting BACnet Standard protocol SSPC-135.
    b. The SA Bus shall support a minimum of 10 devices.
    c. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the NCE and the furthest connected device.

13. The NCE shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the Field Trunk or the SA Bus.

    a. Lighting and electrical distribution.
    b. Built-up air handling units for special applications.
    c. Power generation and energy monitoring equipment.
    d. Interfaces to security and fire detection systems.

14. The NCE shall support a Local Controller Display either as an integral part of the NCE or as a remote device communicating over the SA Bus.

    a. The Display shall use a BACnet Standard SSPC-135 MS/TP protocol.
    b. The Display shall allow the user to view monitored points without logging into the system.
    c. The Display shall allow the user to view and change setpoints, modes of operation, and parameters.
    d. The Display shall provide password protection with user adjustable password timeout.
    e. The Display shall be menu driven with separate paths for:

        1) Input/Output
        2) Parameter/Setpoint
        3) Overrides

    f. The Display shall use easy-to-read English text messages.
    g. The Display shall allow the user to select the points to be shown and in what order.
    h. The Display shall support a back lit LCD with adjustable contrast and brightens and automatic backlight brightening during user interaction.
    i. The display shall be a minimum of 4 lines and a minimum of 20 characters per line.
    j. The Display shall have a keypad with no more than 6 keys.
    k. The Display shall be panel mountable.

15. The NCE shall be microprocessor-based with a minimum word size of 32 bits. The NAE shall be a multi-tasking, multi-user, and real-time digital control processor. Standard operating systems shall be employed. NCE size and capability shall be sufficient to fully meet the requirements of this Specification.
16. The NCE shall employ an industrial single board computer.
17. Each NCE shall have sufficient memory to support its own operating system, databases, and control programs, and to provide supervisory control for all control level devices.
18. The NCE shall include an integrated, hardware-based, real-time clock.
19. The NCE shall employ nonvolatile Flash memory to store all programs and data. The NCE shall employ a data protection battery to save data and power the real time clock when primary power is interrupted.
20. The NCE shall provide removable, color coded, screw terminal blocks for 24 VAC power, communication bus and I/O point field wiring.
21. The NCE shall include troubleshooting LED indicators to identify the following conditions:

a. Power
b. Fault
c. SA Bus
d. FC Bus
e. Modem TX
f. Modem RX
g. Battery Fault
h. Ethernet
i. 10 LNK
j. 100 LNK
k. Run
l. Peer Com

22. Communications Ports – The NCE shall provide the following ports for operation of operator I/O devices, such as industry-standard computers, modems, and portable operator's terminals.

    a. USB port
    b. RS-232 serial data communication port
    c. RS-485 port
    d. RJ-45 Ethernet port
    e. RJ-12 jack

23. Diagnostics – The NCE shall continuously perform self-diagnostics, communication diagnosis, and diagnosis of all panel components. The Network Control Engine shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failures to establish communication.
24. Power Failure – In the event of the loss of normal power, The NCE shall continue to operate for a user adjustable period of up to 10 minutes after which there shall be an orderly shutdown of all programs to prevent the loss of database or operating system software.

    a. During a loss of normal power, the control sequences shall go to the normal system shutdown conditions. All critical configuration data shall be saved into Flash memory.
    b. Upon restoration of normal power and after a minimum off-time delay, the controller shall automatically resume full operation without manual intervention through a normal soft-start sequence.

25. Certification – The NCE shall be listed by UL. File E107041, CCN PAZX, UL 916, Energy Management Equipment. FCC Compliant to CFR47, Part 15, Subpart B, Class A.
26. Field Controller Bus – The NCE shall support the following selectable communication protocols on the optional Field Controller Bus:

    a. The NCE shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135 on the controller network.

        1) The NCE shall be BTL certified and carry the BTL Label.
        2) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
        3) A BACnet Protocol Implementation Conformance Statement shall be provided for the NCE.
        4) The Conformance Statements shall be submitted 10 days prior to bidding.
        5) The NCE shall support a minimum of 32 control devices.

b. The NCE shall support LonWorks enabled devices using the Free Topology Transceiver FTT10 on the Field Controller Bus (LonWorks Network).

1) All LonWorks controls devices shall be LonMark certified.
2) The NCE shall support a minimum of 32 LonWorks enabled control devices.

c. The NCE shall support the N2 devices on the Field Controller Bus (Johnson Controls N2 Bus).

27. Provide Johnson Controls NCE25 or approved equal as shown on plans.

2.6 APPLICATION AND DATA SERVERS

A. Application and Data Server

1. Existing to be reused.

2.7 DDC SYSTEM CONTROLLERS

A. Advanced Application Field Equipment Controller

1. The Advanced Application Field Equipment Controller (FAC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol.

a. The FAC shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

1) The FAC shall be BTL certified and carry the BTL Label.
2) The FAC shall be tested and certified as a BACnet Advanced Application Controller (B-AAC).
3) A BACnet Protocol Implementation Conformance Statement shall be provided for the FAC.
4) The Conformance Statement shall be submitted 10 days prior to bidding.

2. The FAC shall employ finite state programming to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.
3. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable. The FAC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
4. The FAC shall include an integral real-time clock and support time-based tasks which enables these field controllers to monitor and control:

a. Schedules.
b. Calendars.
c. Alarms.
d. Trends.

5. The FAC can continue time-based monitoring when offline for extended periods of time from a network.

6. The FAC can operate as a stand-alone controller in applications that do not require a networked supervisory device or for network applications where it is preferred to have the scheduling, alarming, and/or trending performed locally in the field controllers.
7. The FAC shall include troubleshooting LED indicators to identify the following conditions (*dependent on connection option):

    a. Power On.
    b. Power Off.
    c. Download or Startup in progress, not ready for normal operation.
    d. No Faults.
    e. Device Fault.
    f. Field Controller Bus – Normal Data Transmission*.
    g. Field Controller Bus – No Data Transmission*.
    h. Field Controller Bus – No Communication*.
    i. SA Bus – Normal Data Transmission.
    j. SA Bus – No Data Transmission.
    k. SA Bus – No Communication.
    l. Ethernet*.

8. The FAC shall accommodate the direct wiring of analog and binary I/O field points with the following minimum Analog to Digital (A/D) and Digital to Analog (D/A) conversion resolution.

    a. Provide a minimum 15 bit A/D resolution for analog inputs.
    b. Provide a minimum 15 bit D/A resolution for analog outputs.

9. The FAC shall support the following types of inputs and outputs supplied in the amounts required for the specified applications:

    a. Universal Inputs – shall be configured to monitor any of the following:

        1) Analog Input, Voltage Mode.
        2) Analog Input, Current Mode.
        3) Analog Input, Resistive Mode.
        4) Binary Input, Dry Contact Maintained Mode.
        5) Binary Input, Pulse Counter Mode.

    b. Binary Inputs – shall be configured to monitor either of the following:

        1) Dry Contact Maintained Mode.
        2) Pulse Counter Mode.

    c. Analog Outputs – shall be configured to output either of the following:

        1) Analog Output, Voltage Mode.
        2) Analog Output, Current Mode.

    d. Binary Outputs – shall output the following:

        1) Line-voltage relay outputs.
        2) 24 VAC Triac.

    e. Configurable Outputs – shall be capable of the following:

        1) Analog Output, Voltage Mode.

2) Binary Output Mode.

f. The FC Bus shall be a MS/TP Bus supporting BACnet Standard protocol SSPC-135.
g. The FC Bus shall support communications between the FACs and the NAE.
h. The FC Bus shall also support Input/Output Module (IOM) communications with the FAC and with the NAE.
i. The FC Bus shall support a minimum of 100 IOMs and FACs in any combination.
j. The FC Bus shall operate at a maximum distance of 15,000 Ft. between the FAC and the furthest connected device.

10. The FAC shall support a Local Controller Display either as an integral part of the FAC or as a remote device communicating over the SA Bus.

a. The Display shall use a BACnet Standard SSPC-135 MS/TP protocol.
b. The Display shall allow the user to view monitored points without logging into the system.
c. The Display shall allow the user to view and change setpoints, modes of operation, and parameters.
d. The Display shall provide password protection with user adjustable password timeout.
e. The Display shall be menu driven with separate paths for:

1) Input/Output.
2) Parameter/Setpoint.
3) Overrides.

f. The Display shall use easy-to-read English text messages.
g. The Display shall allow the user to select the points to be shown and in what order.
h. The Display shall support a back lit LCD with adjustable contrast and brightens and automatic backlight brightening during user interaction.
i. The display shall be a minimum of 4 lines and a minimum of 20 characters per line.
j. The Display shall have a keypad with no more than 6 keys.
k. The Display shall be panel mountable.

11. Provide Johnson Controls FAC or approved equal as shown on plans.

2.8 FIELD DEVICES

A. Actuators and Operators

1. General Requirements

a. Damper actuators shall be electronic, as specified in the System Description section. Exact OEM equivalents of specified actuators/operators shall be acceptable if clearly identified in submittals.
b. The manufacturer shall be ISO 9001 certified.

2. Electronic Damper Actuators

a. Spring Return Actuators:

1) Manufactured, brand labeled or distributed by Johnson Controls or approved equal.
2) Regulatory Agency Listing: cULus ,CSA C22.2 No. 24-93, and CE marked.

3) Direct-Coupled Design: Requires no crankarm or linkage for mounting to a shaft.
4) Coupling: toothed V-bolt clamp and nuts with toothed cradle.
5) Reversible Mounting: Provides either clockwise or counterclockwise operation.
6) Power Failure Operation: Mechanical spring return system drives load to the home position. Other forms of internal energy storage for power failure operation are not acceptable.
7) Motor Technology:

    a) Modulating Types: Microprocessor-controlled Brushless DC motor.
    b) On/Off Types: DC brush motor.

8) Overload Protection: Electronic stall detection protects from overload at all angles of rotation without the use of end switches.
9) Enclosure Ratings:

    a) NEMA type 2 / IP54 mounted in any orientation.

10) Double-Insulated construction: Eliminate the need for electrical ground wires.
11) Wiring: Integral cables with colored and numbered conductors.
12) Sized for torque required to seal damper at load conditions.
13) Parallel Operation: Actuators shall be available that are capable of being mechanically or electrically paralleled.
14) Proportional actuators shall be user configurable without the use of external computer software or programming tools. Calibration, input signal range selection, and control logic reversal shall be selectable with an external mode selection switch.
15) Operating Temperature Range:

    a) 70 lb·in. Torque and below: -40°F to 140°F.
    b) 71 lb·in. Torque and above: -40°F to 131°F.

16) Power Requirements:

    a) Modulating Types:

        i. 27 lb·in. Torque and Below: 5VA maximum.
        ii. 70 lb·in. to 19 lb·in.Torque: 8VA maximum.
        iii. 89 lb·in. to 71 lb·in.Torque: 10VA maximum.
        iv. 90 lb·in. to 177 lb·in.Torque: 16VA maximum.

    b) 2-Position Types:

        i. 27 lb·in. Torque and Below: 5VA maximum.
        ii. 70 lb·in. to 19 lb·in.Torque: 7VA maximum.
        iii. 71 lb·in. to 177 lb·in.Torque: 25VA maximum.

b. Non-Spring Return Actuators

1) Manufactured, brand labeled or distributed by Johnson Controls or approved equal.
2) Regulatory Agency: Underwriters Laboratories (UL) Listed, CSA Certified, and CE marked.

3) Direct-Coupled Design: Requires no crank arm or linkage for mounting to a shaft.
4) Coupling:

   a) Above 80 lb.·in.: toothed V-bolt clamp and nuts with toothed cradled.
   b) 80 lb.·in. and below: single cup-point set screw and toothed cradle.

5) Overload Protection: Electronic stall detection or magnetic slip clutch protects from overload at all angles of rotation without the use of end switches.
6) Minimum Enclosure Ratings:

   a) Types with covered wiring terminals: NEMA type 2 / IP42 mounted in any orientation.
   b) Types without covered wiring terminals: NEMA type 1 / IP30 or IP40.
   c) Types with integrated cables: NEMA 2 / IP42 mounted in any orientation.

7) Sized for torque required to seal damper at load conditions.
8) Parallel Operation: Actuators shall be available that are capable of being mechanically or electrically paralleled.
9) Proportional actuators shall be user configurable without the use of external computer software or programming tools.
10) Operating Temperature Range: -4°F to 122°F except for VAV and similar indoor applications in which case 32°F to 122°F is acceptable.
11) Power Requirements: 24 V with models available for both 24 VAC and 24 VDC operation, maximum:

    a) Above 80 lb.·in.: 7.5 VA at 24 VAC.
    b) 80 lb.·in. and below: 3.5 VA at 24 VAC.

12) The manufacturer shall provide 5-year limited warranty from the date of sale covering defects in material or workmanship.

B. Sensors and Transmitters

1. General Requirements

   a. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements. Exact OEM equivalents of specified sensors and transmitters shall be acceptable if clearly identified in submittals.

2. Temperature Sensors

   a. General Requirements

      1) Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.
      2) The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD. Thermistor sensors of 10,000 or 2,250 ohms resistance may be substituted based on the application.

3) The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion.

Point Type	Accuracy
Room Temp	+ .5°F
Duct Temperature	+ .5°F
All Others	+ .75°F

b. Room Temperature Sensors

1) Room sensors shall be constructed for either surface or wall box mounting.
2) Room sensors shall have the following options when specified:

a) Setpoint warmer/cooler.
b) Individual heating/cooling setpoint.
c) Momentary override request for activation of after-hours operation.
d) Analog thermometer.

c. Room Temperature Sensors with Integral Display

1) Room sensors shall be constructed for either surface or wall box mounting.
2) Room sensors shall have an integral LCD display and the following capabilities when specified:

a) Display room air temperatures.
b) Display and adjust room comfort setpoint.
c) Display and adjust fan operation status.
d) Setpoint override request via setpoint adjust dial or buttons.
e) Timed override request via occupancy override with status indication for activation of after-hours setpoint operation.
f) Occupancy sensor status.
g) Toggle between Degrees F and Degrees C.
h) Toggle between temperature and humidity where specified.

d. Thermowells

1) Thermowell manufacturer shall have models available in stainless steel, brass body, and copper bulb.
2) When thermowells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and sensor.
3) Thermowells shall be pressure rated and constructed in accordance with the system working pressure.
4) Thermowells and sensors shall be mounted in a direct mount (no adapter) offering faster installation or 1/2” NFT saddle and allow easy access to the sensor for repair or replacement.
5) Thermowells constructed of 316 stainless steel shall comply with Canadian Registration Number (CRN) pressure vessel rating.

e. Outside Air Sensors

1) Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall be provided with a solar shield.

2) Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
3) Temperature transmitters shall be of NEMA 3R (IP54) or NEMA 4 (IP65) construction and rated for ambient temperatures.
4) The outdoor sensor shall be capable of being mounted on a roof, pole or side of a building utilizing its preassembled mounting bracket.
5) Outside air relative humidity sensors 0-100% full range of accurate measurement. Operating temperature -4 to 140°F (-20 to 60°C).
6) Outside air temperature sensors operating temperature range -40 to 140°F, +/- .55°F (+/- .3°C).

f. Duct Mount Sensors

1) Duct mount sensors shall mount in an electrical box through a hole in the duct, positioned to provide ease of accessibility for repair or replacement.
2) Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
3) For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be provided.

g. Averaging Sensors

1) For ductwork greater in any dimension that 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
2) For plenum applications, such as mixed air temperature measurements, a continuous averaging sensor or a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
3) Capillary supports at the sides of the duct shall be provided to support the sensing string.

h. Acceptable Manufacturers: Johnson Controls, Minco.

3. Humidity Sensors

a. The sensor shall be a solid-state type, relative humidity sensor of the Thin Film Capacitance or Bulk Polymer Design. The sensor element shall resist service contamination.
b. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.
c. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH at 77°F unless specified elsewhere.
d. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R (IP54) or NEMA 4 (IP65) enclosure with sealtite fittings.
e. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.
f. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.
g. Acceptable Manufacturers: Johnson Controls and Vaisala.

4. CO_2 Sensors

a. Where shown on the drawings, CO_2 sensors shall have the following features:

1) Jumper selectable: 0-20mA, 4-20mA & 0-10 VDC output.
2) Liquid Crystal Display (LCD).

b. The CO_2 sensors shall have the ability to monitor and output the following variables as required by the systems sequence of operations:

1) Zone CO_2.

c. The CO_2 shall transmit the information back to the controller via jumper selectable 0-20mA, 4-20mA & 0-10 VDC output signals:

1) The CO_2 sensors shall provide a maximum output current of 25mA; Maximum output voltage of 12.5V.
2) The CO_2 sensors shall be FCC compliant to CFR47 Part 15 subpart B Class A.

d. The CO_2 sensors shall be available with:

1) CO_2 response time (0-63%) of 1 minute.
2) Less than 0.083% of full scale/°F temperature dependence of CO_2 output.
3) Long term CO_2 stability ±5% of full scale for 5 years.
4) CO_2 measurement accuracy of ±(40ppm + 2.0% of reading.)
5) CO_2 non-linearity of less than 1.0% of full scale.

e. The CO_2 sensors may include the following items:

1) Relay output module.
2) LCD module.
3) Analog temperature module with linear 0-10 VDC output for 32-122F.

5. Differential Pressure Transmitters

a. General Air Pressure Transmitter Requirements:

1) Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
2) Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
3) A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.

b. Building Differential Air Pressure Applications (-1” to +1” WC):

1) The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
2) The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:

a) -1.00 to +1.00 WC input differential pressure ranges. (Select range appropriate for system application.)
b) 4-20 mA output.
c) Maintain accuracy up to 20 to 1 ratio turndown.
d) Reference Accuracy: +0.2% of full span.
e) Acceptable Manufacturers: Johnson Controls or approved equal.

c. Low Differential Air Pressure Applications (0" to 2.5" WC):

1) The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
2) The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications.

a) (0.00 - 1.00" to 5.00") WC input differential pressure ranges. (Select range appropriate for system application.)
b) 4-20 mA, 0-5 VDC, 0-10 VDC output.
c) Maintain accuracy up to 20/1 ratio turndown.
d) Reference Accuracy: +0.25%, or 0.5% of full span.

3) Acceptable Manufacturers: Johnson Controls and Ruskin.

d. Medium Differential Air Pressure Applications (5" to 21" WC):

1) The pressure transmitter shall be similar to the Low Air Pressure Transmitter, except that the performance specifications are not as severe. Differential pressure transmitters shall be provided that meet the following performance requirements.

a) Zero & span: (c/o F.S./Deg. F): .04% including linearity, hysteresis and repeatability.
b) Accuracy: 1% F.S. (best straight line) Static Pressure Effect: 0.5% F.S. (to 100 psig.
c) Thermal Effects: <+.033 F.S./Deg. F. over 40°F to 100°F (calibrated at 70°F.)

2) Acceptable manufacturers: Johnson Controls and Ruskin.

6. Flow Monitoring

a. Air Flow Monitoring

1) Fan Inlet Air Flow Measuring Stations

a) At the inlet of each fan and near the exit of the inlet sound trap, airflow sensors shall be provided that shall continuously monitor the fan air volumes or velocity pressure.
b) Each sensor shall be surface mount type. Unit shall be capable of monitoring and reporting the airflow and temperature at each fan inlet location through two or four sensing circuits. If a static pressure manifold is used, it shall incorporate dual offset static tips on the opposing sides of the averaging manifold so as to be insensitive to flow-angle variations of as much as + 20° in the approaching air stream.

c) Devices creating fan performance degradation, resulting in additional energy consumption, caused from pressure drop associated with probes or mounting apparatus in the center of the fan inlet are not allowed. The device shall not induce a significant pressure drop, nor shall the sound level within the duct be amplified by its singular or multiple presence in the air stream. Sensor circuit casings shall be constructed of U.L. 94 flame rated high impact ABS and include a stainless steel thermistor cap that maintains the precise calibrated flow over the heated and ambient measurement points.
d) Acceptable manufacturers: Johnson Controls, Air Monitor Corp., Tek-Air Systems, Inc., or Dietrich Standard.

2) Single Probe Air Flow Measuring Sensor

a) The single probe airflow-measuring sensor shall be duct mounted with an adjustable sensor insertion length of up to eight inches. The transmitter shall produce a 4-20 mA or 0-10 VDC signal linear to air velocity. The sensor shall be a thermal dispersion and utilize one temperature sensor and a heated thermistor. The sensor pair shall measure the air temperature and airflow velocity.

3) Duct Air Flow Measuring Stations

a) Furnish and install, at locations shown on plans or as in accordance with schedules, an equalized air measuring probe system piped to a high performance pressure transducer or an electronic type airflow temperature measuring station.
b) Each device shall be designed and built in order to comply with, and provide results in accordance with, accepted practice as defined for system testing in the ASHRAE Handbook of fundamentals, as well as in the Industrial Ventilation Handbook.
c) Assembly shall be AMCA tested and capable of measuring a range from 70 to 5,000 FPM (22 to 1524 MPM).
d) Equalized air measuring assembly shall measure to ±3% average and consist of 6063T5 extruded aluminum step sensing blade(s) with anodized finish, plenum-rated polyethylene pressure tubing, brass barbed fittings, mounting hardware and a glass-on-silicone capacitance sensor pressure transducer capable of measuring up to five field-selectable pressure ranges up to 2.5 in. WC.
e) The transducer shall be accurate to ±0.5%, or 0.25% of full scale and be contained in a National Electrical Manufacturer's Association (NEMA) 4 (IP-65) enclosure. Transducer shall be factory mounted and piped to high and low pressure ports through fittings made of brass.
f) All sensor tubing shall terminate in solid brass barbed fittings.
g) Total and static pressure manifolds shall terminate with external ports for connection to control tubing. An identification label shall be present on each unit casing, listing model number, size, area, and airflow capacity.
h) Air straightener shall be provided for sizes over 17 square feet (1.6 sq meter).
i) Airflow measuring station assemblies shall be fabricated of galvanized steel or aluminum casing of appropriate thickness for slip fits or with 90 Deg. connecting flanges in configuration and size equal to that of the duct into which it is mounted. Each station shall be complete with an air directionalizer and parallel cell profile suppressor

(3/4" maximum cell) across the entering air stream and mechanically fastened to the casing in such a way to withstand velocities up to 5000 feet per minute.

j) Electronic air measuring station shall be capable of monitoring and reporting the airflow and temperature at each measuring location through one or more measuring probes containing multiple sensor points and a control transmitter that outputs a 4-20 mA linear signal.

k) Probe(s) shall be constructed of an airfoil shaped aluminum extrusion containing the sensor circuit(s).

l) Each sensor circuit shall consist of coated thermistors, for temperature and velocity, mounted to a Printed Circuit Board (PCB). Multiplexer board shall be encased to prevent moisture damage.

m) Control transmitter shall be capable of processing independent sensing points and shall operate on a fused 24 VAC supply.

n) Control transmitter shall feature a 16 x 2 character alphanumeric LCD screen, digital offset/gain adjustment, continuous performing sensor/transmitter diagnostics, and a visual alarm to detect malfunctions.

o) Installation Considerations

i. The maximum allowable pressure loss through the Flow and Static Pressure elements shall not exceed .04" WC at 1000 feet per minute, or .11" WC at 2000 feet per minute. Each unit shall measure the airflow rate within an accuracy of plus 3-5% as determined by AMCA.

ii. Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct. Station flanges shall be 1.5 inches to facilitate matching connecting ductwork.

iii. Where control dampers are provided as part of the airflow measuring station, parallel blade precision controlled volume dampers integral to the station and complete with actuator, and linkage shall be provided.

iv. Stations shall be installed in strict accordance with the manufacturer's published requirements, and in accordance with ASME Guidelines affecting non-standard approach conditions.

p) All air measuring devices shall be tested according to AMCA Standard 610.

q) Acceptable manufacturers: Johnson Controls, Air Monitor Corp., Tek-Air, Ruskin, and Dietrich Standard.

4) Static Pressure Traverse Probe

a) Duct static traverse probes shall be provided where required to monitor duct static pressure. The probe shall contain multiple static pressure sensors located along exterior surface of the cylindrical probe.

b) Acceptable manufacturers: Cleveland Controls.

5) Shielded Static Air Probe

a) Where indicated on plans or in schedules a shielded static pressure probe shall be provided at each end of the building. The probe shall have multiple sensing ports, an impulse suppression chamber, and airflow shielding.

7. Power Monitoring Devices

    a. Current Measurement (amps)

        1) Current measurement shall be by a combination current transformer and a current transducer. The current transformer shall be sized to reduce the full amperage of the monitored circuit to a maximum 5 Amp signal, which will be converted to a 4-20 mA DDC compatible signal for use by the Facility Management System.
        2) Current Transformer – A split core current transformer shall be provided to monitor motor amps.

            a) Operating frequency – 50 - 400 Hz.
            b) Insulation – 0.6 Kv class 10Kv BIL.
            c) UL recognized.
            d) Five amp secondary.
            e) Select current range as appropriate for application.
            f) Acceptable manufacturers: Setra.

        3) Current Transducer – A current to voltage or current to mA transducer shall be provided. The current transducer shall include:

            a) 6X input over amp rating for AC inrushes of up to 120 amps.
            b) Manufactured to UL 1244.
            c) Accuracy: +.5%, Ripple +1%.
            d) Minimum load resistance 30kOhm.
            e) Input 0-20 amps.
            f) Output 4-20 mA.
            g) Transducer shall be powered by a 24 VDC regulated power supply (24 VDC +5%).
            h) Acceptable manufacturers: Setra.

8. Smoke Detectors

    a. Ionization type air duct detectors shall be furnished as specified elsewhere in Division 26 for installation under Division 23. All wiring for air duct detectors shall be provided under Division 26, Fire Alarm System.

9. Status and Safety Switches

    a. General Requirements

        1) Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the Building Management System (BMS) when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

    b. Current Sensing Switches

        1) The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load

shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
2) Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.
3) Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
4) Acceptable manufacturers: Johnson Controls or approved equal.

c. Air Filter Status Switches

1) Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.
2) A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
3) Provide appropriate scale range and differential adjustment for intended service.
4) Acceptable manufacturers: Johnson Controls, Cleveland Controls.

d. Air Flow Switches

1) Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.
2) Acceptable manufacturers: Johnson Controls, Cleveland Controls.

e. Air Pressure Safety Switches

1) Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.
2) Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.
3) Acceptable manufacturers: Johnson Controls, Cleveland Controls.

10. Control Relays

a. Control Pilot Relays

1) Control pilot relays shall be of a modular plug-in design with retaining springs or clips.
2) Mounting Bases shall be snap-mount.
3) DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.
4) Contacts shall be rated for 10 amps at 120VAC.
5) Relays shall have an integral indicator light and check button.
6) Acceptable manufacturers: Johnson Controls, Lectro.

b. Lighting Control Relays

1) Lighting control relays shall be latching with integral status contacts.
2) Contacts shall be rated for 20 amps at 277 VAC.
3) The coil shall be a split low-voltage coil that moves the line voltage contact armature to the On or Off latched position.
4) Lighting control relays shall be controlled by:

a) Pulsed Tristate Output – Preferred method.
b) Pulsed Paired Binary Outputs.
c) A Binary Input to the Facility Management System shall monitor integral status contacts on the lighting control relay. Relay status contacts shall be of the “dry-contact” type.

5) The relay shall be designed so that power outages do not result in a change-of-state, and so that multiple same state commands will simply maintain the commanded state. Example: Multiple Off command pulses shall simply keep the contacts in the Off position.

11. Electronic Signal Isolation Transducers

a. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input, or is to receive as an input signal from a remote system.
b. The signal isolation transducer shall provide ground plane isolation between systems.
c. Signals shall provide optical isolation between systems.
d. Acceptable manufacturers: Advanced Control Technologies.

12. Thermostats – Electric

a. Electric room thermostats of the heavy-duty type shall be provided for unit heaters, cabinet unit heaters, and ventilation fans, where required. All these items shall be provided with concealed adjustment. Finish of covers for all room-type instruments shall match and, unless otherwise indicated or specified, covers shall be manufacturer’s standard finish.
b. Acceptable Manufacturers: Penn, Emerson, Honeywell.

C. Control Dampers

1. The BMS Contractor shall furnish all automatic dampers. All automatic dampers shall be sized for the application by the BMS Contractor or as specifically indicated on the drawings. Dampers provided with the air handlers and direct outside air units to be provided with the units.
2. All dampers used for throttling airflow shall be of the opposed blade type arranged for normally open or normally closed operation, as required. The damper is to be sized so that, when wide open, the pressure drop is a sufficient amount of its close-off pressure drop to shift the characteristic curve to near linear.
3. All dampers used for two-position, open/close control shall be parallel blade type arranged for normally open or closed operation, as required.
4. Damper frames and blades shall be constructed of either galvanized steel or aluminum. Maximum blade length in any section shall be 60”. Damper blades shall be 16-gauge minimum and shall not exceed eight (8) inches in width. Damper frames shall be 16-gauge minimum hat channel type with corner bracing. All damper bearings shall be made of reinforced nylon, stainless steel or oil-impregnated bronze. Dampers shall be tight closing, low leakage type, with synthetic elastomer seals on the blade edges and flexible stainless steel side seals. Dampers of 48”x48” size shall not leak in excess of 8.0 cfm per square foot when closed against 4” WC static pressure when tested in accordance with AMCA Std. 500.
5. Airfoil blade dampers of double skin construction with linkage out of the air stream shall be used whenever the damper face velocity exceeds 1500 FPM or system pressure exceeds 2.5” WC, but no more than 4000 FPM or 6” WC.

a. Acceptable manufacturers are Johnson Controls VD-1250, VD1630, or VD-1330, Ruskin CD50 or CD60, and Vent Products 5650.

6. One piece rolled blade dampers with exposed or concealed linkage may be used with face velocities of 1500 FPM or below.

a. Acceptable manufacturers: Johnson Controls VD-1620, VD-1320, Ruskin CD36, and Vent Products 5800.

7. Multiple section dampers may be jack-shafted to allow mounting of direct connect electronic actuators. Each end of the jackshaft shall receive at least one actuator to reduce jackshaft twist.

D. Advanced Application VAV Modular Assembly

1. The Advanced Application VAV Modular Assembly (AVMA) shall provide both standalone and networked DDC of pressure-independent, VAV terminal units.
2. The AVMA shall be BTL certified and carry the BTL Label.

a. The AVMA shall be tested and certified as a BACnet Advanced Application Controller (B-AAC).
b. A BACnet Protocol Implementation Conformance Statement shall be provided for the AVMA.
c. The Conformance Statement shall be submitted 10 days prior to bidding.

3. The AVMA shall communicate over the Automation Network in compliance with BACnet IPv4 and supporting BACnet Protocol Revision 12 (PR12).

4. The AVMA shall include an integral real-time clock and support time-based tasks that enables these field controllers to monitor and control:

a. Schedules.
b. Calendars.
c. Alarms.
d. Trends.

5. The AVMA can continue time-based monitoring for extended periods when offline from an Automation Network.
6. The AVMA can operate as a stand-alone controller in applications that do not require a networked supervisory device or for network applications where it is preferred to have the scheduling, alarming, and/or trending performed locally in the field controllers.
7. The AVMA shall have internal electrical isolation for MS/TP communications.
8. The AVMA shall be a configurable digital controller with integral differential pressure transducer and damper actuator. All components shall be connected and mounted as a single assembly, removable as one piece.
9. The AVMA shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB or the controller is designed and suitable for use in other environmental air space (plenums) in accordance with Section 300.252(C) of the National Electrical Code.
10. The integral damper actuator shall be a fast response stepper motor capable of stroking 90 degrees in 60 seconds for quick damper positioning to speed commissioning and troubleshooting tasks.
11. The controller shall determine airflow by a state-of-the-art digital non-flow pressure sensor to provide 14-bit resolution with bidirectional flow operation that supports automatic correction for polarity on high- and low-pressure DP tube connections; this pressure sensor eliminates high- and low-pressure connection mistakes.

12. Each controller shall have the ability to automatically calibrate the flow sensor to eliminate pressure transducer offset error due to ambient temperature / humidity effects.
13. The controller shall utilize a proportional plus integration (PI) algorithm for the space temperature control loops.
14. Each controller shall continuously, adaptively tune the control algorithms to improve control and controller reliability through reduced actuator duty cycle. In addition, this tuning reduces commissioning costs, and eliminates the maintenance costs of manually re-tuning loops to compensate for seasonal or other load changes.
15. The controller shall provide the ability to download and upload configuration files, both locally and via the communications network. Controllers shall be able to be loaded individually or as a group.
16. Control setpoint changes initiated over the network shall be written to VMA non-volatile memory to prevent loss of setpoint changes and to provide consistent operation in the event of communication failure.
17. The controller firmware shall be flash-upgradeable remotely via the communications bus.
18. The controller shall provide fail-soft operation if the airflow signal becomes unreliable, by automatically reverting to a pressure-dependent control mode.
19. The controller shall interface with balancer tools that allow automatic recalculation of box flow pickup gain (“K” factor), and the ability to directly command the airflow control loop to the box minimum and maximum airflow setpoints.
20. Controller shall have on-board diagnostics. These diagnostics shall consist of control loop performance measurements executing at each control loop’s sample interval, which may be used to continuously monitor and document system performance. The AVMA shall calculate Exponentially Weighted Moving Averages (EWMA) for each of the following. These metrics shall be available to the end user for efficient management of the VAV terminals.

    a. Absolute temperature loop error.
    b. Signed temperature loop error.
    c. Absolute airflow loop error.
    d. Signed airflow loop error.
    e. Average damper actuator duty cycle

21. The controller shall detect system error conditions to assist in managing the VAV zones. The error conditions shall consist of:

    a. Unreliable space temperature sensor.
    b. Unreliable differential pressure sensor.
    c. Starved box.
    d. Actuator stall.
    e. Insufficient cooling.
    f. Insufficient heating.

22. The controller shall provide a flow test function to view damper position vs. flow in a graphical format. The information would alert the user to check damper position. The AVMA would also provide a method to calculate actuator duty cycle as an indicator of damper actuator runtime.
23. The controller shall provide a compliant interface for ASHRAE Standard 62-1989 (indoor air quality), and shall be capable of resetting the box minimum airflow based on the percent of outdoor air in the primary air stream.
24. The controller shall comply with ASHRAE Standard 90.1 (energy efficiency) by preventing simultaneous heating and cooling, and where the control strategy requires reset of airflow while in reheat, by modulating the box reheat device fully open prior to increasing the airflow in the heating sequence.
25. Inputs:

a. Analog inputs with user-defined ranges shall monitor the following analog signals, without the addition of equipment outside the terminal controller cabinet:

1) 0-10 VDC Sensors
2) 1000ohm RTDs
3) NTC Thermistors

b. The AVMA shall provide minimum 15 bit A/D resolution of Analog Inputs.
c. Binary inputs shall monitor dry contact closures. Input shall provide filtering to eliminate false signals resulting from input “bouncing.”
d. Binary inputs shall meet applicable CE noise immunity standards. The inputs shall be resilient against faults from power and output circuits as well as isolated from communications ports.

26. Outputs

a. Analog outputs shall provide 0-10V DC output with 24 VAC miswiring protection. The AVMA shall provide minimum 15 bit D/A resolution of Analog outputs.
b. Binary outputs shall provide a SPST Triac output rated for 500mA at 24 VAC utilizing isolated drive circuitry.
c. Outputs shall meet applicable CE noise immunity standards.

27. Application Configuration

a. The AVMA shall be configured with a software tool that provides a simple Question/Answer format for developing applications and downloading.

28. Sensor Support

a. The AVMA shall communicate over the SA Bus with a Network Sensor.
b. The AVMA shall support an LCD display room sensor.
c. The AVMA shall also support standard room sensors as defined by analog input requirements.
d. The AVMA shall support humidity sensors defined by the AI side loop.

29. Provide Johnson Controls VMA or approved equal as shown on plans.

E. Input/Output Module

1. The Input/Output Module (IOM) provides additional inputs and outputs for use in digital controllers.
2. The IOM shall communicate with controllers over the FC Bus or the SA Bus.
3. The IOM shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

a. The IOM shall be BTL certified and carry the BTL Label.
b. The IOM shall be tested and certified as a BACnet Application Specific Controller (B-ASC).
c. A BACnet Protocol Implementation Conformance Statement shall be provided for the IOM.
d. The Conformance Statement shall be submitted 10 days prior to bidding.

4. The IOM shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
5. The IOM shall have a minimum of 4 points to a maximum of 17 points.
6. The IOM shall support the following types of inputs and outputs:

a. Universal Inputs – shall be configured to monitor any of the following:

1) Analog Input, Voltage Mode.
2) Analog Input, Current Mode.
3) Analog Input, Resistive Mode.
4) The IOM shall provide minimum 15 bit A/D resolution of analog inputs.
5) Binary Input, Dry Contact Maintained Mode.
6) Binary Input, Pulse Counter Mode.

b. Binary Inputs – shall be configured to monitor either of the following:

1) Dry Contact Maintained Mode.
2) Pulse Counter Mode.

c. Analog Outputs – shall be configured to output either of the following:

1) Analog Output, Voltage Mode.
2) Analog Output, current Mode.
3) The IOM shall provide minimum 15 bit D/A resolution of analog outputs.

d. Binary Outputs – shall output the following:

1) 24 VAC Triac.

e. Configurable Outputs – shall be capable of the following:

1) Analog Output, Voltage Mode.
2) Binary Output Mode.

7. The IOM shall include troubleshooting LED indicators to identify the following conditions:

a. Power On.
b. Power Off.
c. Download or Startup in progress, not ready for normal operation.
d. No Faults.
e. Device Fault.
f. Normal Data Transmission.
g. No Data Transmission.
h. No Communication.

8. Provide Johnson Controls IOM or approved equal as shown on plans.

F. VRF Smart Gateway

1. BACnet: The VRF Smart Gateway shall provide a BACnet IP extension of the Hitachi-made Variable Refrigerant Flow (VRF) outdoor units and indoor units that natively communicate using an H-LINK I/II serial network.

a. BACnet device and point objects from the VRF units shall be presented to the BMS in an organized, consistent manner for quick and easy integration.
b. Provide sufficient point data from the VRF indoor units over BACnet IP.

1) Control functions over BACnet IP shall include on/off, operational mode [cool, heat, fan, dry, auto], room temperature set point, fan speed, enabling or disabling remote controller operations, and resetting dirty filter status.

2) Monitoring points over BACnet IP shall include reporting actual operational mode [cool, heat, fan, dry], current room temperature, actual fan speed, filter status, expansion valve position, supply liquid and gas pipe temperatures, return air and discharge air temperatures, coil differential temperature, requested compressor speed, and indoor unit alarm status and alarm code.

c. Provide sufficient point data from the VRF outdoor units over BACnet IP.
   1) Monitoring points over BACnet IP shall include system mode [heat, cool, auto] and status, heat exchanger state, inverter state and status, fan state and status, inverter and compressor hours of operation, inverter compressor and total frequencies, fan output level, expansion valve position, discharge and suction pressures, outdoor air temperature, inverter compressor current draw, inverter compressor top temperature, defrost status, emergency status, and alarm and protection codes.

d. Support 64 refrigerant systems, 160 indoor units, and a combined 200 indoor and outdoor units.
e. Be a BACnet certified/listed device.
f. Serve as a BACnet BBMD device to integrate VRF system networks across IP subnets.

2. Communications: The VRF Smart Gateway Shall include a connection for the H-LINK network that is used to connect to the VRF outdoor and indoor units. Provide an Ethernet IP connection for BACnet IP communications with a BMS and to access the VRF Smart Gateway user interface as well as a Wi-Fi access point connection for local use only (no connection to the IP Network.)
3. User Interface: The VRF Smart Gateway shall be a combination Wi-Fi access point (hot spot) and web server to provide HTML5 browser communications between mobile devices and the VRF Smart Gateway user interface to view a Device List Page and to configure communications settings only. Access to the same user interface pages can be through the Ethernet IP connection as well.

   a. Device List Page: The VRF Smart Gateway user interface shall include a Device List Page that will allow the user to scroll through all of the VRF indoor and outdoor units organized by refrigerant systems. By connecting the H-LINK communications network and power, the VRF Smart Gateway automatically discover the VRF units over H-LINK. Viewing the Device List Page allows the user determine the online or offline status of every VRF unit on the H-LINK network. The Device List Page also allows the user to change the VRF unit names and descriptions to room or space names to provide clear identity of the VRF units at the time of integration with the BMS.
   b. Configuration Pages: The VRF Smart Gateway user interface shall include easy-to-navigate pages for configuring the Ethernet and BACnet communications settings required by the user's network.
   c. Backup/Restore: The VRF Smart Gateway user interface shall include the ability to back up the communications settings and Device List Page settings and restore them on the same or different VRF Smart Gateway.
   d. Firmware Update: The VRF Smart Gateway user interface shall include the ability to update firmware when new versions become available.

4. Provide Johnson Controls Model CBN02.

PART 3 - PERFORMANCE/EXECUTION

3.1 BMS SPECIFIC REQUIREMENTS

A. Graphic Displays

1. Provide a color graphic system flow diagram display for each system with all points as indicated on the point list. All terminal unit graphic displays shall be from a standard design library.
2. User shall access the various system schematics via a graphical penetration scheme and/or menu selection.

B. Custom Reports:

1. Provide custom reports as required for this project.

C. Actuation / Control Type

1. Primary Equipment

a. Controls shall be provided by equipment manufacturer as specified herein.
b. All damper actuation shall be electric.

2. Air Handling Equipment

a. All air handlers shall be controlled with a HVAC-DDC Controller.
b. All damper actuation shall be electric.

3. Terminal Equipment:

a. Terminal Units (VAV, UV, etc.) shall have electric damper actuation.
b. All Terminal Units shall be controlled with HVAC-DDC Controller.

3.2 INSTALLATION PRACTICES

A. BMS Wiring

1. All conduit, wiring, accessories and wiring connections required for the installation of the BMS, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 26 Electrical. All wiring shall comply with the requirements of applicable portions of Division 26 and all local and national electric codes, unless specified otherwise in this section.
2. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.
3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
4. Class 2 Wiring

a. All Class 2 (24 VAC or less) wiring shall be installed in conduit unless otherwise specified.
b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5’ from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.

5. Class 2 signal wiring and 24 VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.
6. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

B. BMS Line Voltage Power Source

1. 120-volt AC circuits used for the BMS shall be taken from panel boards and circuit breakers provided by Division 26.
2. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.
3. DDC terminal unit controllers may use AC power from motor power circuits.

C. BMS Raceway

1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2”.
2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.

D. Penetrations

1. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

E. BMS Identification Standards

1. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
2. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

F. BMS Panel Installation

1. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer’s recommendations.
2. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.

G. Input Devices

1. All Input devices shall be installed per the manufacturer recommendation.
2. Locate components of the BMS in accessible local control panels wherever possible.

H. HVAC Input Devices – General

1. All Input devices shall be installed per the manufacturer recommendation.
2. Locate components of the BMS in accessible local control panels wherever possible.
3. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
4. Input Flow Measuring Devices shall be installed in strict compliance with ASME guidelines affecting non-standard approach conditions.
5. Outside Air Sensors

    a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outdoor air conditions accurately.
    b. Sensors shall be installed with a rain proof, perforated cover.

6. Building Differential Air Pressure Applications (-1” to +1” WC)

    a. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
    b. The interior tip shall be inconspicuous and located as shown on the drawings.

7. Air Flow Measuring Stations

    a. Where the stations are installed in insulated ducts, the airflow passage of the station shall be the same size as the inside airflow dimension of the duct.
    b. Station flanges shall be two inch to three inch to facilitate matching connecting ductwork.

8. Duct Temperature Sensors

    a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
    b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.
    c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.
    d. The sensor shall be mounted to suitable supports using factory approved element holders.

9. Space Sensors

    a. Shall be mounted per ADA requirements.
    b. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.

10. Low Temperature Limit Switches

    a. Install on the discharge side of the first DX coil in the air stream.
    b. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.
    c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.

11. Air Differential Pressure Status Switches

a. Install with static pressure tips, tubing, fittings, and air filter.

12. HVAC Output Devices

a. All output devices shall be installed per the manufacturers' recommendation. The mechanical contractor shall install all in-line devices such as dampers, airflow stations, pressure wells, etc.
b. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke.
c. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.
d. Electronic Signal Isolation Transducers: Whenever an analog output signal from the BMS is to be connected to an external control system as an input, or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems.

3.3 TRAINING

A. The BMS contractor shall provide the following training services:

1. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

3.4 COMMISSIONING REQUIREMENTS

A. Fully commission all aspects of the BMS work.

B. Acceptance Check Sheet

1. Prepare a check sheet that includes all points for all functions of the BMS as indicated on the point list included in this specification.
2. Submit the check sheet to the Engineer for approval.
3. The Engineer will use the check sheet as the basis for acceptance with the BMS Contractor.

C. VAV box performance verification and documentation:

1. The BMS Contractor shall test each VAV box for operation and correct flow. At each step, after a settling time, box air flows and damper positions will be sampled. Following the tests, a pass/fail report indicating results shall be produced. Possible results are Pass, No change in flow between full open and full close, Reverse operation or Maximum flow not achieved. The report shall be submitted as documentation of the installation.
2. The BMS Contractor shall issue a report based on a sampling of the VAV calculated loop performance metrics. The report shall indicate performance criteria, include the count of conforming and non-conforming boxes, list the non-conforming boxes along with their performance data, and shall also include graphical representations of performance.
3. Promptly rectify all listed deficiencies and submit a document summarizing completion to the Engineer.

3.5 PERFORMANCE VERIFICATION

A. The installing contractor shall perform a complete Performance Validation (PV) of the Building management system three times throughout the project:

1. At project turnover to customer.
2. At six (6) months of project operation.
3. At twelve (12) months of project operation or end of warranty.

B. Performance Verification shall include a complete and current Building Automation System site inventory including the following information at a minimum: a listing of all field and supervisory controllers with the following key attribute data; corresponding model numbers, firmware versions, available security updates, CPU and memory performance data, battery conditions, integrations, controlled equipment, and device and point counts.

C. Performance Verification shall include a complete written evaluation of system configuration and performance in the following categories:

1. Security – The Security evaluation shall include information about controllers that require security updates and conformance of user accounts to latest security rules and best practices.
2. Energy Performance – The Energy Performance and Savings evaluation shall identify opportunities through schedule and nightly setbacks, economizers, eliminating simultaneous heating and cooling and adding VSD to equipment.
3. Comfort and Health – The Comfort and Health evaluation shall identify temperature, pressure, and carbon dioxide values that deviate from desired set points that could lead to occupant discomfort.
4. Reliability – The Reliability evaluation shall identify overridden control points, control points creating excessive alarms, and opportunities to adding control points and trends to further enable system functionality.
5. Standards – The Standards evaluation shall identify conformance to published standards for point count, network performance and protocol standards.

D. Provide all reports as specified on a new, USB compatible flash drive.

END OF SECTION 230900

AECOM

SECTION 265668 - EXTERIOR ATHLETIC LIGHTING

Section Record:

Issued: Addendum 02 – December 12, 2019

Issued: 100% Construction Documents - November 15th, 2019.

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. Section includes lighting for the following outdoor sports venues:

1. Baseball fields.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic and remote control of lighting, including time switches, photoelectric relays, and multiple lighting relays and contactors.
2. Section 260926 "Lighting Control Panelboards" for panelboard-based lighting control.
3. Section 265613 "Lighting Poles and Standards" for poles and standards used to support lighting equipment.
4. Section 265619 "LED Exterior Lighting" for exterior LED luminaires and photoelectric relays.

1.3 DEFINITIONS

A. Coefficient of Variation (CV): A statistical measure of the weighted average of all relevant illumination values for the playing area, expressed as the ratio of the standard deviation for all illuminance values to the mean illuminance value.

B. Fixture: See "Luminaire."

C. Illuminance: The metric most commonly used to evaluate lighting systems. It is the density of luminous flux, or flow of light, reaching a surface divided by the area of that surface.

1. Horizontal Illuminance: Measurement in foot-candles (lux), on a horizontal surface 36 inches (914 mm) above ground unless otherwise indicated.
2. Target Illuminance: Average maintained illuminance level, calculated by multiplying initial illuminance by LLF.
3. Vertical Illuminance: Measurement in foot-candles (lux), in two directions on a vertical surface, at an elevation coinciding with plane height of horizontal measurements.

D. LC: Lighting Certified.

E. Light-Loss Factor (LLF): A factor used in calculating the level of illumination after a given period of time and under given conditions. It takes into account temperature, dirt accumulation on the luminaire, lamp depreciation, maintenance procedures, and atmospheric conditions. An LLF includes a recoverable light-loss factor.

F. Luminaire: A complete lighting unit, internally lighted exit sign, or emergency lighting unit. Luminaires include lamps and the parts required to distribute light, position and protect lamps, and connect lamps to power supply. Note that "fixture" and "luminaire" may be used interchangeably and the "IES Lighting Handbook" uses "luminaire" over "fixture."

G. Pole: Luminaire support structure, including tower used for large area illumination.

H. Uniformity Gradient (UG): The rate of change of illuminance on the playing field, expressed as a ratio between the illuminances of adjacent measuring points on a uniform grid.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Luminaire support structures.
3. Limits of athletic fields.
4. Proposed underground utilities and structures.
5. Existing underground utilities and structures.
6. Athletic field support structures.

B. Qualification Data: For qualified Installer and professional engineer.

C. Welding certificates.

D. Product Certificates:

1. For each type of ballast for bi-level and dimmer-controlled luminaire, from manufacturer.
2. For support structures, including brackets, arms, appurtenances, bases, anchorages, and foundations, from manufacturer.

E. Field quality-control reports.

F. Sample warranty.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of lighting product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of the luminaires.

4. Ballast, including BF, UL listing and recognition, ANSI certification, and Energy Independence and Security Act of 2007 compliance.
5. Lamps, including life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides," of each lighting luminaire type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the luminaire as applied in this Project.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the NVLAP for Energy Efficient Lighting Products.

7. Photoelectric relays.
8. Means of attaching luminaires to supports and indication that attachment is suitable for components involved.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Include plans, elevations, sections, and mounting and attachment details.
2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

D. Delegated-Design Submittal: For exterior athletic lighting indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings and specifications for construction of lighting system.
2. Manufacturer's determination of LLF used in design calculations.
3. Lighting system design calculations for the following:

    a. Target illuminance.
    b. Point calculations of horizontal and vertical illuminance, CV, and UG at minimum grid size and area.
    c. Point calculations of horizontal and vertical illuminance in indicated areas of concern for spill light.
    d. Calculations of source intensity of luminaires observed at eye level from indicated properties near the playing fields.

4. Electrical system design calculations for the following:

    a. Short-circuit current calculations for rating of panelboards.
    b. Total connected and estimated peak-demand electrical load, in kilowatts, of lighting system.
    c. Capacity of feeder required to supply lighting system.

5. Wiring requirements, including required conductors, cables, and wiring methods.
6. Structural analysis data and calculations used for pole selection.

a. Manufacturer Wind-Load Strength Certification: Submit certification that selected total support system, including poles, complies with AASHTO LTS-6-M for location of Project.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Luminaires.
2. Luminaire support structures.
3. Limits of athletic fields.
4. Proposed underground utilities and structures.
5. Existing underground utilities and structures.
6. Athletic field support structures.

B. Qualification Data: For qualified Installer, manufacturer, and field testing agency.

C. Field quality-control reports.

D. Sample warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
2. Glass, Acrylic, and Plastic Lenses, Covers, and Other Optical Parts: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
4. Fuses: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: Manufacturer's responsibilities include fabricating sports lighting and providing professional engineering services needed to assume engineering responsibility.

1. **Engineering Responsibility: Preparation of delegated-design submittals and comprehensive engineering design and analysis by a qualified professional engineer for the pole structures and foundations.**

C. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory accredited under the NVLAP for Energy Efficient Lighting Products.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of luminaires, lamps, and luminaire alignment products and to correct misalignment that occurs subsequent to successful acceptance tests. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, and unauthorized repairs and alterations from special warranty coverage.

1. Luminaire Warranty: Luminaire and luminaire assembly (excluding fuses and lamps) shall be free from defects in materials and workmanship for a period of 10 years from date of Substantial Completion.
2. Lamp Warranty:

    a. Replace lamps and fuses that fail within 24 months from date of Substantial Completion.

3. Alignment Warranty: Accuracy of alignment of luminaires shall remain within specified illuminance uniformity ratios for a period of five years from date of successful completion of acceptance tests.

    a. Realign luminaires that become misaligned during the warranty period.
    b. Replace alignment products that fail within the warranty period.
    c. Verify successful realignment of luminaires by retesting as specified in "Field Quality Control" Article.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available manufacturers: Subject to compliance, metal conduit manufacturers include, and are limited to:
1. Musco
2. Eaton Corp.
3. Carolina High Mast

2.2 ALLIED PERFORMANCE REQUIREMENTS

A. Facility Type: College.

B. Illumination Criteria:

1. Minimum average target illuminance level for each lighted area for each sports venue and for the indicated class of play according to IES RP-6.
2. CV and maximum-to-minimum uniformity ratios for each lighted area equal to or less than those listed in IES RP-6 for the indicated class of play.
3. UG levels within each lighted area equal to or less than those listed in IES RP-6 for the indicated speed of sport.

C. Illumination Criteria including lighting levels (horizontal/vertical footcandles), uniformity, etc. shall meet NCAA criteria for Regional television broadcasts. At a minimum, the criteria below shall be met

1. Minimum Average Target Illumination: 100 footcandles infield / 70 footcandles outfield
2. Horizontal Uniformity: 1.5:1 infield, 2.0:1 outfield
3. Vertical Average Target Illumination: 70/40 footcandles to high home plate camera, 70/40 footcandles to 1st baseline camera, 70/40 footcandles to 3rd baseline camera
4. CV: 0.13 or less
5. Maximum-to-Minimum Uniformity Ratio:
6. UG Level:

D. Illumination Calculations: Computer-analyzed point method complying with IES RP-6 to optimize selection, location, and aiming of luminaires.

1. Grid Pattern Dimensions: For playing areas of each sport and areas of concern for spill-light control, correlate and reference calculated parameters to the grid areas. Each grid point represents the center of the grid area defined by the length and width of the grid spacing.
2. Spill-Light Control: Minimize spill light for each playing area on adjacent and nearby areas.

    a. Prevent light trespass on properties near Project as defined by Marshall University.
    b. For areas indicated on Drawings as "spill-light critical," limit the level of illuminance directed into the area from any luminaire or group of luminaires, and measured 36 inches (914 mm) above grade to the following:

3. Glare Control: Design illumination for each playing area to minimize direct glare in adjacent and nearby areas.

4. Determine LLF according to IES RP-6 and manufacturer's test data.

    a. Use LLD at 100 percent of rated lamp life. LLF shall be applied to initial illumination to ensure that target illumination is achieved at 100 percent of lamp life and shall include consideration of field factor.
    b. LLF shall not be higher than 70 percent and may be lower when determined by manufacturer after application of the ballast output and optical system output according to IES RP-6.

5. Luminaire-Mounting Height: Comply with IES RP-6, with consideration for requirements to minimize spill light and glare.

6. Luminaire Placement: Luminaire clusters shall be outside the glare zones defined by IES RP-6.

E. Baseball Fields:

1. IES RP-6: Class of Play II.
2. Speed of Sport: Fast.
3. Grid Pattern Dimensions: 30 by 30 feet (9 by 9 m).

F. Egress Lighting: In case of power failure, provide a minimum of 1.0-fc (10.8-lux) illumination, within 30 seconds, measured at grade in spectator and spectator egress areas.

1. Duration of emergency illumination shall be not less than 15 minutes.
2. Momentary Power Interruptions: Provide emergency illumination immediately following restoration of power to the lighting circuits. Emergency illumination shall automatically extinguish after 15 minutes.

G. Lighting Control: Manual, low voltage, or digital; providing the following functions, integrated into a single control station, with multiple subcontrol stations as indicated:

1. Control Station: Key-operated master switch, manual push-button controls, and system status indicator lights.
2. Light Levels: Two levels of control - **100/50** percent of minimum target illumination.

H. Electric Power Distribution Requirements:

1. Electric Power: 480 V; single phase.

a. Include roughing-in of service indicated for nonsports improvements on Project site.
b. Balance load between phases. Install wiring to balance three phases at each support structure.
c. Include required overcurrent protective devices and individual lighting control for each sports field or venue.
d. Include indicated feeder capacity and panelboard provisions for future lighted sports field construction.

2. Maximum Total Voltage Drop from Source to Load: 5 percent, including voltage drops in branch circuit, subfeeder, and feeder.

2.3 LUMINAIRES, LAMPS, AND BALLASTS

A. Luminaires: Complying with requirements described in Section 265619 "LED Exterior Lighting."

1. Listed and labeled, by an NRTL acceptable to authorities having jurisdiction, for compliance with UL 1598 for installation in wet locations.
2. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without using tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent their accidental falling during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lens. Designed to disconnect ballast when door opens.
3. Exposed Hardware: Stainless-steel latches, fasteners, and hinges.

4. Spill-Light Control Devices: Internal louvers and external baffles furnished by manufacturer and designed for secure attachment to specific luminaire.

B. Ballast (Driver) Mounting: Grouped in cabinets, remote from location of associated luminaires unless otherwise indicated.

2.4 SUPPORT STRUCTURES

2.5 STEEL POLES (Athletic Lighting)

A. Available manufacturers: Subject to compliance, metal conduit manufacturers include, but are not limited to:
1. **American LitePole**
2. **Cooper Lighting, Eaton**
3. **EGS / Appleton Electric**
4. **H.E. Williams**

B. Source Limitations: Obtain poles from single manufacturer or producer.

A. Engineering Responsibility: Preparation of delegated-design submittals and comprehensive engineering design and analysis by a qualified professional engineer for the pole structures and foundations.
1. **Pole Structural Design: The stress analysis and safety factor of the poles shall conform to 2013 AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals (LTS-6).**
2. **All luminaires must include the following as a standard product; external visors, and cross-arm assemblies shall withstand 150 mph winds, banners (up to 16'x24') and maintain luminaire aiming alignment for 10 years.**
3. **Coordination and accommodation of other loads such as foul ball netting system.**
4. **Refer to Design Drawings for pole shapes and elevations, banner locations, etc.**

B. Manufacturer must provide a complete new cross-arm assembly with no external wiring. All wiring to be internal to the cross-arm and pole.

C. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.

D. Poles: Comply with ASTM A500/A500M, Grade B carbon steel with a minimum yield of 46,000 psig (317 MPa); one-piece construction up to 100 feet in height with access handhole in pole wall pending pole cross section.

1. **Shape: Refer to Drawings**
2. **Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.**

E. Steel Mast Arms: Single-arm Truss Davit type, continuously welded to pole attachment plate. Material and finish same as plate.

F. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. **Adaptor fitting welded to pole, allowing the bracket to be bolted to the pole-mounted adapter, then bolted together with stainless galvanized-steel bolts.**

2. **Cross Section: Refer to Drawings.**

G. **Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.**

H. **Fasteners: Stainless steel Galvanized steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.**

1. **Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.**
2. **Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.**

I. **Grounding and Bonding Lugs: Welded 1/2-inch (13-mm) threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.**

J. **Handhole if required: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches (65 by 130 mm), with cover secured by stainless-steel captive screws.**

K. **Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.**

L. **Platform for Lamp and Ballast Servicing: Pending height of ballast, factory fabricated of steel, with finish matching that of pole. Final approval by Architect**

M. **Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.**

1. **Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.**
2. **Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.**
3. **Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.**

a. **Color: As selected by Architect from manufacturer's full range of options.**

2.6 POWER DISTRIBUTION AND CONTROL

A. Wiring Method for Feeders, Subfeeders, Branch Circuits, and Control Wiring: Underground nonmetallic raceway; No. 10 AWG minimum conductor size for power wiring.

B. Overhead-, pole-, or structure-supported wiring and transformers are not permitted.

C. Electrical Enclosures Exposed to Weather: NEMA 250, Type 3R enclosure constructed from stainless steel, with hinged doors fitted with padlock hasps or lockable latches.

2.7 SURGE PROTECTION

A. Surge Protection: Comply with requirements in Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits" and include surge suppressors with the following requirements:

1. Panelboard type.
2. Nonmodular, with digital indicator lights and one set of dry contacts.
3. Peak Single-Impulse Surge Current Rating: 50 kA per phase.

2.8 POLE AND BASE PROTECTION

A. Pole Pads: Wraparound pad, with 4 inches (100 mm) of extra-firm polyfoam, 360-degree coverage of ground-mounted poles and supports, continuous hook-and-loop fastening; and not less than 72 inches (1820 mm) high.

2.9 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire electrical and communications conduit to verify actual locations of connections before pole or luminaire installation.

C. Examine foundations for suitable conditions where luminaires will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install cables in raceways, except when cables are installed within boxes and poles. Conceal raceways and cables.

1. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

C. Coordination layout and installation of luminaires with other construction.

D. Use web fabric slings (not chain or cable) to raise and set structural members. Protect equipment during installation to prevent corrosion.

E. Install poles and other structural units level, plumb, and square.

F. Install luminaires at height and aiming angle as indicated on Drawings.

G. Except for embedded structural members, grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole. Nonshrink grout is specified in Section 055000 "Metal Fabrications."

H. Extend cast-in-place bolted base foundations 36 inches (914 mm) above grade **at A, C, and D poles**, minimum.

I. Install controls and ballast housings in cabinets mounted on support structure at least 10 feet (3 m) above finished grade.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: **Engage** a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. After installing sports lighting system and after electrical circuits have been energized, perform proof-of-performance field measurements and analysis for compliance with requirements.
2. Playing and Other Designated Areas: Make field measurements at intersections of grids, dimensioned and located as specified in "Performance Requirements" Article and as described below:

    a. Baseball Fields: Measure at least 25 points of the infield and **120 points** of the outfield. Extend the grid 15 feet (5 m) outside the foul lines, extending to outfield boundary or fence.

3. Make field measurements at established test points in areas of concern for spill light and glare.
4. Perform analysis to demonstrate correlation of field measurements with specified illumination quality and quantity values and corresponding computer-generated values that were submitted with engineered design documents. Submit a report of the analysis. For computer-generated values, use manufacturer's lamp lumens that are adjusted to lamp age at time of field testing.

C. Correction of Illumination Deficiencies for Playing Areas: Make corrections to illumination quality or quantity, measured in field quality-control tests, that varies from specified illumination criteria by plus or minus 10 percent.

1. Add or replace luminaires; change mounting height and aiming; or install louvers, shields, or baffles.
2. If luminaires are added or mounting height is changed, revise aiming and recalculate and modify or replace support structures if indicated.
3. Do not replace luminaires with units of higher or lower wattage without Architect's approval.
4. Retest as specified above after repairs, adjustments, or replacements are made.
5. Report results in writing.

D. Correction of Excessive Illumination in Spill-Light-Critical Areas: If measurements indicate that specified limits for spill light are exceeded, make corrections to illumination quantity, measured in field quality-control tests, that reduce levels to within specified maximum values.

1. Replace luminaires; change mounting heights and revise aiming; or install louvers, shields, or baffles.
2. Obtain Architect's approval to replace luminaires with units of higher or lower wattage.
3. If mounting height is changed, revise aiming and recalculate and modify or replace support structures if indicated.
4. Retest as specified above after repairs, adjustments, or replacements are made.
5. Report results in writing.

E. Sports lighting will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust luminaires and supports to maintain orientation and aiming as recommended by manufacturer.

END OF SECTION 265668

Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"

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S303	LLRS STEEL - MOMENT FRAMES ELEV. 3	1
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S404	BOWL RAKERS - ELEVATIONS 4	1
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S503	SECTIONS AND DETAILS 4 (PRESS AND ROOF)	1
S504	SECTIONS AND DETAILS 5 (EXP. JT)	1
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S704	CONCRETE - TYP. DETAILS 4	1
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PROJECT

MARSHALL UNIVERSITY BASEBALL STADIUM

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL

AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL

AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION

AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL

Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT

D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE

S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

STATE OF WEST VIRGINIA
JON NIEMUTH
No. 3873
REGISTERED ARCHITECT
11.15.2019

CONSTRUCTION DOCUMENTS - BID SET

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60590790

SHEET TITLE

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G101

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AECOM

PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

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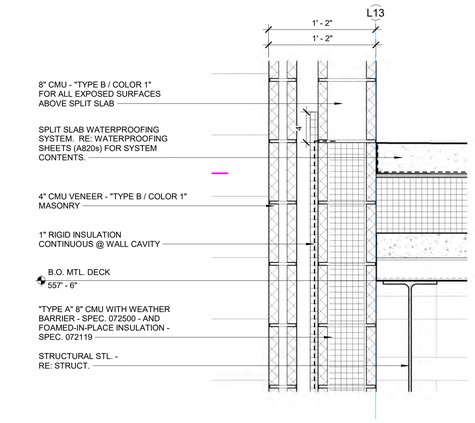
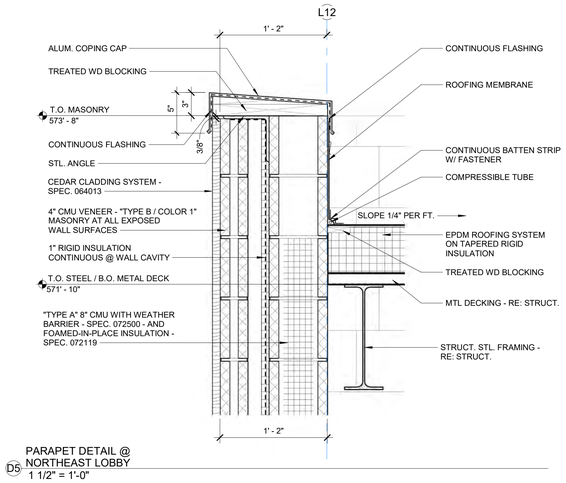
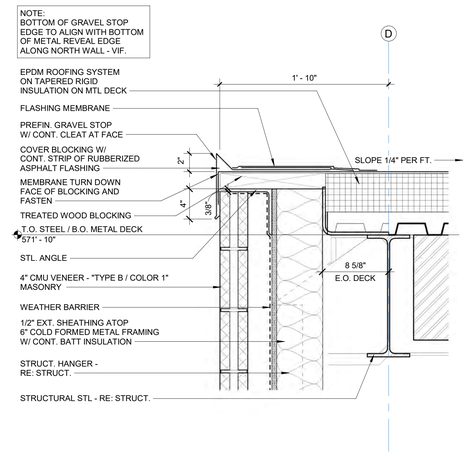
G102



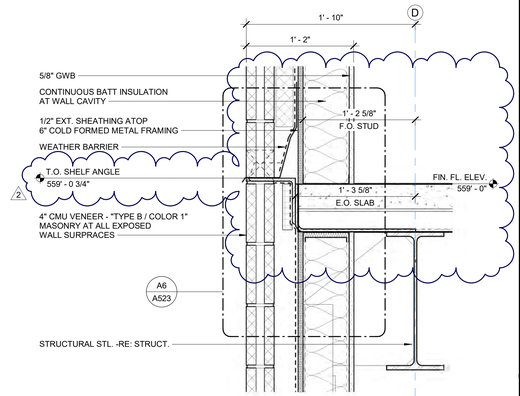
D6 SLAB EDGE DETAIL @ ABOVE FOOR SERVICE OFFICE
1 1/2" = 1'-0"



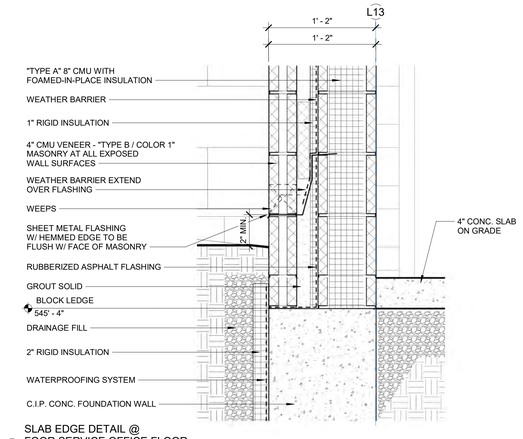
D5 PARAPET DETAIL @ NORTHEAST LOBBY
1 1/2" = 1'-0"



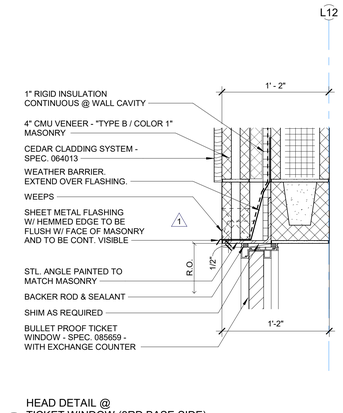
D3 GRAVEL STOP DETAIL @ LOBBY
1 1/2" = 1'-0"



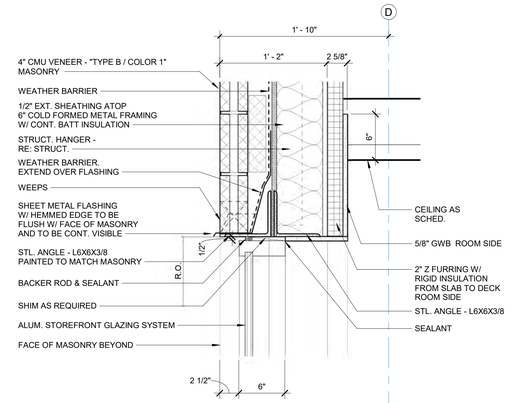
D2 SLAB EDGE DETAIL @ CMU VENEER CONCOURSE LEVEL
1 1/2" = 1'-0"



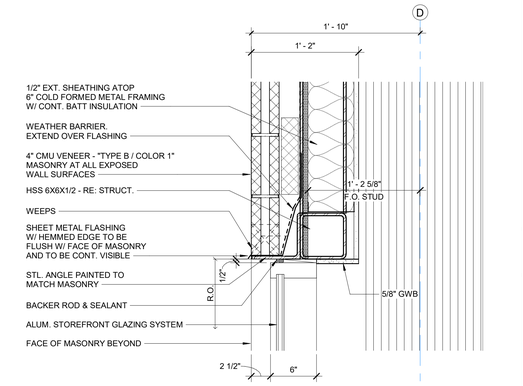
C6 SLAB EDGE DETAIL @ FOOR SERVICE OFFICE FLOOR
1 1/2" = 1'-0"



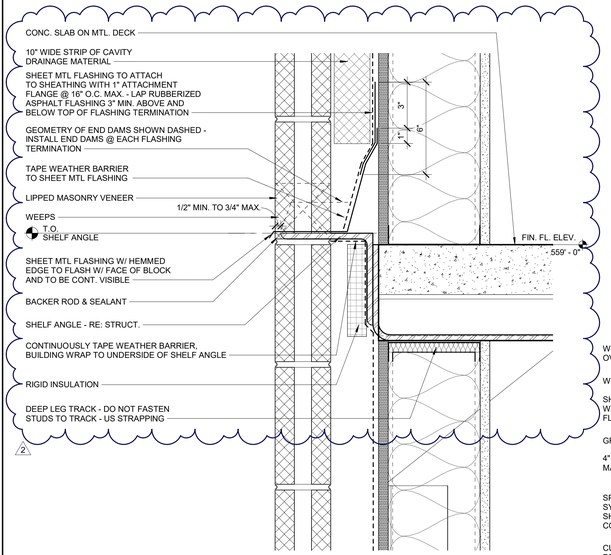
C5 HEAD DETAIL @ TICKET WINDOW (3RD BASE SIDE)
1 1/2" = 1'-0"



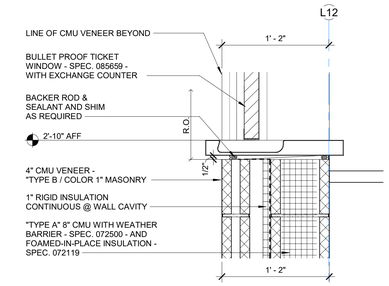
C3 HEAD DETAIL @ LOBBY GLAZING SYSTEM
1 1/2" = 1'-0"



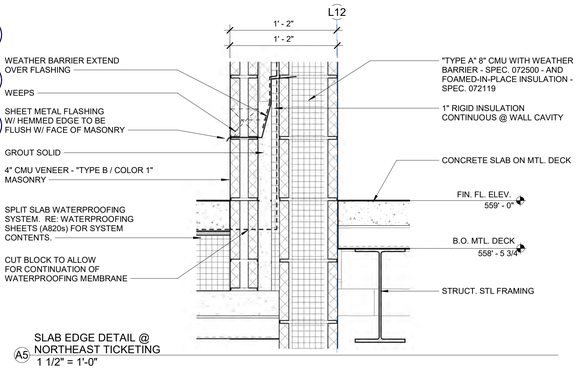
C2 HEAD DETAIL @ NORTH GLAZING SYSTEM
1 1/2" = 1'-0"



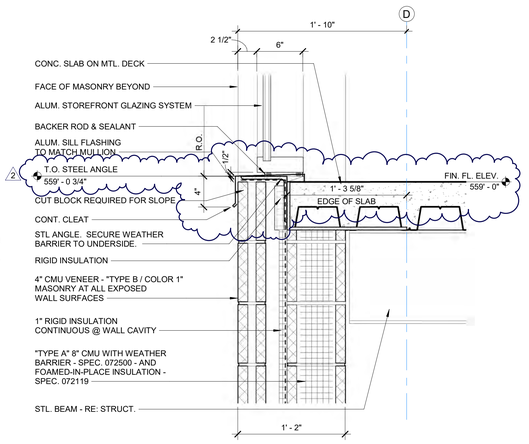
A6 DEFLECTION JOINT DETAIL @ SLAB EDGE W/ MASONRY VENEER
3" = 1'-0"



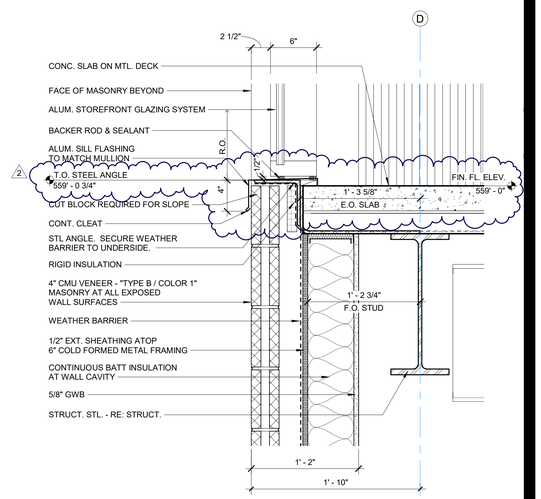
B5 SILL DETAIL @ TICKET WINDOW (3RD BASE)
1 1/2" = 1'-0"



A5 SLAB EDGE DETAIL @ NORTHEAST TICKETING
1 1/2" = 1'-0"



A3 SILL DETAIL @ LOBBY GLAZING SYSTEM
1 1/2" = 1'-0"



A2 SILL DETAIL @ NORTH GLAZING SYSTEM
1 1/2" = 1'-0"

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PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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2380 McGee St., #200
Kansas City, MO 64108
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11.15.2019

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

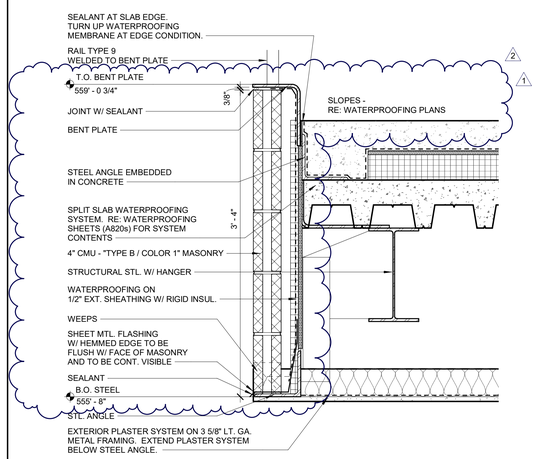
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/19	ADDENDUM 02
1	12/02/19	ADDENDUM 01

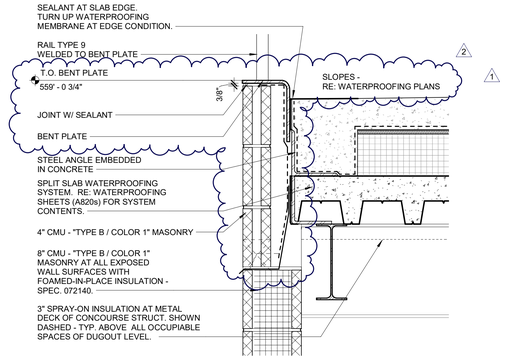
PROJECT NUMBER
60590790

SHEET TITLE
EXTERIOR DETAILS - SECTIONS @ CONCOURSE LEVEL

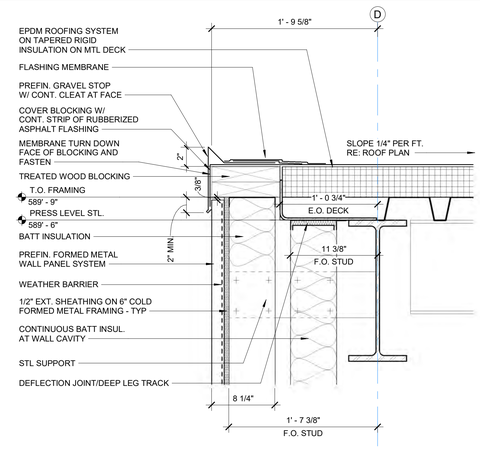
SHEET NUMBER
A523



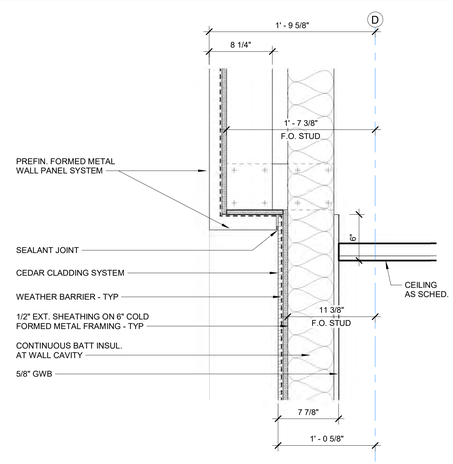
SLAB EDGE/RAILING DETAIL @ HOME TEAM BULLPEN SOFFIT
C6 1 1/2" = 1'-0"



SLAB EDGE/RAILING TYP DETAIL @ FIELD SIDE CONCOURSE
C5 1 1/2" = 1'-0"

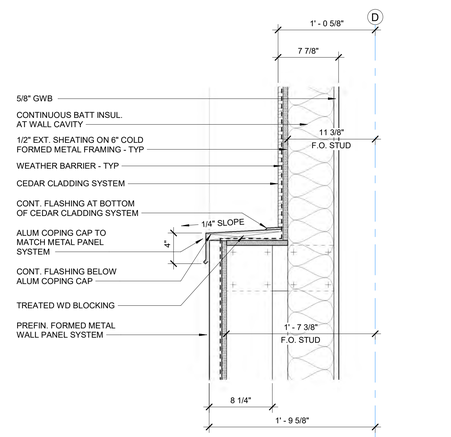


SECTION DETAIL @ ROOFING GRAVEL STOP
C3 1 1/2" = 1'-0"

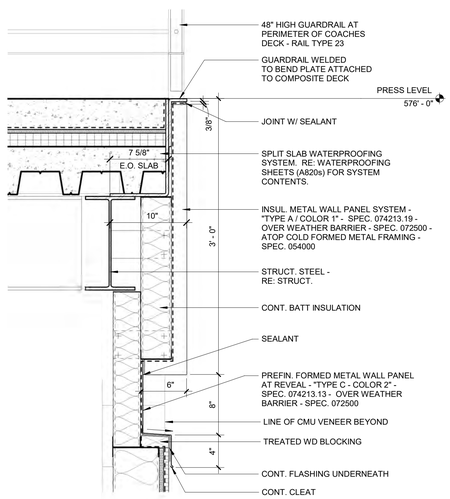


HEAD DETAIL @ GLAZING SYSTEM PRESS LEVEL
B3 1 1/2" = 1'-0"

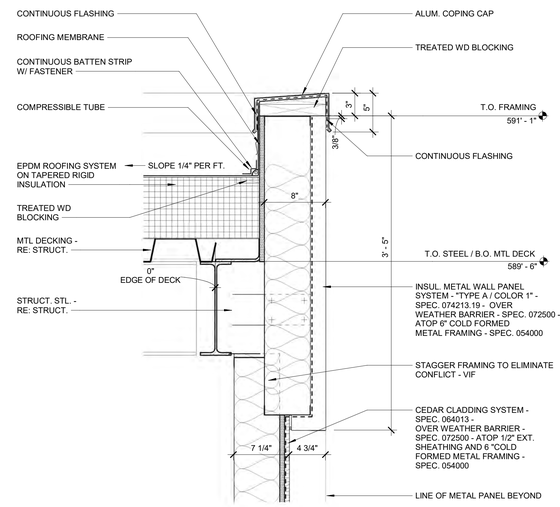
SECTION DETAIL @ RECESSED CEDAR CLADDING HEAD
C2 1 1/2" = 1'-0"



SECTION DETAIL @ RECESSED CEDAR CLADDING SILL
B1 1 1/2" = 1'-0"



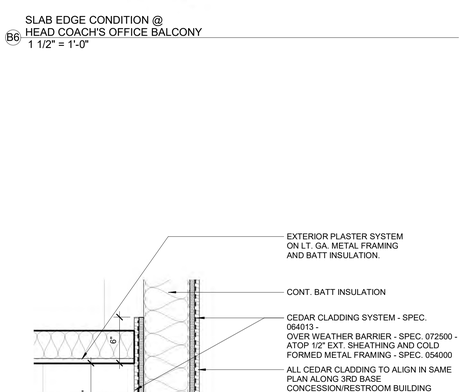
SLAB EDGE CONDITION @ HEAD COACH'S OFFICE BALCONY
B6 1 1/2" = 1'-0"



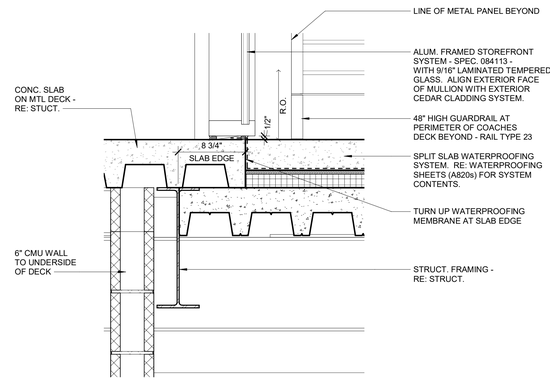
PARAPET DETAIL @ METAL PANEL FIELD SIDE
B5 1 1/2" = 1'-0"

SILL DETAIL @ GLAZING SYSTEM PRESS LEVEL
A3 1 1/2" = 1'-0"

SLAB EDGE DETAIL @ METAL PANEL PRESS LEVEL
A1 1 1/2" = 1'-0"



SOFFIT CONDITION @ CONCESSIONS 2.L10.02
A6 1 1/2" = 1'-0"



SILL DETAIL @ HEAD COACH'S OFFICE
A5 1 1/2" = 1'-0"

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PROJECT
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BASEBALL STADIUM

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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Kansas City, MO 64108
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JON NEMUTH
No. 20073
REGISTERED ARCHITECT
11.15.2019

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

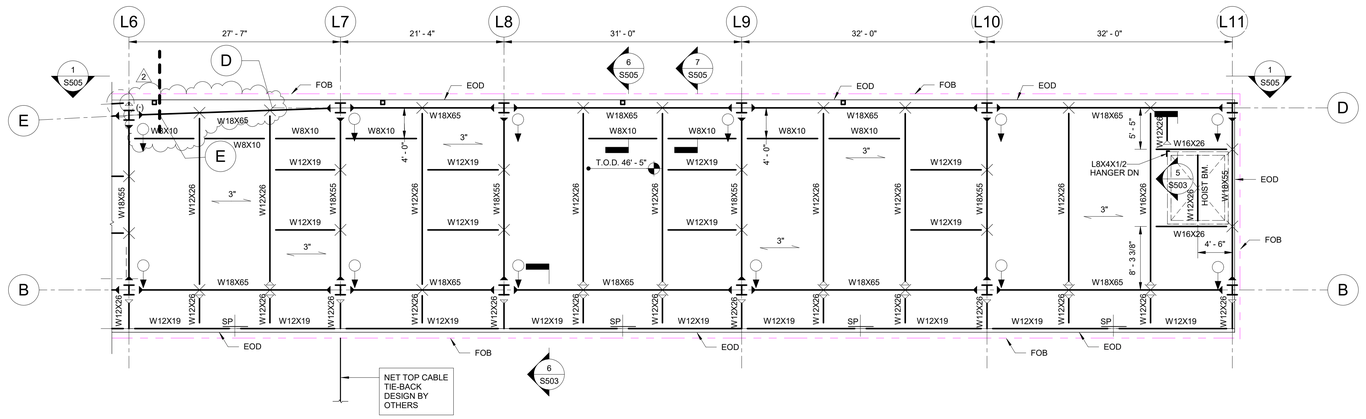
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/19	ADDENDUM 02
1	12/02/19	ADDENDUM 01

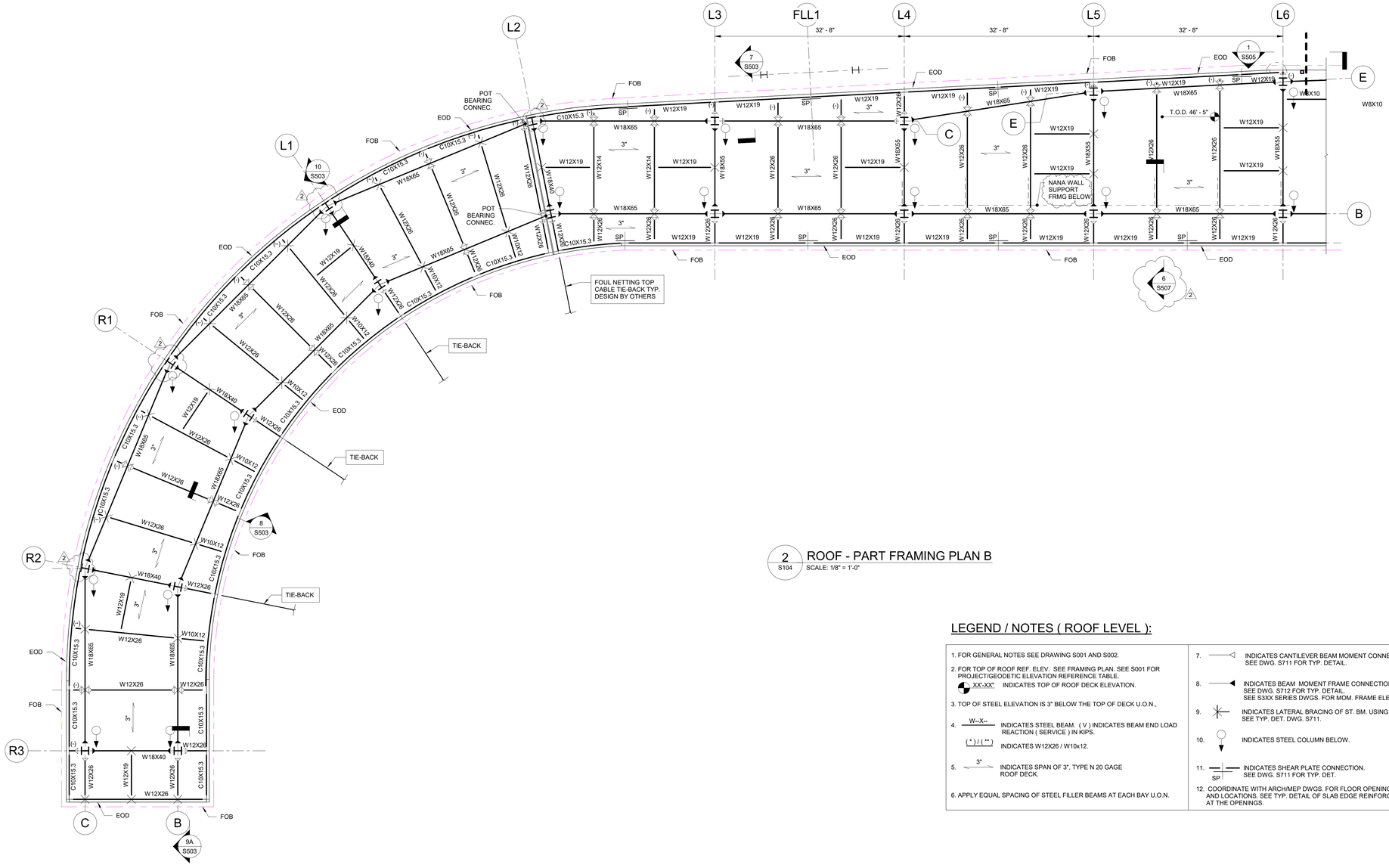
PROJECT NUMBER
60590790

SHEET TITLE
EXTERIOR DETAILS - SECTIONS @ PRESS LEVEL

SHEET NUMBER
A525



1 S104 ROOF - PART FRAMING PLAN A
SCALE: 1/8" = 1'-0"



2 S104 ROOF - PART FRAMING PLAN B
SCALE: 1/8" = 1'-0"

LEGEND / NOTES (ROOF LEVEL):

1. FOR GENERAL NOTES SEE DRAWING S001 AND S002.
2. FOR TOP OF ROOF REF. ELEV. SEE FRAMING PLAN. SEE S001 FOR PROJECT/GEODETIC ELEVATION REFERENCE TABLE.
   XX'-XX" INDICATES TOP OF ROOF DECK ELEVATION.
3. TOP OF STEEL ELEVATION IS 3" BELOW THE TOP OF DECK U.O.N.,
4. W--X-- INDICATES STEEL BEAM. (V) INDICATES BEAM END LOAD REACTION (SERVICE) IN KIPS.
   (*) / (**) INDICATES W12X26 / W10x12.
5. 3" INDICATES SPAN OF 3", TYPE N 20 GAGE ROOF DECK.
6. APPLY EQUAL SPACING OF STEEL FILLER BEAMS AT EACH BAY U.O.N.
7. INDICATES CANTILEVER BEAM MOMENT CONNECTION. SEE DWG. S711 FOR TYP. DETAIL.
8. INDICATES BEAM MOMENT FRAME CONNECTION. SEE DWG. S712 FOR TYP. DETAIL. SEE S3XX SERIES DWGS. FOR MOM. FRAME ELEVATIONS
9. INDICATES LATERAL BRACING OF ST. BM. USING ST. BEAM SEE TYP. DET. DWG. S711.
10. INDICATES STEEL COLUMN BELOW.
11. SP INDICATES SHEAR PLATE CONNECTION. SEE DWG. S711 FOR TYP. DET.
12. COORDINATE WITH ARCH/MEP DWGS. FOR FLOOR OPENING SIZES AND LOCATIONS. SEE TYP. DETAIL OF SLAB EDGE REINFORCEMENT AT THE OPENINGS.

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PROJECT

Project Name
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CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
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Kansas City, MO 64108
HTTP://AECOM.COM

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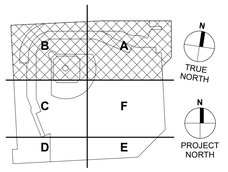
11/15/19

KEY PLAN



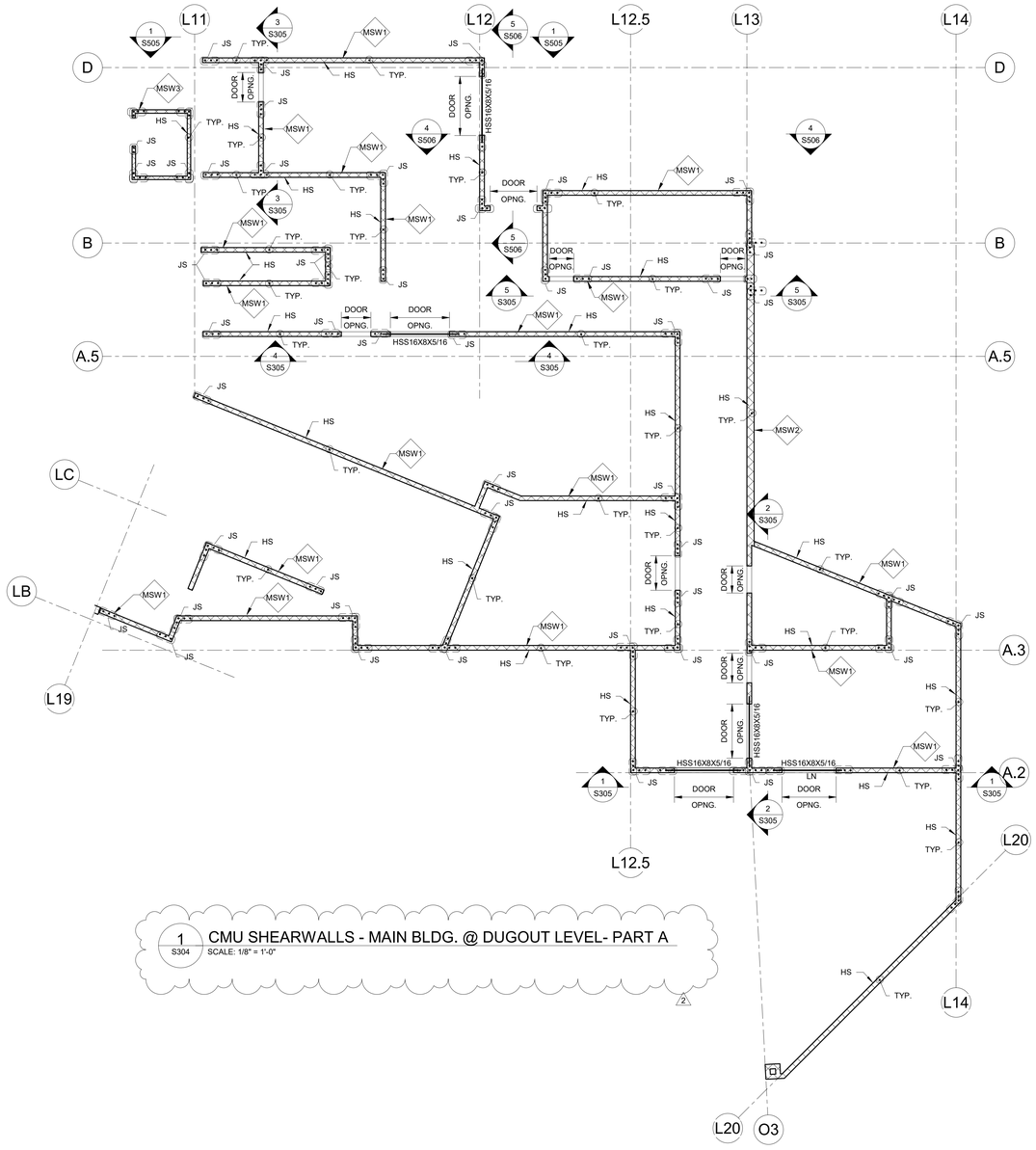
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/10/19	ADDENDUM #2
1	12/02/19	ADDENDUM # 1

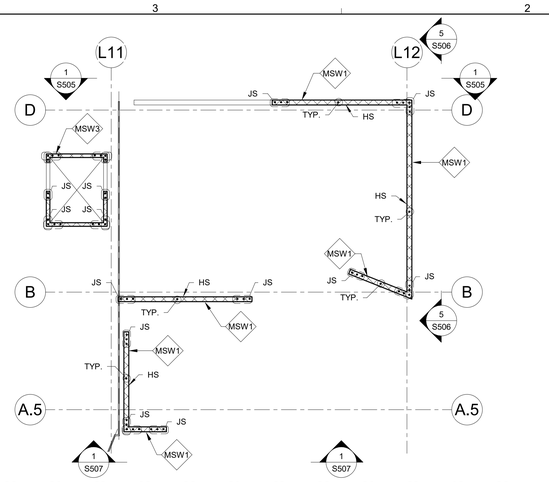
PROJECT NUMBER
Project Number

SHEET TITLE
ROOF (PRESS LEVEL) - FRAMING PLAN

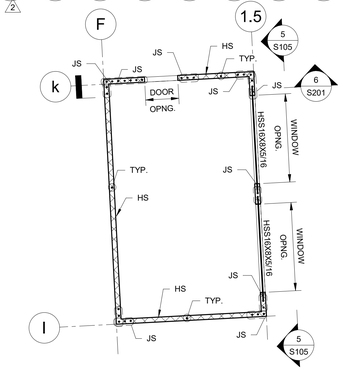
SHEET NUMBER
S104



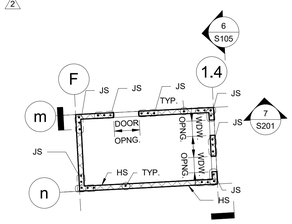
1 S304 CMU SHEARWALLS - MAIN BLDG. @ DUGOUT LEVEL- PART A
SCALE: 1/8" = 1'-0"



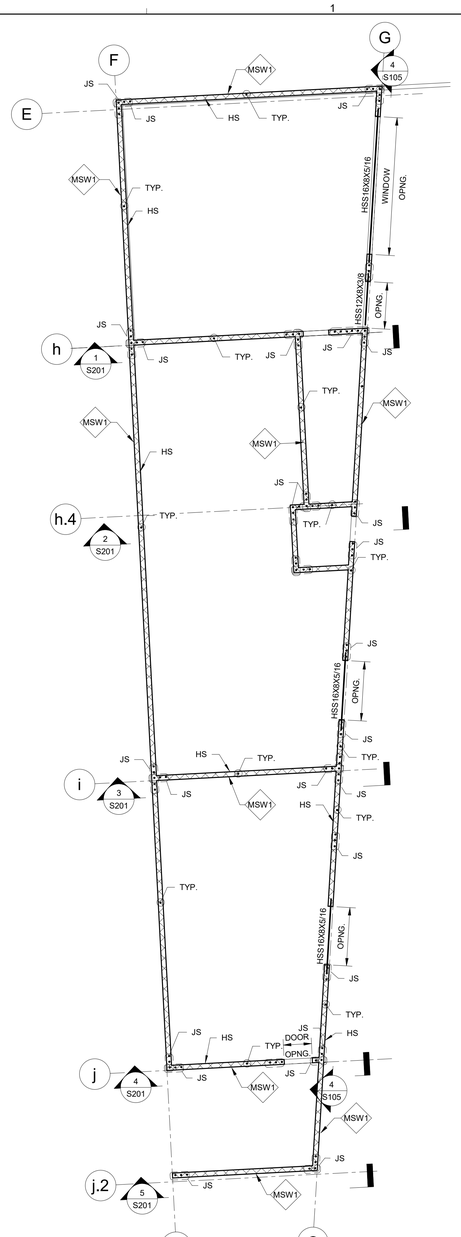
2 S304 CMU SHEAR WALLS - MAIN BLDG. @ CONCOURSE LEVEL
SCALE: 1/8" = 1'-0"



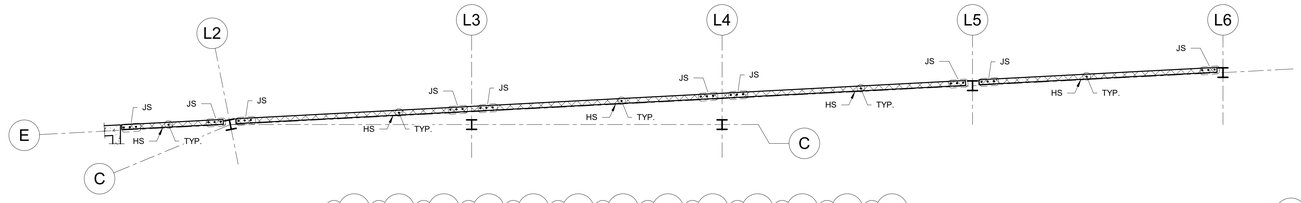
4 S304 CMU SHEARWALLS - CONCESSION
SCALE: 1/8" = 1'-0"



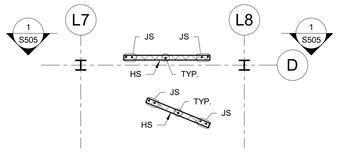
5 S304 CMU SHEARWALLS - TICKETTING BOOTH
SCALE: 1/8" = 1'-0"



3 S304 CMU SHEARWALLS - CONCESSION / RESTROOMS
SCALE: 1/8" = 1'-0"



6 S304 CMUS HEARWALLS - MAIN BLDG. @ DUGOUT LEVEL - PART B
SCALE: 1/8" = 1'-0"



7 S304 CMU STR WALLS - MAIN BLDG - PART FRAMING PLAN A
SCALE: 1/8" = 1'-0"

LEGEND / NOTES (MASONRY SHEAR WALLS):

1. FOR GENERAL NOTES SEE DRAWINGS S001 AND S002.
2. MSW# - INDICATES MASONRY SHEAR WALL TYPE.
3. FOR REINF. DETAILS AND ADDL. INFO SEE DWG S722
4. STR WALL REINFORCEMENT INDICATED:
   JS - #6 @ 8" O.C. IN GROUTED CELL PLACED AS INDICATED ON PLANS
   TYP. - #4 @24" O.C. IN GROUTED CELL
   HS - HORIZONTAL REINF. (2) GAGE 9 WIRE (LADDER TYPE) @16" O.C.
5. FOR WALL OPENING DETAILS SEE WALL ELEVATIONS INDICATED ON PLAN.

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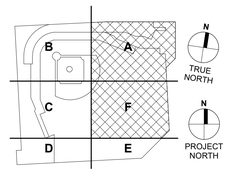


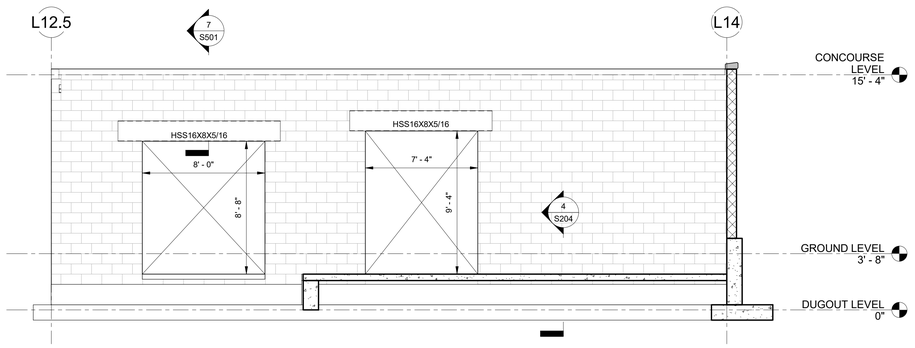
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/10/19	ADDENDUM #2
1	12/02/19	ADDENDUM # 1

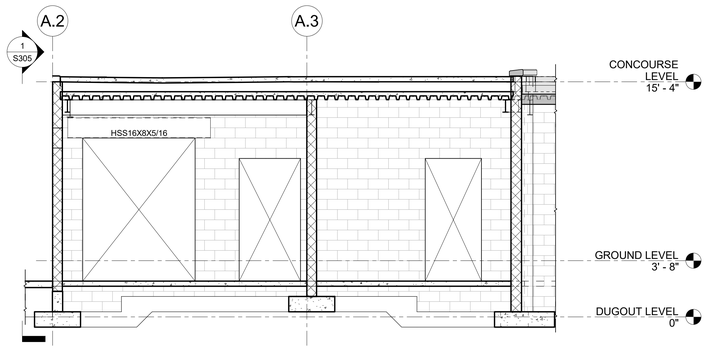
PROJECT NUMBER
Project Number

SHEET TITLE
LLRS MASONRY - SHEARWALLS 1

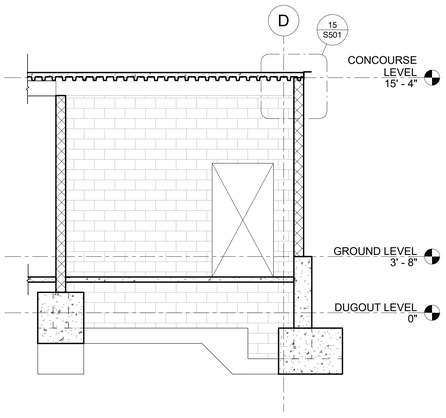
SHEET NUMBER
S304



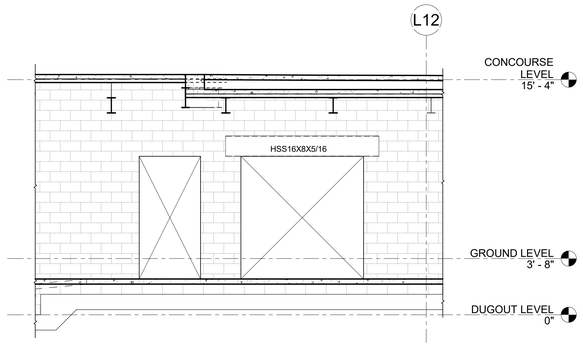
1 S305 CMU SHEARWALL - ELEV. 1
SCALE: 1/4" = 1'-0"



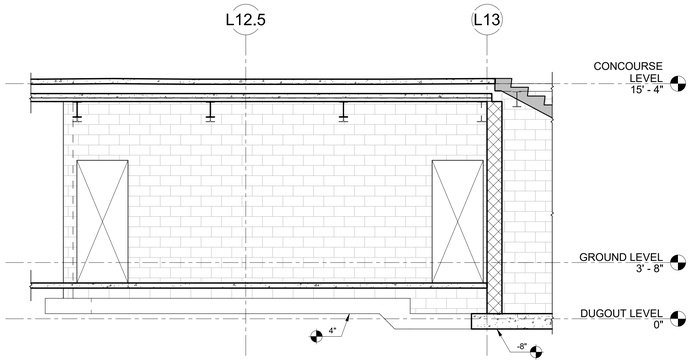
2 S305 CMU SHEARWALL - ELEV. 2
SCALE: 1/4" = 1'-0"



3 S305 CMU SHEARWALL - ELEV. 3
SCALE: 1/4" = 1'-0"



4 S305 CMU SHEARWALL - ELEV. 4 (PART)
SCALE: 1/4" = 1'-0"



5 S305 CMU SHEARWALL - ELEV. 5
SCALE: 1/4" = 1'-0"

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11/15/19

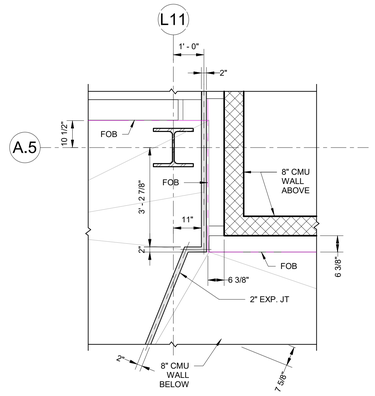
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/10/19	ADDENDUM #2

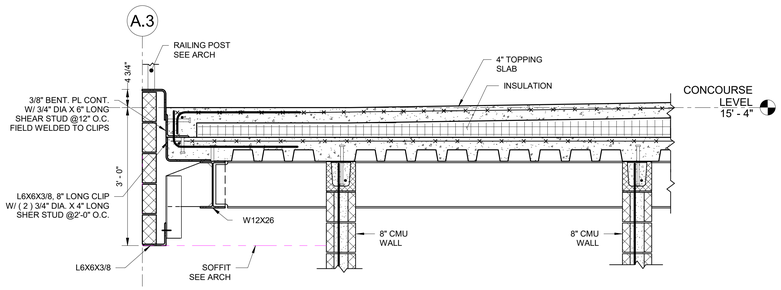
PROJECT NUMBER
Project Number

SHEET TITLE
LLRS MASONRY - SHEARWALLS 2

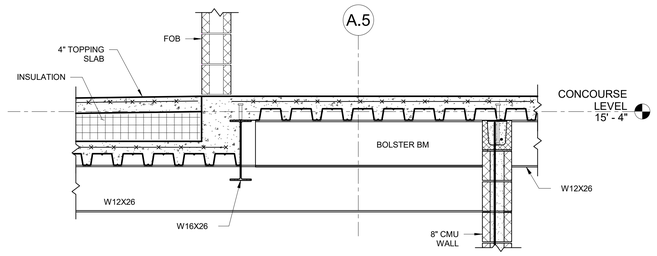
SHEET NUMBER
S305 2



1 S501 CONCOURSE - EXP. JOINT PART PLAN
SCALE: 1/2" = 1'-0"

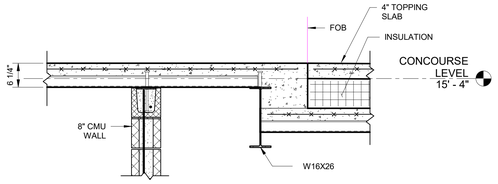


2 S501 CONCOURSE FRMG. - SECT. 1
SCALE: 3/4" = 1'-0"



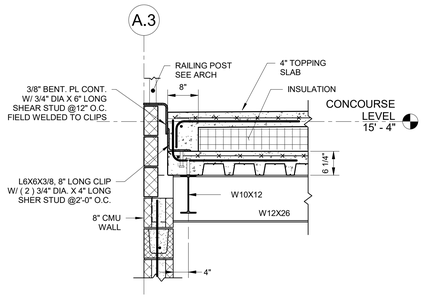
NOTE: SEE TYP. DET. DWG S713 FOR BALANCE OF INFO.

3 S501 CONCOURSE FRMG. - SECT. 2
SCALE: 3/4" = 1'-0"



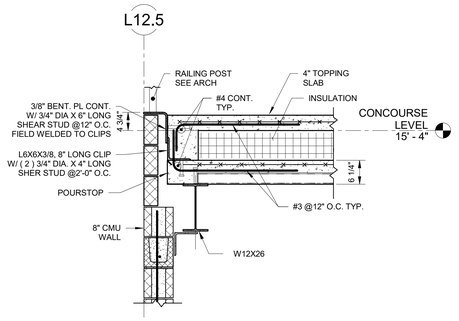
NOTE: SEE TYP. DET. DWG S713 FOR BALANCE OF INFO.

4 S501 CONCOURSE FRMG. - SECT. 3
SCALE: 3/4" = 1'-0"



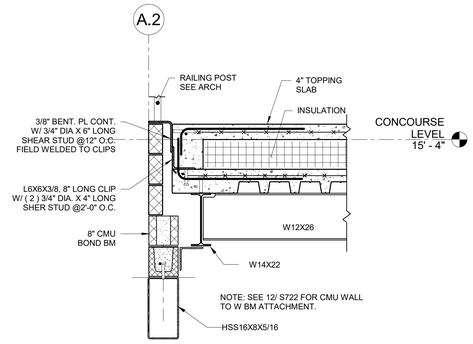
NOTE: SEE 12/ S722 FOR CMU WALL TO W BM ATTACHMENT.

5 S501 CONCOURSE FRMG. - SECT. 4
SCALE: 3/4" = 1'-0"

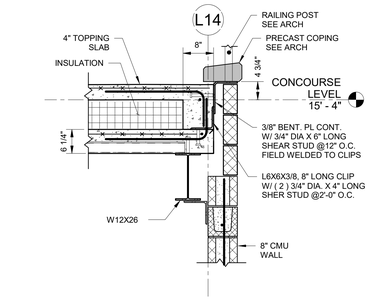


NOTE: SEE 12/ S722 FOR CMU WALL TO W BM ATTACHMENT.

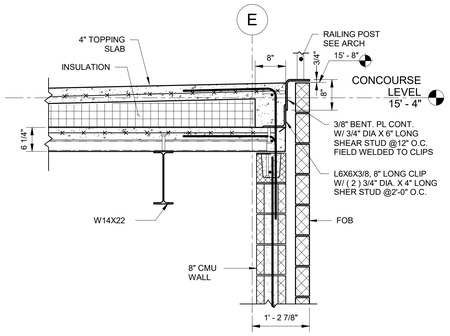
6 S501 CONCOURSE FRMG. - SECT. 5
SCALE: 3/4" = 1'-0"



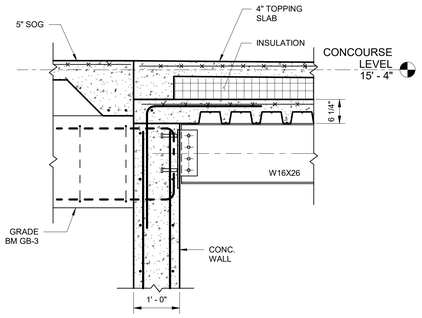
7 S501 CONCOURSE FRMG. - SECT. 6
SCALE: 3/4" = 1'-0"



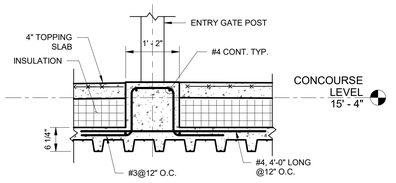
8 S501 CONCOURSE FRMG. - SECT. 7
SCALE: 3/4" = 1'-0"



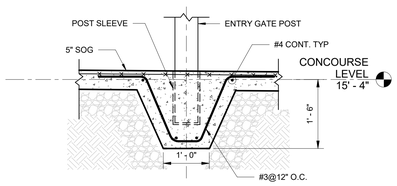
9 S501 CONCOURSE FRMG. - SECT. 8
SCALE: 3/4" = 1'-0"



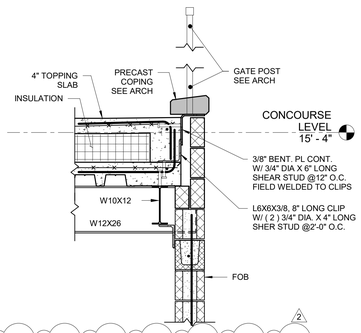
10 S501 CONCOURSE FRMG. - SECT. 9
SCALE: 3/4" = 1'-0"



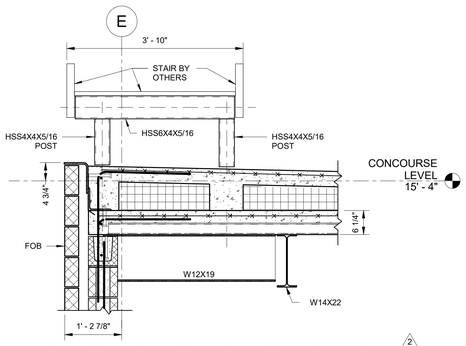
11 S501 CONCOURSE FRMG - ENTR. GATE CURB TYP DET. 1
SCALE: 3/4" = 1'-0"



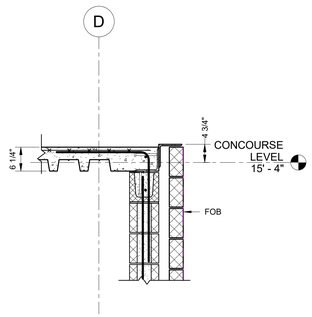
12 S501 CONCOURSE FRMG - ENTR. GATE CURB TYP. DET. 2
SCALE: 3/4" = 1'-0"



13 S501 CONCOURSE FRMG - SECT. 10
SCALE: 3/4" = 1'-0"



14 S501 STAIR SUPPORT AT CONCOURSE - SECT.
SCALE: 3/4" = 1'-0"



15 S501 CONCOURSE FRMG - SECT 11
SCALE: 3/4" = 1'-0"

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1 John Marshall Drive
Huntington, WV 25755
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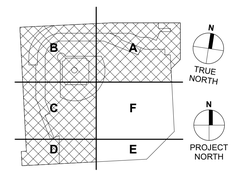
KEY PLAN



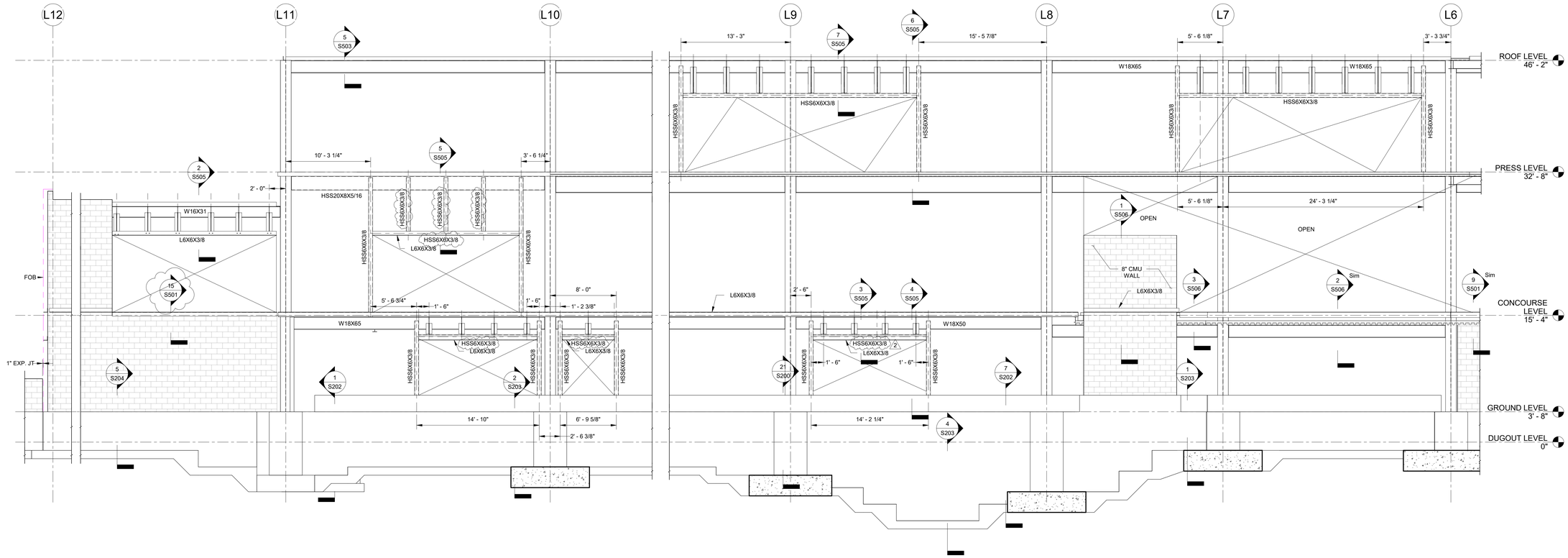
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/10/19	ADDENDUM #2
1	12/02/19	ADDENDUM # 1

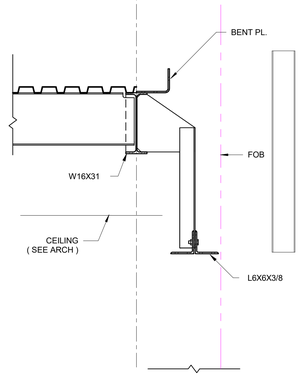
PROJECT NUMBER
Project Number

SHEET TITLE
SECTIONS AND DETAILS 2 (CONCOURSE)

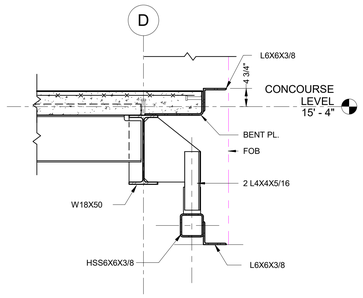
SHEET NUMBER
S501



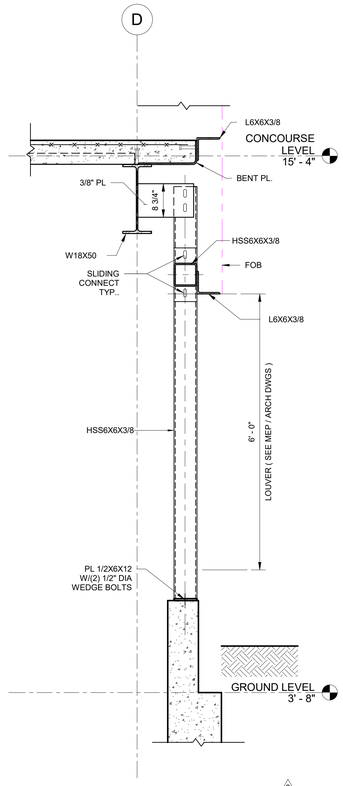
1 S505 PART OF NORTH WALL ELEV. 1 - MISC. STEEL FRAMING
SCALE: 3/16" = 1'-0"



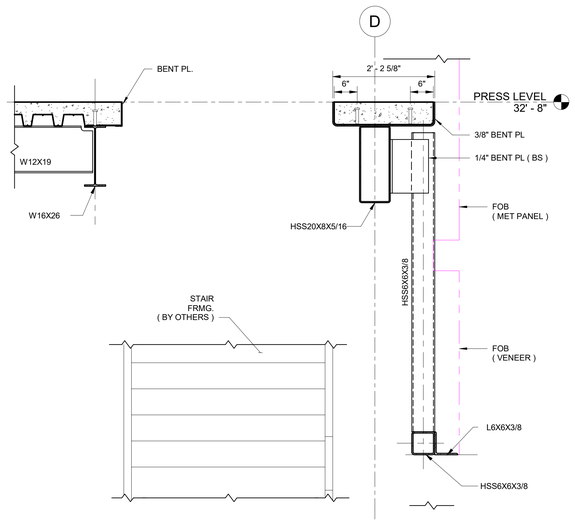
2 S505 NORTH WALL - SECT. 1
SCALE: 3/4" = 1'-0"



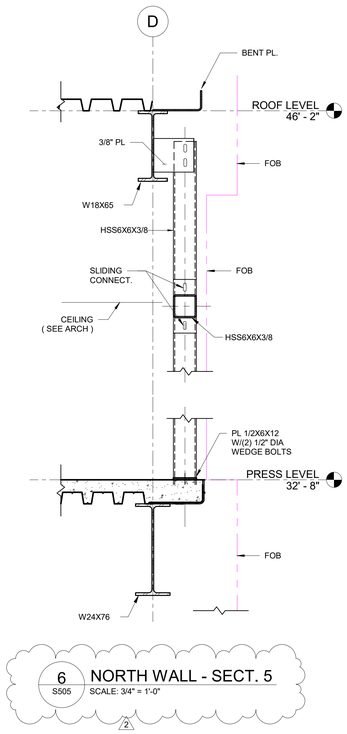
3 S505 NORTH WALL - SECT. 22
SCALE: 3/4" = 1'-0"



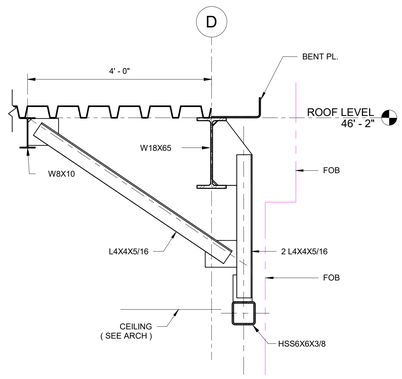
4 S505 NORTH WALL - SECT. 3
SCALE: 3/4" = 1'-0"



5 S505 NORTH WALL - SECT. 4
SCALE: 3/4" = 1'-0"



6 S505 NORTH WALL - SECT. 5
SCALE: 3/4" = 1'-0"



7 S505 NORTH WALL - SECT. 6
SCALE: 3/4" = 1'-0"

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Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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Kansas City, MO 64108
HTTP://AECOM.COM

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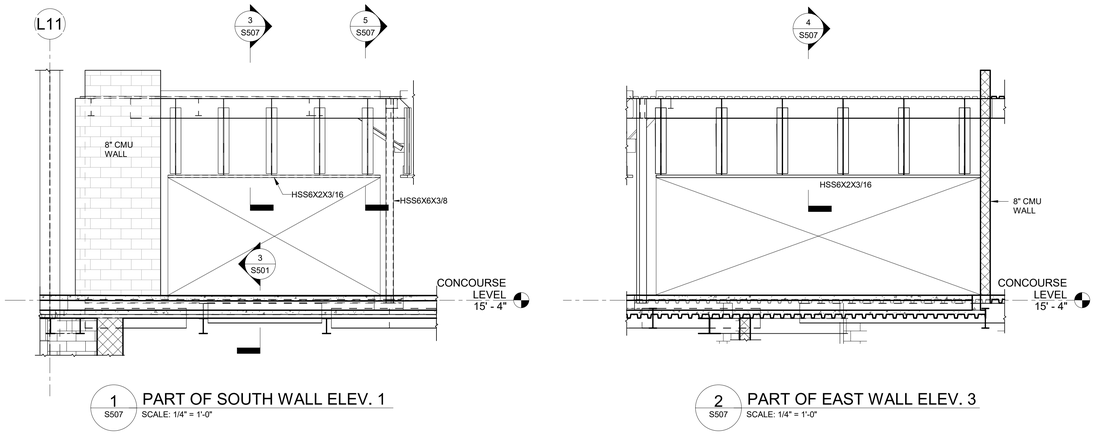
I/R	DATE	DESCRIPTION
2	12/10/19	ADDENDUM #2
1	12/02/19	ADDENDUM # 1

PROJECT NUMBER
Project Number

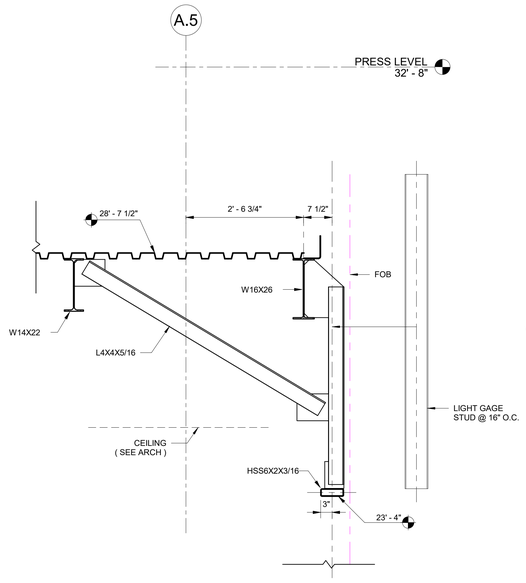
SHEET TITLE
SECTIONS AND DETAILS 6 (MISC. FACADE FRMG)

SHEET NUMBER
S505

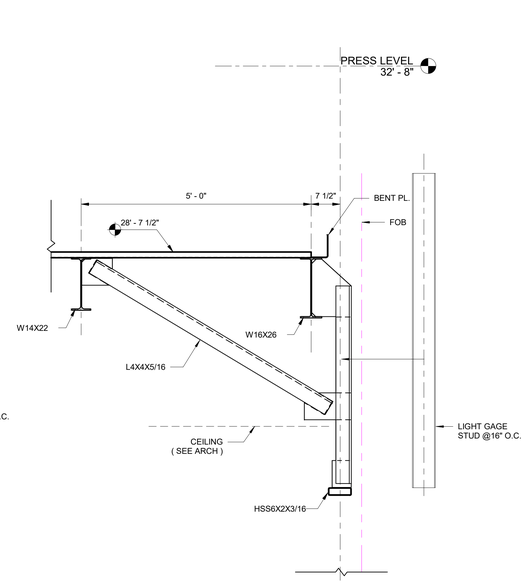


1 S507 PART OF SOUTH WALL ELEV. 1
SCALE: 1/4" = 1'-0"

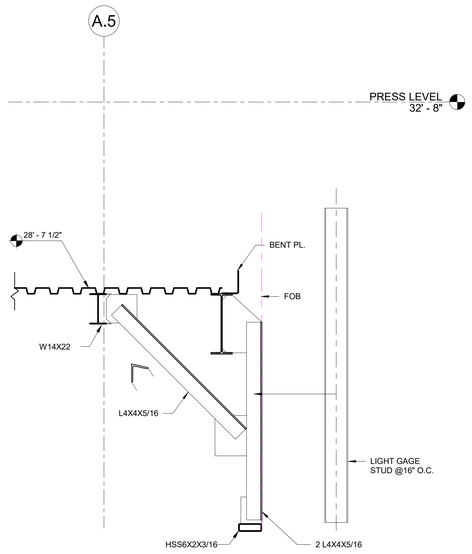
2 S507 PART OF EAST WALL ELEV. 3
SCALE: 1/4" = 1'-0"



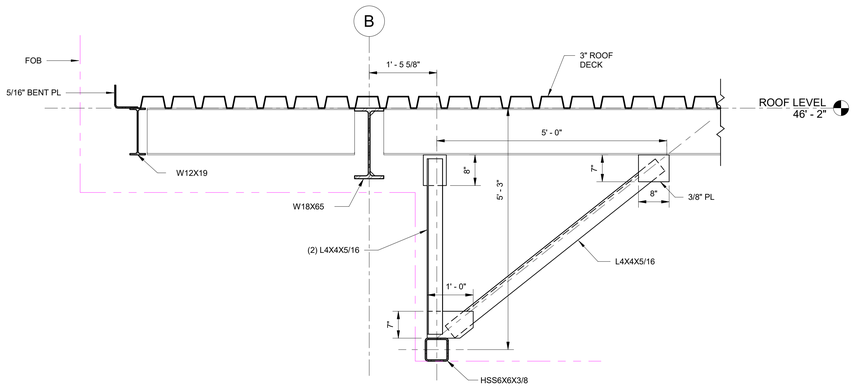
3 S507 SOUTH WALL - SECT. 1
SCALE: 3/4" = 1'-0"



4 S507 SOUTH WALL - SECT. 2
SCALE: 3/4" = 1'-0"



5 S507 EAST WALL - SECT. 3
SCALE: 3/4" = 1'-0"



6 S507 ROOF LEVEL FRMG - TOP OF NANA WALL TYP. SUPPORT
SCALE: 3/4" = 1'-0"

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HTTP://MARSHALL.EDU

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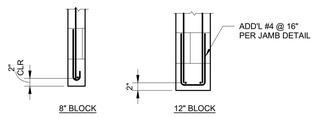
PROJECT NUMBER
Project Number

SHEET TITLE
SECTIONS AND DETAILS (MISC. FACADE FRMG)

SHEET NUMBER
S507



LINTEL REINFORCING SCHEDULE	
# OF REBAR	SIZE OF OPENING
2-#6	OPENINGS LESS THAN 5'-0"
2-#7	OPENINGS 5'-1" TO 7'-0"
2-#8	OPENINGS 7'-1" TO 10'-0"

NOTE: FOR STEEL LINTEL SEE SCHEDULE

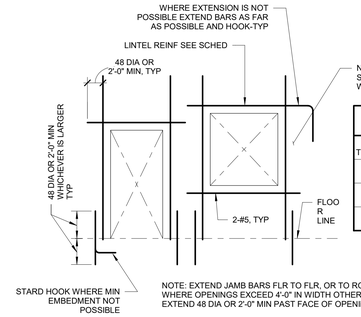
MASONRY LINTEL

(SILLS SIMILAR)

MASONRY JAMB

* WHEN "L" ≤ 32" USE ONE PIECE REINF W/ STANDARD HOOK EA END

MASONRY PIER



TYPICAL MASONRY WALL REINFORCING		
WALL THICKNESS	VERTICAL BARS	HORIZONTAL BARS
6"	#4 @ 32" OC @ CL OF WALL	#4 @ 32" OC
8"	#5 @ 24" OC OF CL OF WALL	#4 @ 24" OC
12"	#5 @ 32" OC EA FACE (STAGGER 16")	#4 @ 32" OC EA FACE (STAGGER 16")

ELEVATION

1 S721 CMU WALL OPENINGS TYP. REINF. / MIN. REINF.
SCALE:N.T.S.

MASORNY WALL STEEL LINTEL SCHEDULE				
MAX. WALL OPENING	MASORNY WALL THICKNESS			
	4" WALL	6" WALL	8" WALL	12" WALL
3'-0"	L3 1/2x3 1/2x1/4	2-⌊L3 1/2x2 1/2x1/4	2-⌊L3 1/2x3 1/2x1/4	3-⌊L3 1/2x3 1/2x1/4
4'-0"	L4x3 1/2x1/4	2-⌊L3 1/2x2 1/2x1/4	2-⌊L4x3 1/2x1/4	3-⌊L4x3 1/2x1/4
5'-0"	L4x3 1/2x1/4	2-⌊L3 1/2x2 1/2x1/4	2-⌊L5x3 1/2x1/4	3-⌊L5x3 1/2x1/4
6'-0"	L5x3 1/2x1/4	2-⌊L3 1/2x2 1/2x1/4	2-⌊L5x3x1/4	3-⌊L5x3x1/4
8'-0"	L6x3 1/2x1/4	2-⌊L3 1/2x2 1/2x1/4	2-⌊L6x3 1/2x3/8	3-⌊L6x3 1/2x3/8

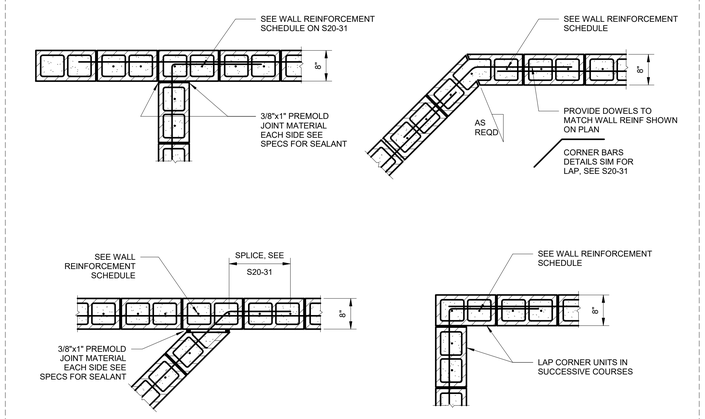
NOTES:

1. PROVIDE AND INSTALL LINTEL ANGELS FOR MASONRY OPENINGS IN ACCORDANCE WITH THE SCHEDULE ABOVE. ISTALL LONG LEG VERTICAL.
2. PROVIDE 6" MIN. BEARING AT EACH END, BUT NOT LESS THAT 1" PER FOOT OF SPAN. FILL 2 COURSES OF MASONRY BELOW BEARING WITH GROUT.
3. WHERE MINIMUM BEARING CANNOT BE PROVIDED, ATTACHED SECURELY TO ADJACENT STRUCTURAL MEMBERS OR PROVIDE SEPARATE SUPPORT.
4. WHERE LINTELS OCCUR IN EXTERIOR WALLS, MINIMUM THICKNESS SHALL BE 5/16" AND ANGLES SHALL BE HOT DIPPED GALVANIZED.
5. WHERE WALL THICKNESS EXCEEDS 12" PROVIDE ONE ADDITIONAL ANGLE FOR EACH ADDITIONAL 4" OF WALL.

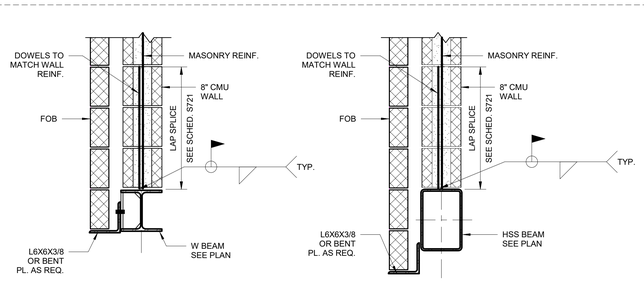
SPLICE LENGTH FOR MASONRY CONSTRUCTION			
WIRE SIZE	SPLICE LENGHT	BAR SIZE	SPLICE LENGHT
W1.7	12"	#4	24"
W2.1	12"	#5	30"
W2.8	12"	#6	37"
W4.9	12"	#7	51"
		#8	79"

NOTES:

1. SPLICE LENGTHS APPLY TO VERT. AND HORIZ. REINFORCEMENT.
2. ALL VERT. REINFORCEMENT SHALL EXTEND TO WITHIN 2 INCHES OF TOPS OF WALLS.
3. SEE STRUCTURAL / ARCH. PLANS FOR CMU WALL LOCATIONS.

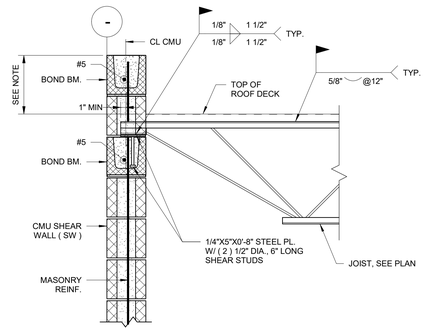


2 S721 TYP. MASONRY WALL CORRNERS AND INTERSECTION DET.
SCALE:N.T.S.



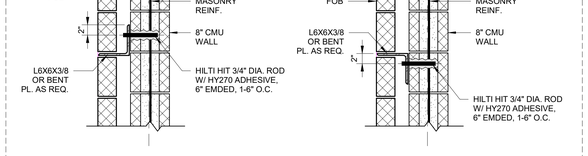
NOTE: LINTEL SHALL BE ATTACHED TO BEAM FOR OPENINGS EXCEEDING 4'-0", OTHERWISE USE LOOSE LINTEL

5 S721 TYP. VENEER LINTEL DET.
SCALE: 1" = 1'-0"

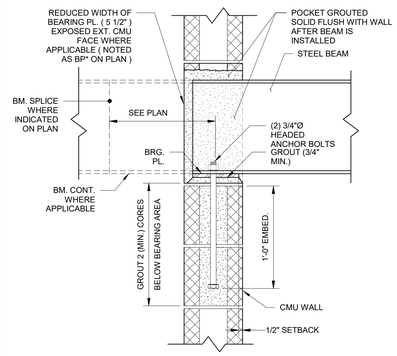


NOTE: WALL EXTENSION WHERE APPLICABLE

6 S721 JOIST BEARING ON CMU WALL - TYP DET.
SCALE: 1" = 1'-0"



7 S721 TYP. RELIEV. ANGLE / CMU WALL DET.
SCALE: 1" = 1'-0"

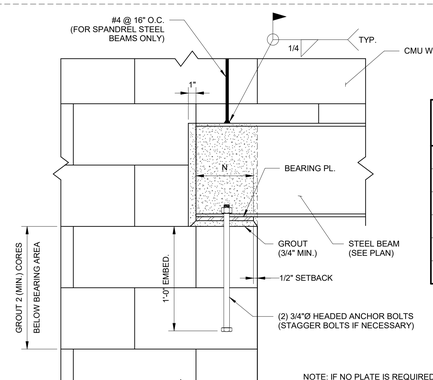


BEARING PLATE SCHEDULE (BEAM PERPENDICULAR TO WALL)	
BEAM	SIZE t x N x B
W16	3/4" x 7" x 1'-1"
W14	3/4" x 7" x 1'-1"
W12	3/4" x 7" x 1'-1"
W14 (*)	1" x 5 1/2"" x 1'-1"
W12 (*)	1" x 5 1/2"" x 1'-1"

(*) - INDICATES BM. BEARING ON EXPOSED EXTERIOR CMU WALL

NOTE: IF NO PLATE IS REQUIRED, BEAM SHALL BEAR ALONG ENTIRE WALL WIDTH.

3 S721 TYP. DET. OF ST. BEAM BEARING ON CMU WALL 1
SCALE:N.T.S.



BEARING PLATE SCHEDULE (BM PARALLEL TO WALL)	
BEAM	SIZE t x N x B
W16	3/4" x 7" x 0'-9"
W14	3/4" x 7" x 0'-9"

NOTE: IF NO PLATE IS REQUIRED, PROVIDE A MINIMUM BEARING LENGTH (N) OF 9".

4 S721 TYP. DET. OF ST. BEAM BEARING ON CMU WALL 2
SCALE:N.T.S.

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Huntington, WV 25755
HTTP://MARSHALL.EDU

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11/15/19

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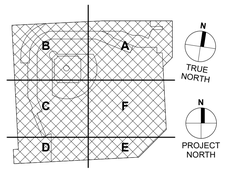

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/10/19	ADDENDUM #2
1	12/02/19	ADDENDUM # 1

PROJECT NUMBER
Project Number

SHEET TITLE
MASONRY - TYP. DETAILS 1

SHEET NUMBER
S721

MECHANICAL ABBREVIATIONS

NOTE: NOT ALL ABBREVIATIONS MAY BE USED.

ABBREVIATION	DESCRIPTION
(D)	EXISTING TO BE DEMOLISHED
(E)	EXISTING TO REMAIN
(F)	FUTURE
AFF	ABOVE FINISHED FLOOR
AMB	AMBIENT
APD	AIR PRESSURE DROP
BAS	BUILDING AUTOMATION SYSTEM
BFP	BACKFLOW PREVENTOR
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BOB	BOTTOM OF BEAM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STRUCTURE
BTUH	BRITISH THERMAL UNITS PER HOUR
CFM	CUBIC FEET PER MINUTE
CL	CENTER LINE
CO	CLEAN OUT
COMPR	COMPRESSOR
COP	COEFFICIENT OF PERFORMANCE
CV	CONSTANT VOLUME
DB	DRY BULB
DIA	DIAMETER
DN	DOWN
EAT	ENTERING AIR TEMPERATURE
EER	ENERGY EFFICIENCY RATIO
EFF	EFFICIENCY
EG	ETHYLENE GLYCOL
ESP	EXTERNAL STATIC PRESSURE
EWT	ENTERING WATER TEMPERATURE
FLA	FULL LOAD AMPS
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET
GAL	GALLONS
GPM	GALLONS PER MINUTE
HD	HEAD
HP	HORSEPOWER
ID	INNER DIAMETER
IPLV	INTEGRATED PART LOAD VALUE
KW	KILOWATTS
LAT	LEAVING AIR TEMPERATURE
LWT	LEAVING WATER TEMPERATURE
MBH	THOUSAND BTUH
MCA	MINIMUM CIRCUIT AMPACITY
MFR	MANUFACTURER
MOCP	MAXIMUM OVERCURRENT PROTECTION
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
NOX	NITROUS OXIDE
NPLV	NON-STANDARD PART LOAD VALUE
NPSH	NET POSITIVE SUCTION HEAD
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
PD	PRESSURE DROP
PG	PROPYLENE GLYCOL
PPH	POUNDS PER HOUR
PPM	PARTS PER MILLION
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
REFRIG	REFRIGERANT
RH	RELATIVE HUMIDITY
RPM	REVOLUTIONS PER MINUTE
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SP	STATIC PRESSURE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
VRF	VARIABLE REFRIGERANT FLOW
W	WATTS
WB	WET BULB
WG	WATER GAUGE
WPD	WATER PRESSURE DROP

MECHANICAL SYSTEM TYPES AND ABBREVIATIONS

NOTE: NOT ALL ABBREVIATIONS MAY BE USED.

ABBREVIATION	DESCRIPTION
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
D	DRAIN
EA	EXHAUST AIR
GR	GEOTHERMAL RETURN
GS	GEOTHERMAL SUPPLY
HR	HEAT PUMP RETURN
HS	HEAT PUMP SUPPLY
HWR	HEATING HOT WATER RETURN
HWS	HEATING HOT WATER SUPPLY
MW	MAKEUP WATER - GENERIC
OA	OUTDOOR AIR
PC	PUMPED CONDENSATE
R	REFRIGERANT
RA	RETURN AIR
REL	RELIEF AIR
SA	SUPPLY AIR
V	VENT

MECHANICAL SYMBOLS LIST

NOTE: NOT ALL SYMBOLS MAY BE USED.

SYMBOL	DESCRIPTION
	AIRFLOW ARROW
	FLOW ARROW
	CONNECT TO EXISTING
	END OF DEMOLITION
	PIPE CAPPED
	PIPE DROP
	PIPE RISE
	PIPE TEE DOWN
	PIPE REDUCER
	PIPE UNION
	PIPE GUIDES OR SLEEVES
	PIPE ANCHOR
	FLEXIBLE PIPE CONNECTION
	GENERAL SERVICE VALVE (SEE SPECIFICATIONS FOR VALVE TYPE PER APPLICATION)
	CHECK VALVE (ARROW INDICATES DIRECTION OF FLOW)
	MANUAL BALANCING VALVE
	AUTOMATIC BALANCING VALVE
	TWO-WAY CONTROL VALVE
	THREE-WAY CONTROL VALVE
PICBV	TWO-WAY PRESSURE INDEPENDENT CONTROL AND BALANCE VALVE
	PRESSURE REDUCING VALVE
	STEAM PRESSURE REGULATING VALVE
	RELIEF VALVE
	DRAIN VALVE WITH THREADED HOSE CONNECTION
	REDUCED PRESSURE BACKFLOW PREVENTER
	PRESSURE GAUGE WITH STOPCOCK
	STRAINER WITH BLOW DOWN VALVE
AV	AUTOMATIC AIR VENT
MAV	MANUAL AIR VENT
	TEMPERATURE/PRESSURE TEST PLUG (PETE'S PLUG)
	STEAM TRAP
CO CO	CLEAN OUT
	FLOW METER
	THERMOMETER
	PITCH DOWN IN DIRECTION OF ARROW
H	HUMIDISTAT WITH ADJUSTABLE CONTROL
T	THERMOSTAT WITH ADJUSTABLE CONTROL
H	HUMIDITY SENSOR
T	TEMPERATURE SENSOR
CO2	CARBON DIOXIDE SENSOR
CO	CARBON MONOXIDE SENSOR
NO2	NITROGEN DIOXIDE SENSOR
OS	OCCUPANCY SENSOR

MECHANICAL SYMBOLS LIST CONT.

NOTE: NOT ALL SYMBOLS MAY BE USED.

SYMBOL	DESCRIPTION
	SUPPLY DIFFUSER WITH FLEXIBLE DUCT TAG - NECK SIZE / AIRFLOW (CFM) — TAG EXAMPLE: S1-6a / 100
	SUPPLY DIFFUSER TAG - NECK SIZE / AIRFLOW (CFM) — TAG EXAMPLE: S1-6a / 100
	RETURN/EXHAUST GRILLE TAG / AIRFLOW (CFM) — TAG EXAMPLE: R1 / 500, E1 / 500
	SIDEWALL SUPPLY DIFFUSER TAG - NECK SIZE / AIRFLOW (CFM) — TAG EXAMPLE: S2-12x8 / 100
	SIDEWALL RETURN/EXHAUST GRILLE TAG / AIRFLOW (CFM) — TAG EXAMPLE: R2 / 100, E2 / 100
BDD	DAMPERS/DUCT ACCESSORIES BDD: BACKDRAFT DAMPER FSD: FIRE/SMOKE DAMPER FD: FIRE DAMPER MD: MOTORIZED DAMPER SD: SMOKE DAMPER VD: VOLUME DAMPER SB: SECURITY BARS
	SUPPLY AND OUTDOOR AIR RECTANGULAR DUCT ELBOW UP OVAL DUCT ELBOW UP ROUND DUCT ELBOW UP
	RETURN, RELIEF, AND EXHAUST AIR RECTANGULAR DUCT ELBOW UP OVAL DUCT ELBOW UP ROUND DUCT ELBOW UP
	SUPPLY AND OUTDOOR AIR RECTANGULAR DUCT ELBOW DOWN OVAL DUCT ELBOW DOWN ROUND DUCT ELBOW DOWN
	RETURN, RELIEF, AND EXHAUST AIR RECTANGULAR DUCT ELBOW DOWN OVAL DUCT ELBOW DOWN ROUND DUCT ELBOW DOWN
	NEW WORK DUCTWORK
	EXISTING DUCTWORK
	DEMOLITION DUCTWORK
	NEW WORK PIPING
	EXISTING PIPING
	DEMOLISHED PIPING
	NEW WORK MECHANICAL EQUIPMENT (WITH CLEARANCE SHOWN)
	EXISTING MECHANICAL EQUIPMENT
	DEMOLISHED MECHANICAL EQUIPMENT
	GENERIC FAN
	GENERIC PUMP
	ACCESS DOOR
	TERMINAL BOXES VAV TERMINAL BOX (WITH REHEAT) VAV TERMINAL BOX (NO REHEAT)
	TERMINAL BOX NOTES 1. IF MIN COOLING CFM IS NOT SHOWN ON PLANS, THEN MIN COOLING CFM IS EQUAL TO 65% OF MAX COOLING CFM. 2. HEATING CFM IS EQUAL TO MIN COOLING CFM. DUCTWORK PLANS: TAG / MAX COOLING CFM / MIN COOLING CFM PIPING PLANS: TAG / GPM

TAG EXAMPLES:	DUCTWORK PLANS		PIPING PLANS
	TB1 500/200	TB1 500	TB1 0.5

MECHANICAL CONTROLS SYMBOLS LIST

NOTE: NOT ALL SYMBOLS MAY BE USED.

SYMBOL	DESCRIPTION
AF	AIR FLOW MEASURING DEVICE
AS	AIR SWITCH
CT	CONDUCTIVITY TRANSMITTER
CS	CURRENT SENSOR
DP	DIFFERENTIAL PRESSURE TRANSMITTER
EPT	ELECTRONIC PNEUMATIC TRANSDUCER
ES	END SWITCH
FM	FLOW METER
HOA	HAND-OFF-AUTO SWITCH
LT	LEVEL TRANSMITTER
M	METER
PHT	PH TRANSMITTER
PS	PRESSURE SWITCH
PT	PRESSURE TRANSMITTER
SD	SMOKE DETECTOR
	STARTER
TS	TEMPERATURE SWITCH
VFD	VARIABLE FREQUENCY DRIVE
VT	VIBRATION TRANSMITTER
FS	WATER FLOW SWITCH

MECHANICAL SHEET INDEX

MECHANICAL GENERAL NOTES

1. INSTALL ALL WORK TO COMPLY WITH ALL LAWS, REGULATIONS, CODES, AND STANDARDS (FEDERAL, STATE, AND LOCAL), AS ADOPTED BY THE AGENCIES HAVING JURISDICTION, INCLUDING REASONABLY ANTICIPATED REVISIONS BASED ON EMERGING TRENDS IN BUILDING REGULATIONS. WHERE ANY OF THESE DIFFER, THE MOST STRINGENT SHALL APPLY.
2. CONTRACT DOCUMENTS FOR MECHANICAL WORK ARE SCHEMATIC IN NATURE AND ARE INTENDED TO CONVEY SCOPE AND GENERAL ARRANGEMENT ONLY.
3. PROVIDE ALL MATERIALS AND EQUIPMENT AND PERFORM ALL LABOR REQUIRED TO INSTALL COMPLETE AND OPERABLE SYSTEMS AS INDICATED ON THE DRAWINGS AND SPECIFICATIONS. INCLUDE ALL NECESSARY AND APPLICABLE APPURTENANCES, WHETHER INDICATED OR NOT.
4. ANY DEVIATIONS FROM THE BASIS OF DESIGN THAT REQUIRE ADDITIONAL PROVISIONS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
5. COORDINATE THE EXACT REQUIREMENTS AND LOCATION OF WORK WITH THE WORK OF OTHER TRADES PRIOR TO FABRICATION AND INSTALLATION. PROVIDE ADDITIONAL OFFSETS AND SECTIONS IN DUCTWORK AND/OR PIPING REQUIRED TO MEET THE APPLICABLE JOB CONDITION REQUIREMENTS. VERIFY JOB SITE ELEVATIONS, DIMENSIONS, AND CONDITIONS, PRIOR TO FABRICATION OR INSTALLATION OF THE WORK. COORDINATE EXACT ROUTING OF DUCTWORK AND PIPING WITH OTHER TRADES SO THAT NO CONFLICTS OCCUR WITH DUCTWORK, PIPING, LIGHTS, STRUCTURE, ETC. PROVIDE ALL PERTINENT DATA CONCERNING THE LOCATION, DIMENSIONS, ETC., OF THE MECHANICAL EQUIPMENT THAT REQUIRES BASES, CURBS AND SUPPORTS TO THE APPROPRIATE TRADES.
6. WHERE CEILINGS ARE INDICATED, ALL DUCTS AND PIPES SHALL BE RAN ABOVE CEILING. IN EXPOSED CONDITIONS, INSTALL DUCTWORK AND PIPING TIGHT TO THE BOTTOM OF STRUCTURE.
7. ALL RATED WALL AND FLOOR PENETRATIONS ARE TO BE SEALED WATER TIGHT AND PACKED WITH FIRE STOP MATERIAL.
8. ALL ITEMS THAT REQUIRE MAINTENANCE OR ADJUSTMENT MUST BE INSTALLED IN ACCESSIBLE LOCATIONS. PROVIDE AN APPROPRIATELY SIZED ACCESS DOOR AS REQUIRED.
9. ALL SEALS, BEARINGS, PACKINGS, AND ACCESSORIES FOR ALL EQUIPMENT AND PIPING SPECIALTIES SHALL BE SUITABLE FOR THE CONTINUOUS OPERATIONAL TEMPERATURES, PRESSURES AND CHARACTERISTICS, OF THE SYSTEM THEY SERVE.
10. PERFORM A COMPLETE AIR SYSTEM FLOW BALANCE FOR ALL EQUIPMENT THAT IS SHOWN, SCHEDULED OR OTHERWISE IDENTIFIED, AT THE END OF CONSTRUCTION.
11. INSTALL EQUIPMENT, MATERIALS, ETC. IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND DIRECTION. PROVIDE STRAIGHT INLET AND OUTLET DUCTS/PIPES BASED ON MANUFACTURERS RECOMMENDATIONS. IF IN CONFLICT WITH THE DESIGN INDICATED HEREIN, ADVISE THE ENGINEERS PRIOR TO INSTALLATION FOR CLARIFICATION.
12. COORDINATE THE EXACT LOCATIONS OF DIFFUSERS, GRILLES AND REGISTERS WITH ARCHITECTURAL REFLECTED CEILING PLANS, AREA SMOKE DETECTORS, SPRINKLERS, LIGHTS AND ELECTRICAL DEVICES. AIR DEVICES SHALL NOT BE WITHIN 3 FEET OF AN AREA SMOKE DETECTOR.
13. UNLESS NOTED OTHERWISE, PROVIDE BRANCH DUCT TO DIFFUSERS SAME SIZE AS DIFFUSER NECK. FLEXIBLE DUCT CONNECTION TO THE DIFFUSER SHALL BE NO MORE THAN FIVE FEET IN LENGTH. ALL BRANCH DUCT TAKEOFFS TO AIR DEVICES SHALL HAVE MANUAL BALANCING DAMPER INSTALLED IN ACCESSIBLE LOCATION.
14. AIR DEVICES PROVIDED WITH INTEGRAL BALANCE DAMPERS SHALL NOT HAVE AN ADDITIONAL BALANCING DAMPER AT AIR DEVICE BRANCH TAKEOFF. 2
15. PROVIDE ROOM TEMPERATURE THERMOSTATS FOR ALL EQUIPMENT THAT MAINTAINS SPACE TEMPERATURE. PREFERRED LOCATIONS ARE SHOWN ON THE PLANS. THERMOSTATS SHALL BE MOUNTED AT 48" ABOVE FINISHED FLOOR, UNLESS NOTED OTHERWISE. COORDINATE THE EXACT LOCATIONS OF THERMOSTATS WITH MARKERBOARDS, SWITCHES, AND ANY OTHER WALL MOUNTED FIXTURES PRIOR TO ROUGH IN.
16. AT TIME OF ROUGH INSTALLATION, DURING STORAGE ON THE CONSTRUCTION SITE, AND UNTIL FINAL STARTUP OF THE HEATING AND COOLING EQUIPMENT, ALL DUCT AND OTHER RELATED AIR DISTRIBUTION COMPONENT OPENINGS SHALL BE COVERED WITH TAPE, PLASTIC, SHEET METAL OR OTHER METHODS ACCEPTABLE FOR PROTECTION TO THE ENFORCING AGENCY TO REDUCE THE AMOUNT OF DUST OR DEBRIS WHICH MAY COLLECT IN THE SYSTEM(S).
17. IN MECHANICALLY VENTILATED BUILDINGS, PROVIDE REGULARLY OCCUPIED AREAS OF THE BUILDING WITH AIR FILTRATION MEDIA FOR OUTSIDE AND RETURN AIR THAT PROVIDES AT LEAST A MINIMUM EFFICIENCY REPORTING VALUE (MERV) OF 8 PRIOR TO OCCUPANCY. FILTERS SHALL BE CHANGED PRIOR TO AIR BALANCE AND COMMISSIONING, AND AGAIN AT THE COMPLETION OF CONSTRUCTION JUST PRIOR TO OCCUPANCY OF THE BUILDING WITH FINAL FILTERS PER SPECIFICATIONS. MAINTENANCE RECOMMENDATIONS FOR FILTERS OF THE SAME VALUE SHALL BE INCLUDED IN THE OPERATION AND MAINTENANCE MANUAL.
18. INSTALLATION OF HVAC, REFRIGERATION, AND FIRE SUPPRESSION EQUIPMENT SHALL NOT CONTAIN ANY CFCS OR HALONS.
19. ALL SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SYSTEMS, DEVICES SHALL BE FROM THE BUILDING STRUCTURE. SUPPORT FROM STRUCTURAL BRIDGING IS UNACCEPTABLE.
20. INSTALL NO PIPING, CONDUIT, DUCTWORK, ETC., IN A LOCATION OR IN A MANNER THAT WILL ALLOW FREEZING AND/OR THE COLLECTION OF CONDENSATION.

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PROJECT

MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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Kansas City, MO 64108
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CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

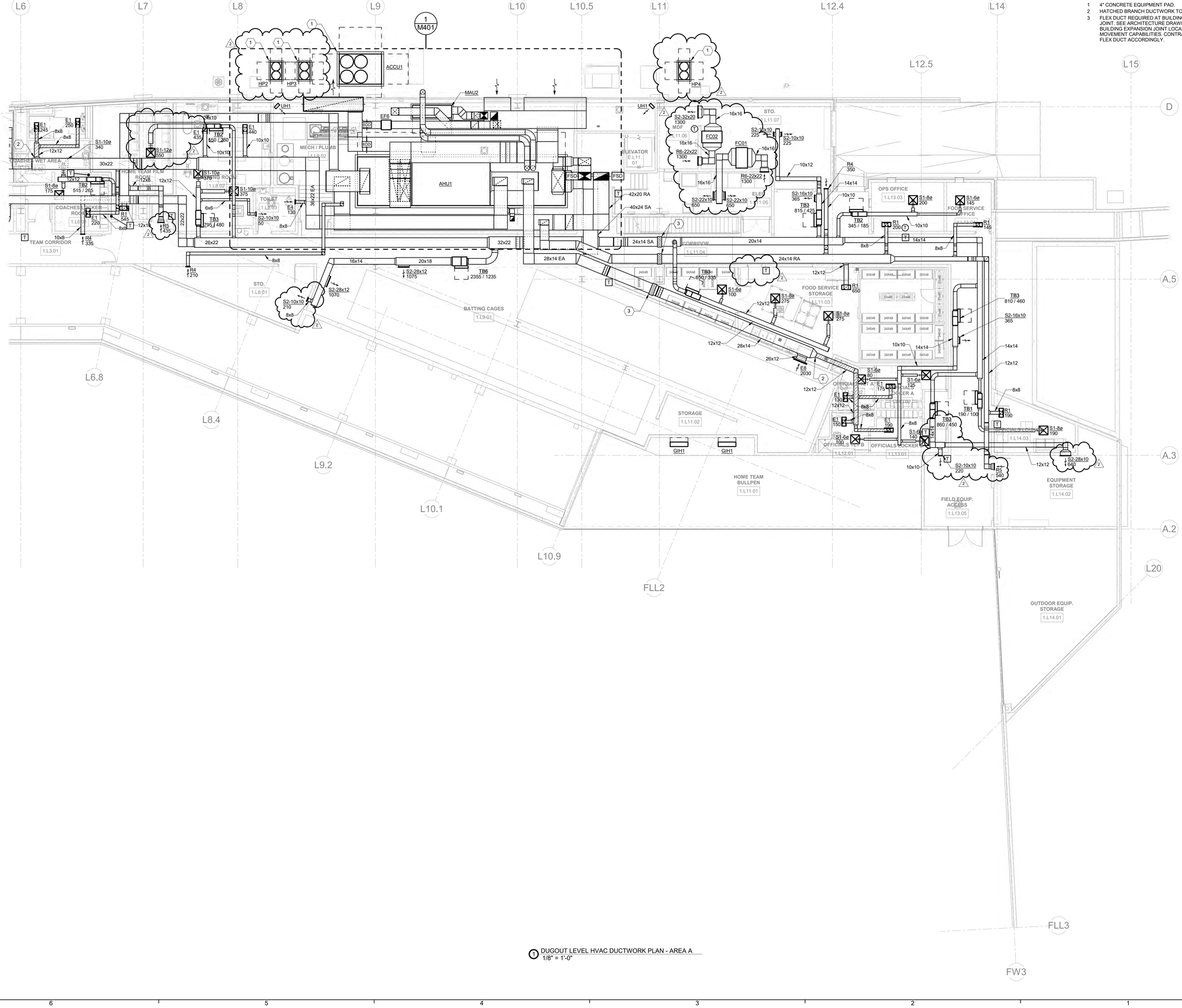
PROJECT NUMBER
60590790

SHEET TITLE
GENERAL INFO - HVAC

SHEET NUMBER
M001

KEYNOTES

1 4" CONCRETE EQUIPMENT PAD.
2 HATCHED BRANCH DUCTWORK TO BE ALUMINUM.
3 FLEX DUCT REQUIRED AT BUILDING EXPANSION JOINT. SEE ARCHITECTURE DRAWINGS FOR BUILDING EXPANSION JOINT LOCATIONS AND MOVEMENT CAPABILITIES. CONTRACTOR TO SIZE FLEX DUCT ACCORDINGLY.



1 DUGOUT LEVEL HVAC DUCTWORK PLAN - AREA A
1/8" = 1'-0"

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PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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Lenexa, KS 66214
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D A Hogan & Associates
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Seattle, WA 98104
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530 N. Wood St. Unit C
Chicago, IL 60622
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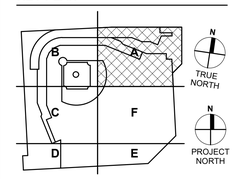
11/15/19

KEY PLAN



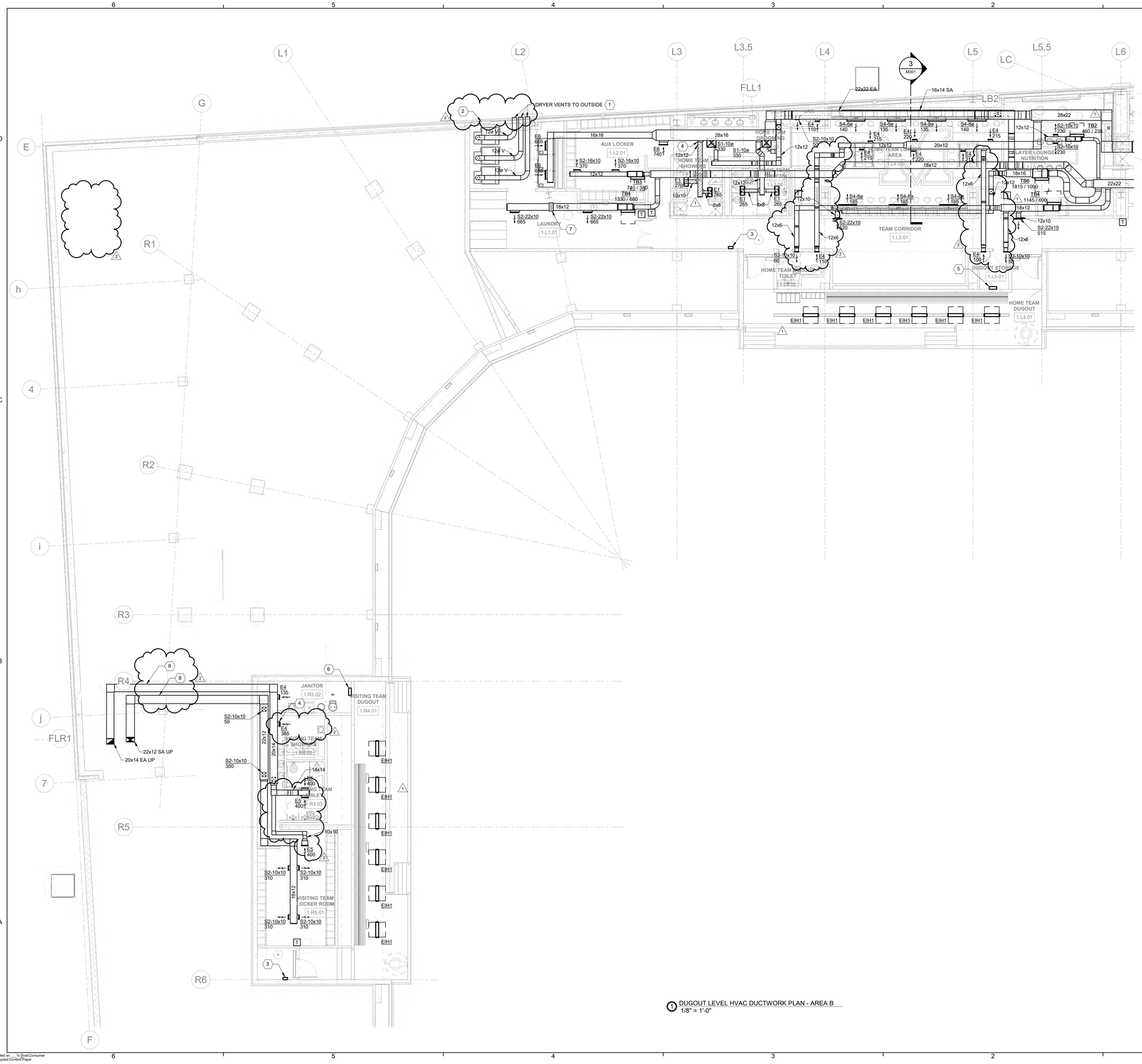
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
DUGOUT LEVEL HVAC DUCTWORK PLAN - AREA A

SHEET NUMBER
M101A



KEYNOTES

1. GALVANIZED STELL SHEET METAL DRYER VENTS. DRYER VENTS MUST NOT CONTAIN SCREW JOINTS OR OTHER FASTENERS THAT WILL OBSTRUCT THE EXHAUST FLOW. DRYER EXHAUST DUCT SHALL TERMINATE ON OUTSIDE OF BUILDING AND MUST BE EQUIPPED WITH A BACKDRAFT DAMPER AND WALL CAP.
2. MAKEUP AIR INTAKE LOUVER WITH MOTORIZED DAMPER INTERLOCKED TO DRYERS. SEE ARCHITECTURAL SHEETS FOR LOUVER INFORMATION.
3. SINGLE ZONE ANALOG CONTROLLER WITH DIGITAL TIMER FOR ELECTRIC INFRARED HEATERS.
4. PAINTED GRAVITY LOUVER WITH BIRDSCREEN.
5. 208V/3 PHASE, 3-RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE HOME TEAM DUGOUT. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.
6. 208V/3 PHASE, 3-RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE VISITING TEAM DUGOUT. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.
7. FLEX DUCT REQUIRED AT BUILDING EXPANSION JOINT. SEE ARCHITECTURE DRAWINGS FOR BUILDING EXPANSION JOINT LOCATION AND MOVEMENT CAPABILITIES. CONTRACTOR TO SIZE FLEX DUCT ACCORDINGLY.
8. ROUTE DUCTWORK WITHIN WATERPROOF TRENCH. COORDINATE FINAL ROUTING WITH ARCHITECTURAL DRAWINGS.

1 DUGOUT LEVEL HVAC DUCTWORK PLAN - AREA B
1/8" = 1'-0"

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PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
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HTTP://MARSHALL.EDU

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530 N. Wood St. Unit C
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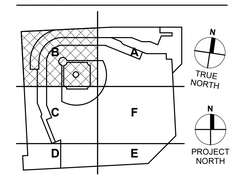
11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2
1	12/02/2019	ADDENDUM 1

PROJECT NUMBER
60590790

SHEET TITLE
DUGOUT LEVEL HVAC DUCTWORK PLAN - AREA B

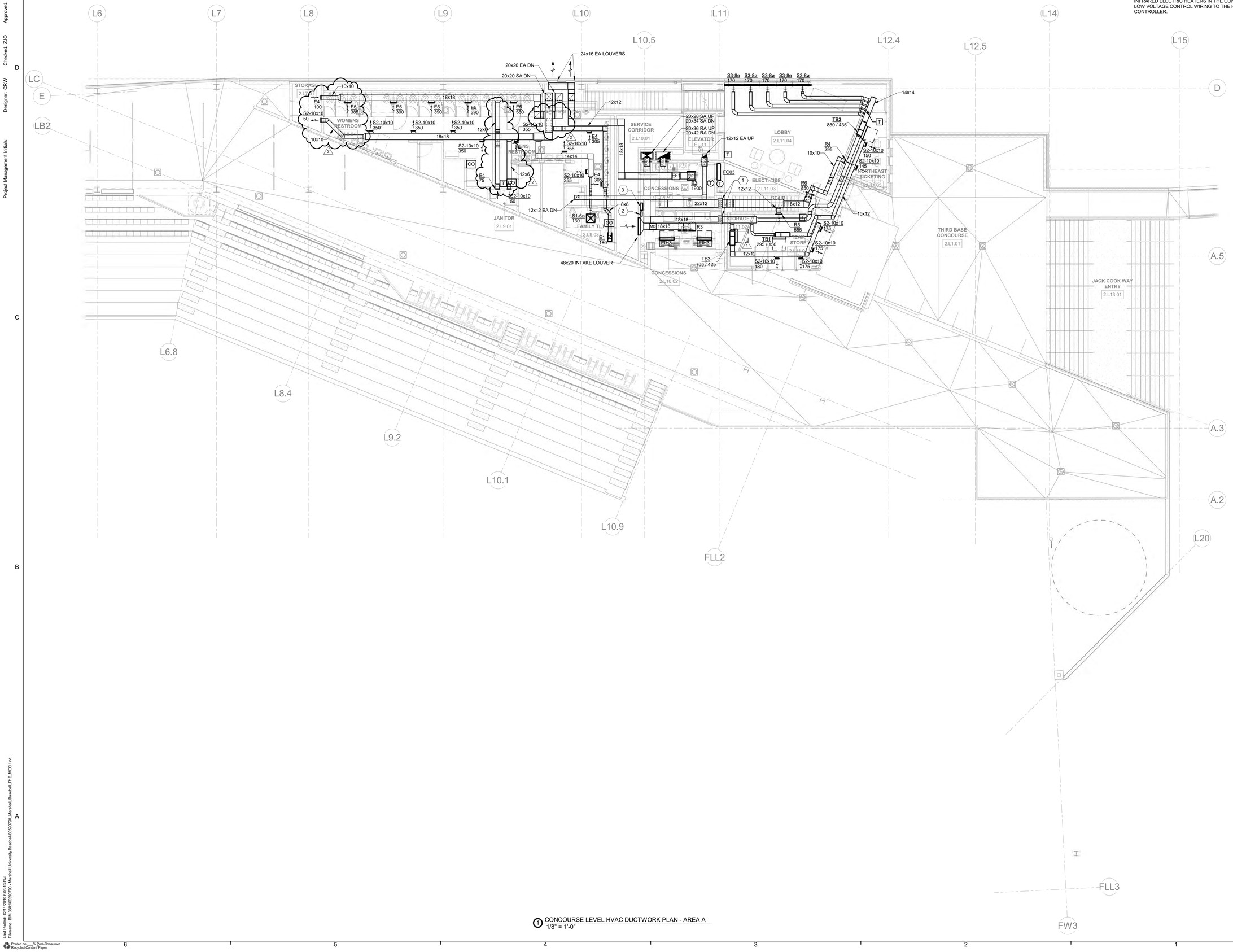
SHEET NUMBER
M101B

KEYNOTES

1 FLEX DUCT REQUIRED AT BUILDING EXPANSION JOINT. SEE ARCHITECTURE DRAWINGS FOR BUILDING EXPANSION JOINT LOCATIONS AND MOVEMENT CAPABILITIES. CONTRACTOR TO SIZE FLEX DUCT ACCORDINGLY.

2 SINGLE ZONE ANALOG CONTROLLER WITH DIGITAL TIMER FOR ELECTRIC INFRARED HEATERS.

3 208V/1 PHASE, 2 RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE CONCESSION AREA. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.



1 CONCOURSE LEVEL HVAC DUCTWORK PLAN - AREA A
1/8" = 1'-0"

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PROJECT

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1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
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AECOM
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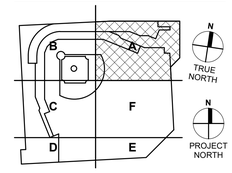
ZACHARY JAMES OLDHAM REGISTERED 23923 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2
1	12/02/2019	ADDENDUM 1

PROJECT NUMBER
60590790

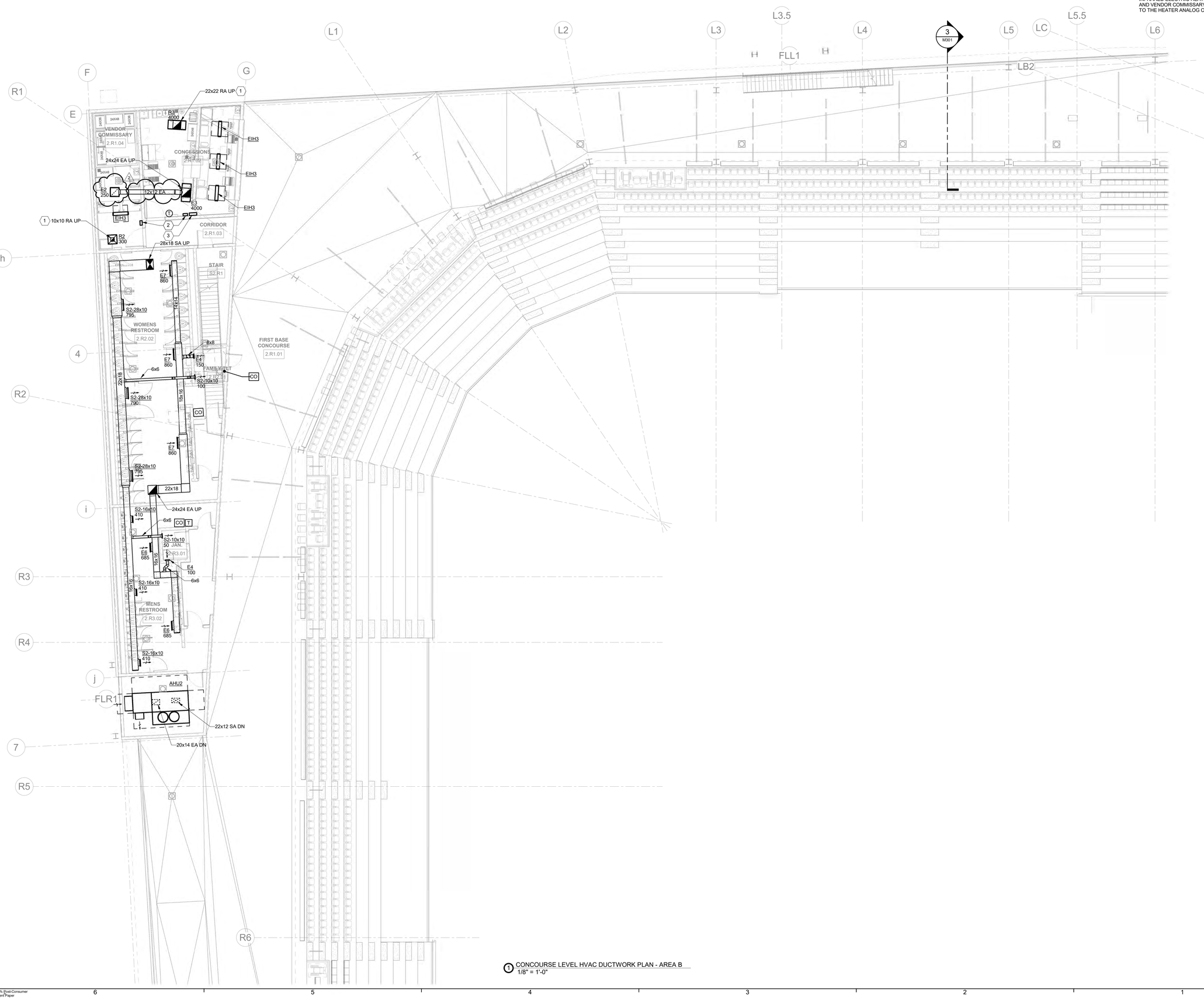
SHEET TITLE
CONCOURSE LEVEL HVAC DUCTWORK PLAN - AREA A

SHEET NUMBER
M104A

Project Management Initials: Designer: CRW Checked: ZJO Approved: Approver ANSI D 22"x34"
Document Set:M104A-CONCOURSE LEVEL HVAC DUCTWORK PLAN - AREA A
Last Plotted: 12/11/2019 6:03:13 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_MECH.rvt
Printed on ___% Post-Consumer Recycled Content Paper

KEYNOTES

1. PROVIDE MOTORIZED DAMPER IN VERTICAL DUCTWORK.
2. SINGLE ZONE ANALOG CONTROLLER WITH DIGITAL TIMER FOR ELECTRIC INFRARED HEATERS.
3. 208V/3 PHASE, 4 RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE CONCESSION AREA AND VENDOR COMMISSARY. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.



1 CONCOURSE LEVEL HVAC DUCTWORK PLAN - AREA B
1/8" = 1'-0"

AECOM

PROJECT
MARSHALL UNIVERSITY
BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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AECOM
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Kansas City, MO 64108
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11-15-19

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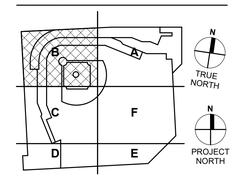


ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

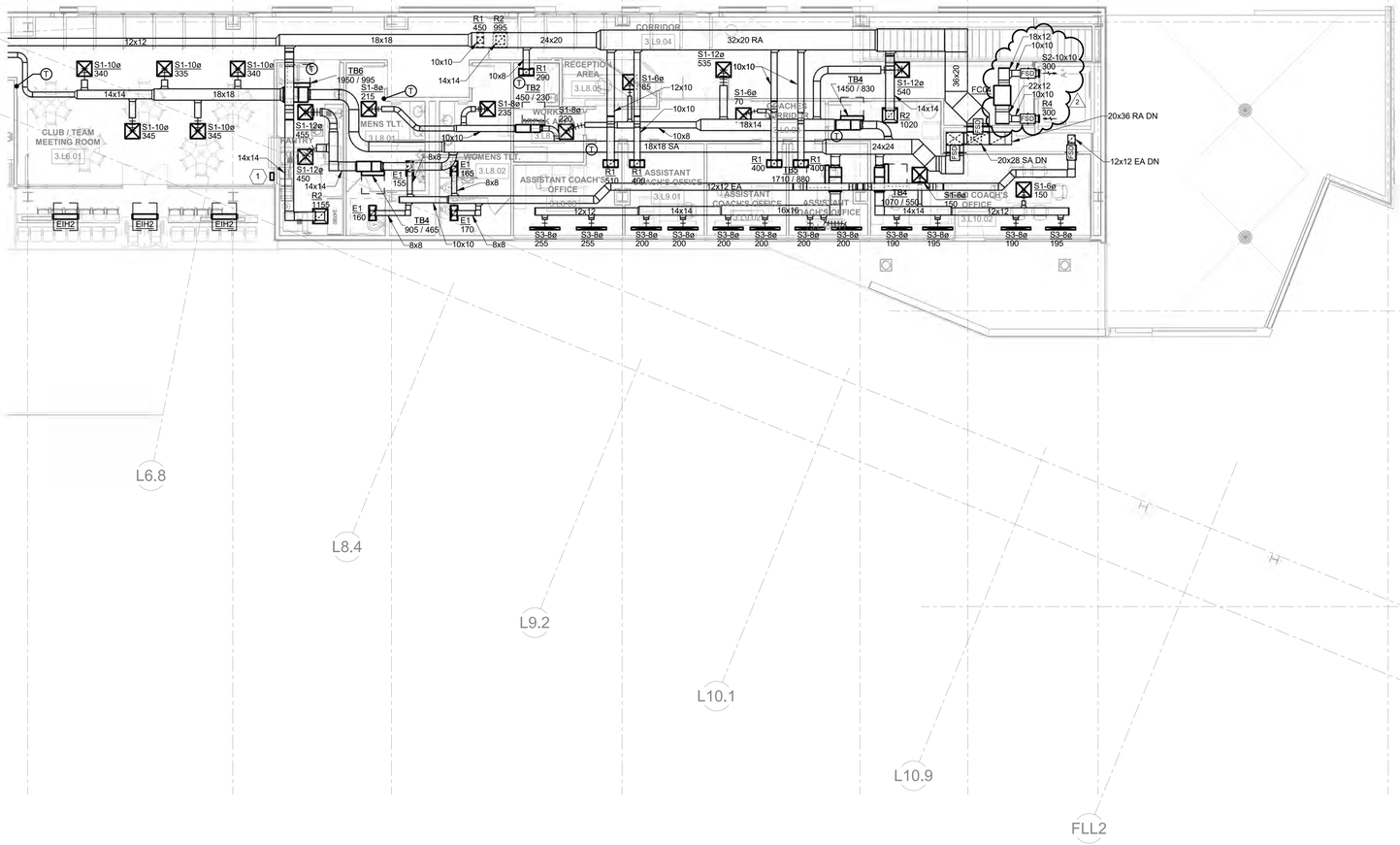
PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL HVAC DUCTWORK PLAN - AREA B

SHEET NUMBER
M104B

KEYNOTES

1 SINGLE ZONE ANALOG CONTROLLER WITH DIGITAL TIMER FOR ELECTRIC INFRARED HEATERS



1 PRESS LEVEL HVAC DUCTWORK PLAN - AREA A
1/8" = 1'-0"

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MARSHALL UNIVERSITY BASEBALL STADIUM
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Huntington, WV 25755

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Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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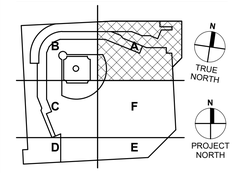
11/15/19

KEY PLAN



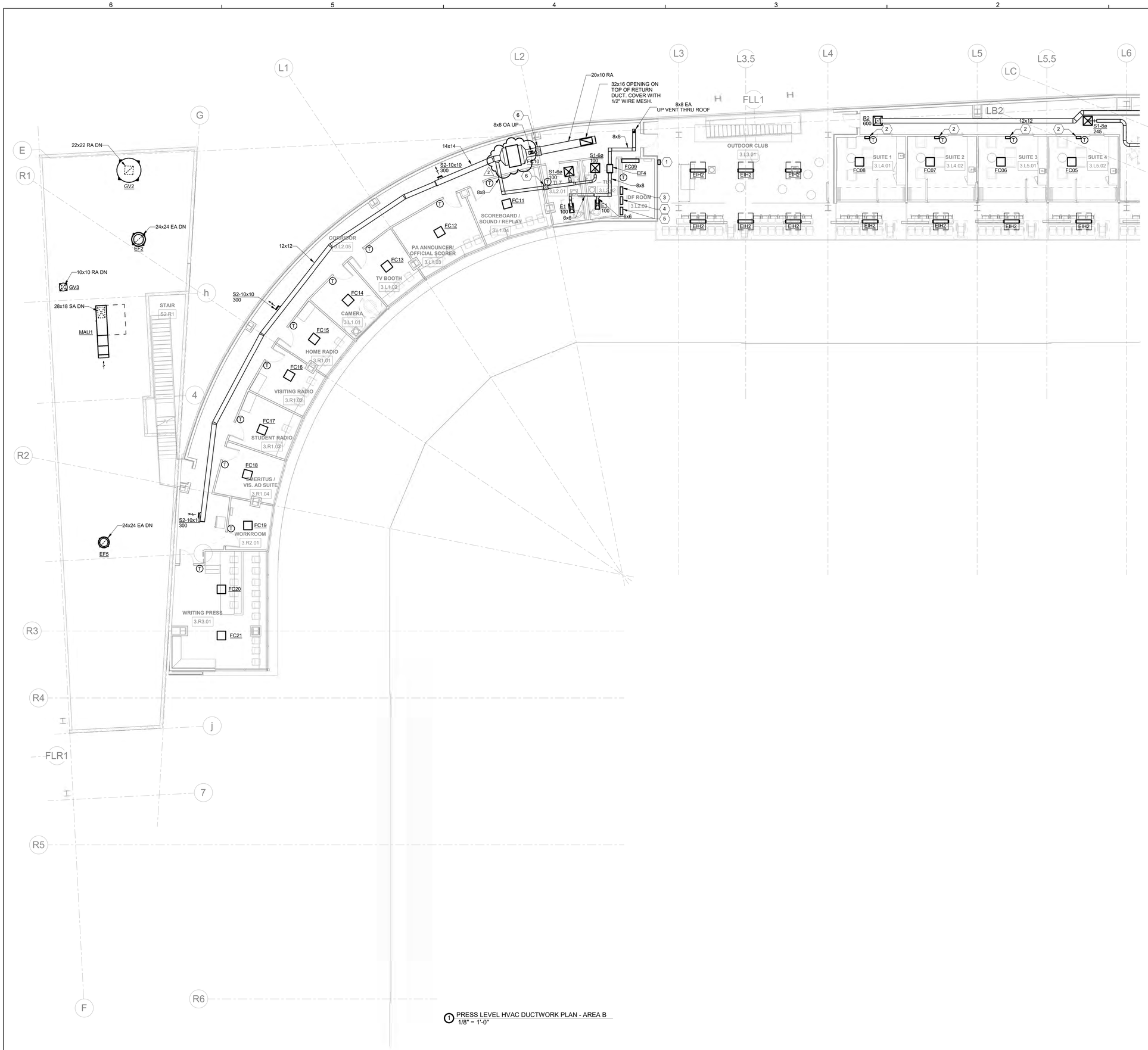
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL HVAC DUCTWORK PLAN - AREA A

SHEET NUMBER
M105A



1 PRESS LEVEL HVAC DUCTWORK PLAN - AREA B
1/8" = 1'-0"

KEYNOTES

1. DUAL ZONE ANALOG CONTROLLER WITH DIGITAL TIMER FOR ELECTRIC INFRARED HEATERS.
2. SINGLE ZONE ANALOG CONTROLLER WITH DIGITAL TIMER FOR ELECTRIC INFRARED HEATERS.
3. 480V/3 PHASE, 3-RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE OUTDOOR CLUB AND BALCONY. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.
4. 480V/3 PHASE, 4-RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE SUITE BALCONIES. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.
5. 480V/3 PHASE, 3-RELAY CONTROL PANEL TO POWER INFRARED ELECTRIC HEATERS IN THE CLUB/TEAM MEETING ROOM BALCONIEY. LOW VOLTAGE CONTROL WIRING TO THE HEATER ANALOG CONTROLLER.
6. FLEX DUCT REQUIRED AT BUILDING EXPANSION JOINT. SEE ARCHITECTURE DRAWINGS FOR BUILDING EXPANSION JOINT LOCATIONS AND MOVEMENT CAPABILITIES. CONTRACTOR TO SIZE FLEX DUCT ACCORDINGLY.

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PROJECT

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1 John Marshall Drive
Huntington, WV 25755

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Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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AECOM
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Kansas City, MO 64108
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11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

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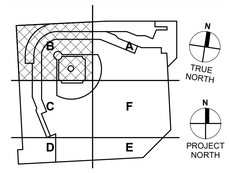

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL HVAC DUCTWORK PLAN - AREA B

SHEET NUMBER
M105B

Project Management Initials:
Designer: CRW
Checked: ZJO
Approved: Approver
ANSI D 22"x34"
Document Set-M105B-PRESS LEVEL HVAC DUCTWORK PLAN - AREA B
Last Plotted: 12/11/2019 6:05:12 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_MECH.rvt
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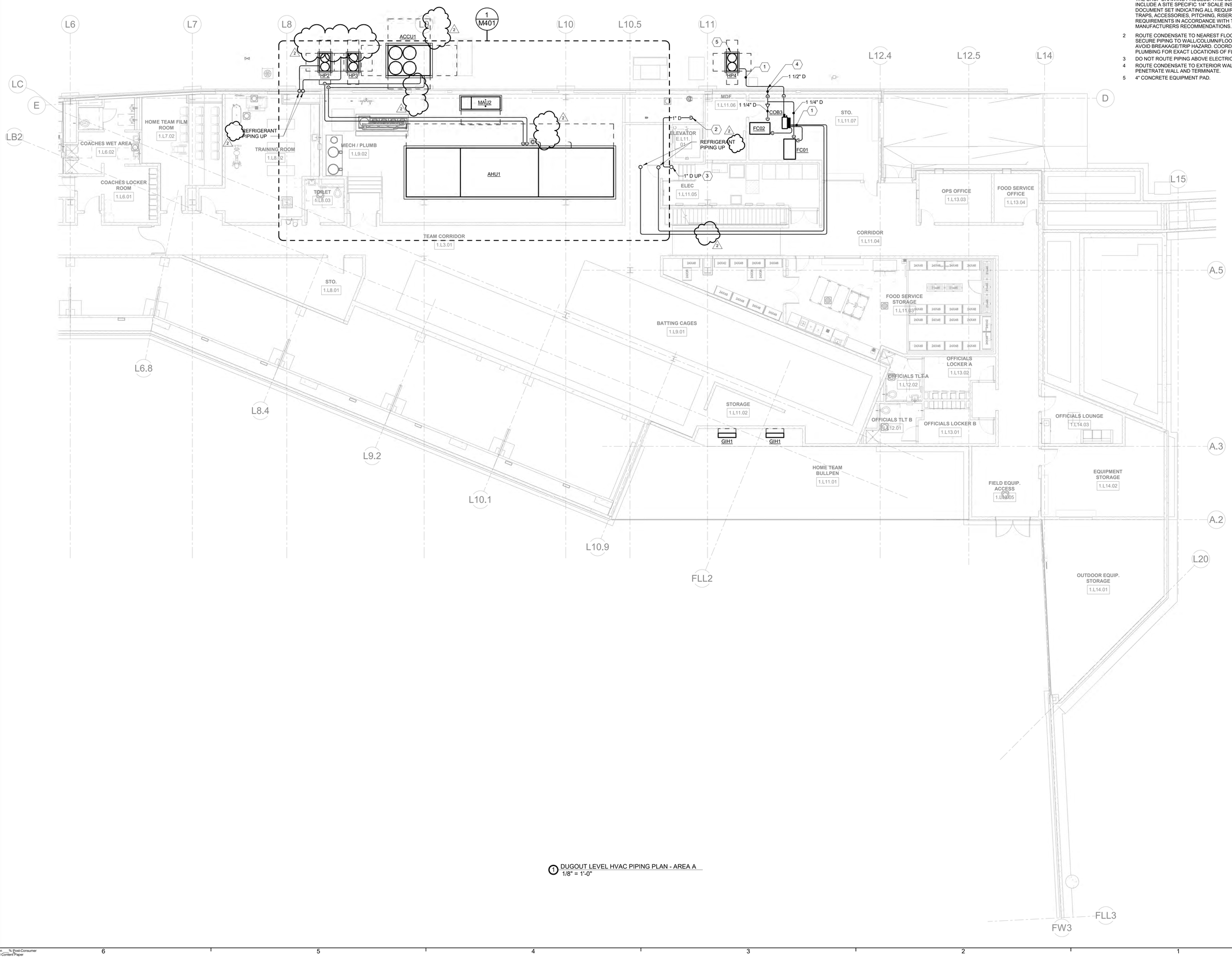
KEYNOTES

1. SINGLE LINE REFRIGERANT LINES SHOWN SCHEMATIC IN NATURE FOR VRF SYSTEM READABILITY. HVAC CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL REFRIGERANT PIPING LINE SETS, SIZING, ROUTING, AND ALL ACCESSORIES WITH VRF EQUIPMENT MANUFACTURER. PIPE SIZING SHALL BE BASED ON ACTUAL FIELD DEVELOPED PIPE LENGTHS. ALL REFRIGERANT PIPING SHALL BE FULLY INSULATED. ALL REFRIGERANT PIPING OUTDOORS SHALL BE JACKETED WITH ALUMINUM . AN ENGINEERING REFRIGERANT PIPING INSTALLATION DIAGRAM SHALL BE INCLUDED AS PART OF THE SHOP DRAWING PROCESS. THIS SUBMITTAL SHALL INCLUDE A SITE SPECIFIC 1/4" SCALE INSTALLATION DOCUMENT SET INDICATING ALL REQUIRED LINE SIZES, TRAPS, ACCESSORIES, PITCHING, RISERS, AND INSTALLATION REQUIREMENTS IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. (TYPICAL).
2. ROUTE CONDENSATE TO NEAREST FLOOR DRAIN AND SPILL. SECURE PIPING TO WALL/COLUMN/FLOOR AS REQUIRED TO AVOID BREAKAGE/TRIP HAZARD. COORDINATE WITH PLUMBING FOR EXACT LOCATIONS OF FLOOR DRAINS.
3. DO NOT ROUTE PIPING ABOVE ELECTRICAL EQUIPMENT.
4. ROUTE CONDENSATE TO EXTERIOR WALL AND DROP; PENETRATE WALL AND TERMINATE.
5. 4" CONCRETE EQUIPMENT PAD.



1 DUGOUT LEVEL HVAC PIPING PLAN - AREA A
1/8" = 1'-0"

AECOM

PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM
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CLIENT
Marshall University
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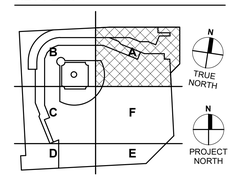
11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
DUGOUT LEVEL HVAC PIPING PLAN - AREA A

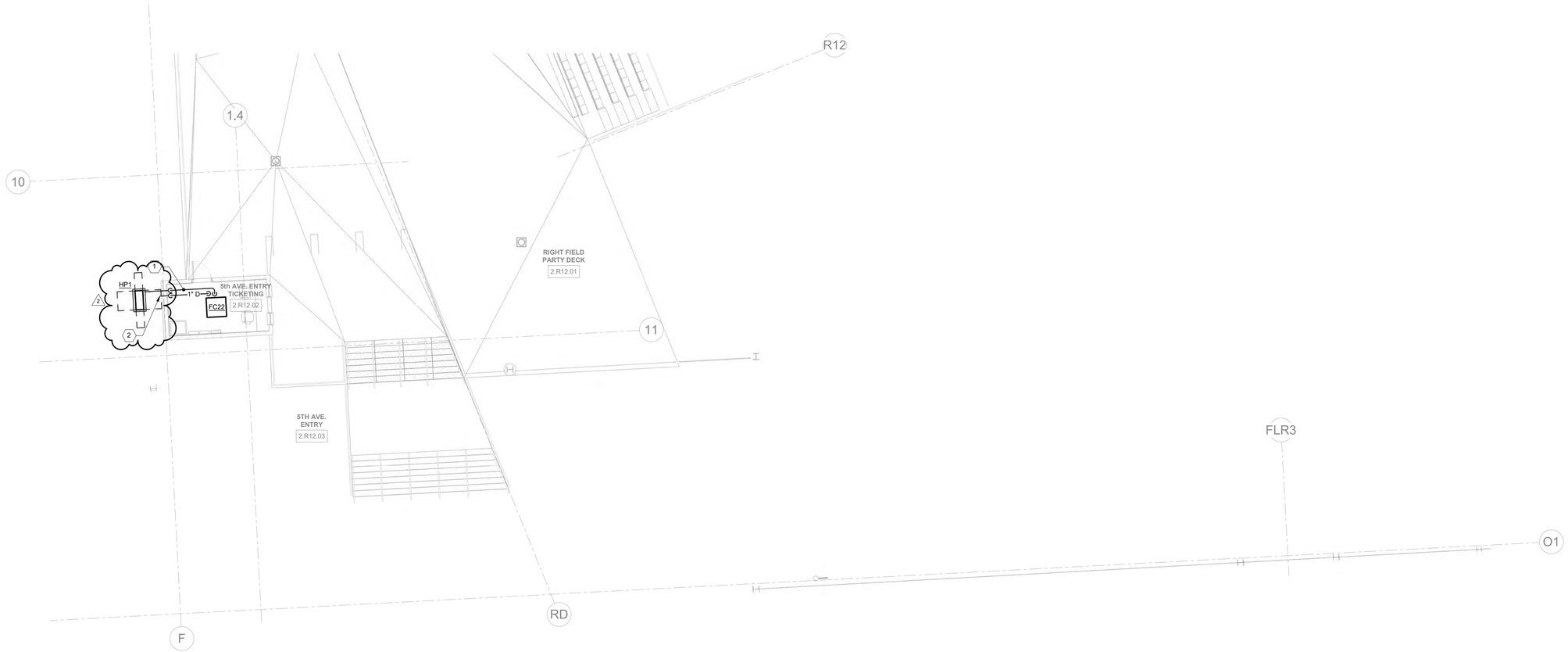
SHEET NUMBER
M201A

Document Set:M201A-DUGOUT LEVEL HVAC PIPING PLAN - AREA A
Last Printed: 12/11/2019 6:05:40 PM
Filename: BIM 360:/60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_MECH.rvt

KEYNOTES

1 SINGLE LINE REFRIGERANT LINES SHOWN SCHEMATIC IN NATURE FOR VRF SYSTEM READABILITY. HVAC CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL REFRIGERANT PIPING LINE SETS, SIZING, ROUTING, AND ALL ACCESSORIES WITH VRF EQUIPMENT MANUFACTURER. PIPE SIZING SHALL BE BASED ON ACTUAL FIELD DEVELOPED PIPE LENGTHS. ALL REFRIGERANT PIPING SHALL BE FULLY INSULATED. ALL REFRIGERANT PIPING OUTDOORS SHALL BE JACKETED WITH ALUMINUM . AN ENGINEERING REFRIGERANT PIPING INSTALLATION DIAGRAM SHALL BE INCLUDED AS PART OF THE SHOP DRAWING PROCESS. THIS SUBMITTAL SHALL INCLUDE A SITE SPECIFIC 1/4" SCALE INSTALLATION DOCUMENT SET INDICATING ALL REQUIRED LINE SIZES, TRAPS, ACCESSORIES, PITCHING, RISERS, AND INSTALLATION REQUIREMENTS IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. (TYPICAL).

2 ROUTE CONDENSATE TO EXTERIOR WALL AND DROP; PENETRATE WALL AND TERMINATE.



1 CONCOURSE LEVEL HVAC PIPING PLAN - AREA D
1/8" = 1'-0"

AECOM

PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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AECOM
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Kansas City, MO 64108
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Lenexa, KS 66214
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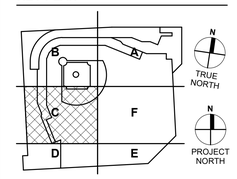
11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL HVAC PIPING PLAN - AREA D

SHEET NUMBER
M204D

Document Set-M204D-CONCOURSE LEVEL HVAC PIPING PLAN - AREA D
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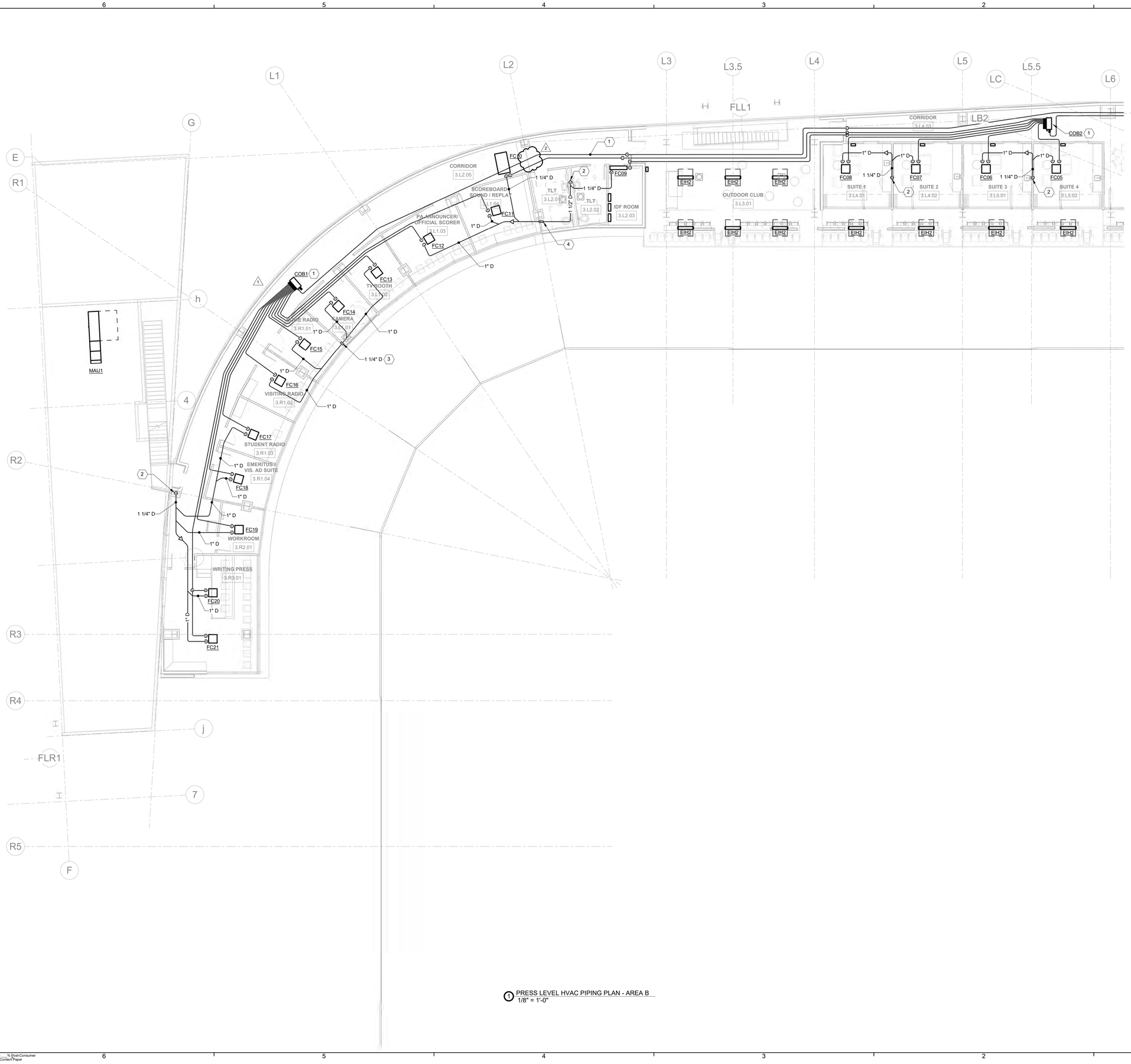

KEYNOTES

1. SINGLE LINE REFRIGERANT LINES SHOWN SCHEMATIC IN NATURE FOR VRF SYSTEM READABILITY. HVAC CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL REFRIGERANT PIPING LINE SETS, SIZING, ROUTING, AND ALL ACCESSORIES WITH VRF EQUIPMENT MANUFACTURER. PIPE SIZING SHALL BE BASED ON ACTUAL FIELD DEVELOPED PIPE LENGTHS. ALL REFRIGERANT PIPING SHALL BE FULLY INSULATED. ALL REFRIGERANT PIPING OUTDOORS SHALL BE JACKETED WITH ALUMINUM . AN ENGINEERING REFRIGERANT PIPING INSTALLATION DIAGRAM SHALL BE INCLUDED AS PART OF THE SHOP DRAWING PROCESS. THIS SUBMITTAL SHALL INCLUDE A SITE SPECIFIC 1/4" SCALE INSTALLATION DOCUMENT SET INDICATING ALL REQUIRED LINE SIZES, TRAPS, ACCESSORIES, PITCHING, RISERS, AND INSTALLATION REQUIREMENTS IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. (TYPICAL).
2. ROUTE CONDENSATE TO HUB DRAIN WITH INDIRECT CONNECTION. COORDINATE WITH PLUMBING FOR EXACT LOCATIONS.
3. ROUTE CONDENSATE TO NEAREST FLOOR DRAIN AND SPILL. SECURE PIPING TO WALL/COLUMN/FLOOR AS REQUIRED TO AVOID BREAKAGE/TRIP HAZARD. COORDINATE WITH PLUMBING FOR EXACT LOCATIONS OF FLOOR DRAINS.
4. PIPING EXPANSION JOINT REQUIRED AT BUILDING EXPANSION JOINT. SEE ARCHITECTURE DRAWINGS FOR BUILDING EXPANSION JOINT LOCATIONS AND MOVEMENT CAPABILITIES. CONTRACTOR TO SIZE PIPING EXPANSION JOINT ACCORDINGLY.

1 PRESS LEVEL HVAC PIPING PLAN - AREA B
1/8" = 1'-0"

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Huntington, WV 25755

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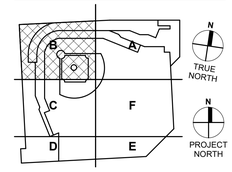
ZACHARY JAMES OLDHAM REGISTERED 23923 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2
1	12/02/2019	ADDENDUM 1

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL HVAC PIPING PLAN - AREA B

SHEET NUMBER
M205B

Document Set:M205B-PRESS LEVEL HVAC PIPING PLAN - AREA B
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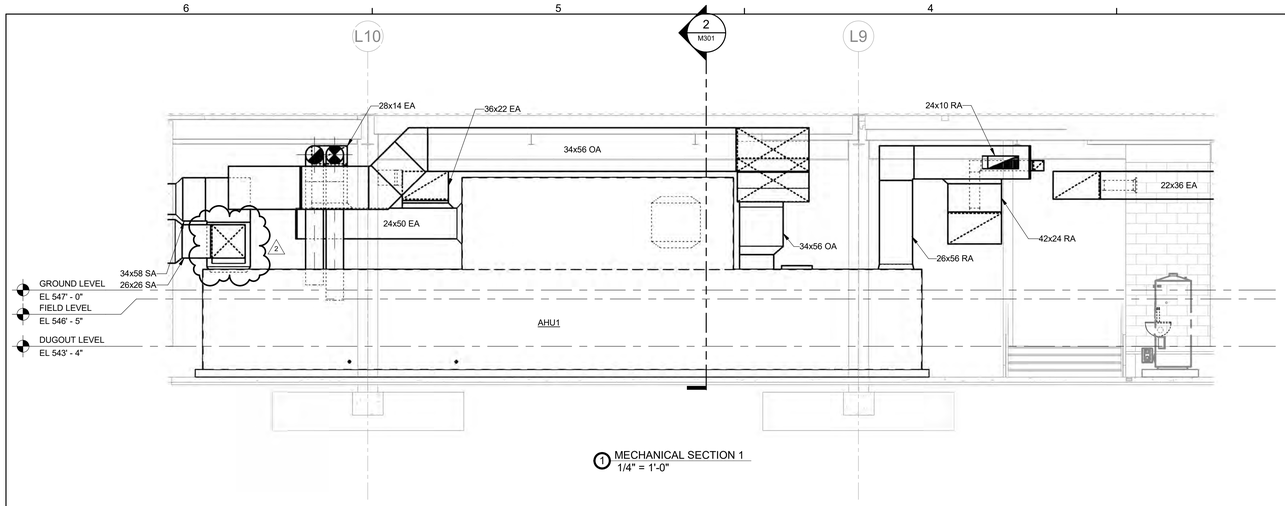

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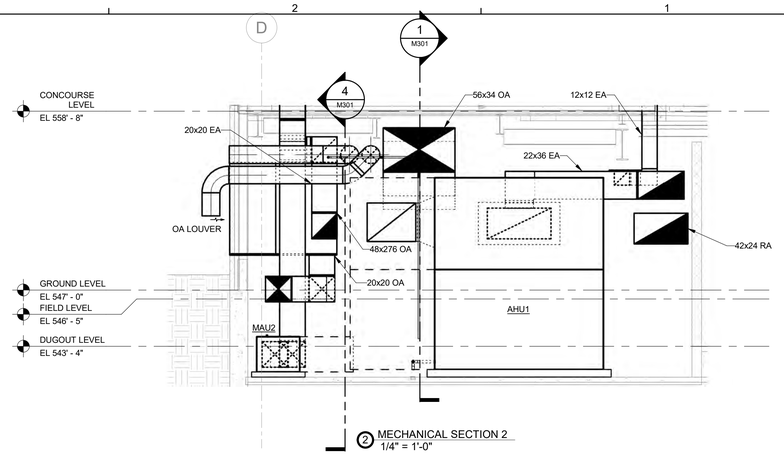
1/4" = 1'-0"



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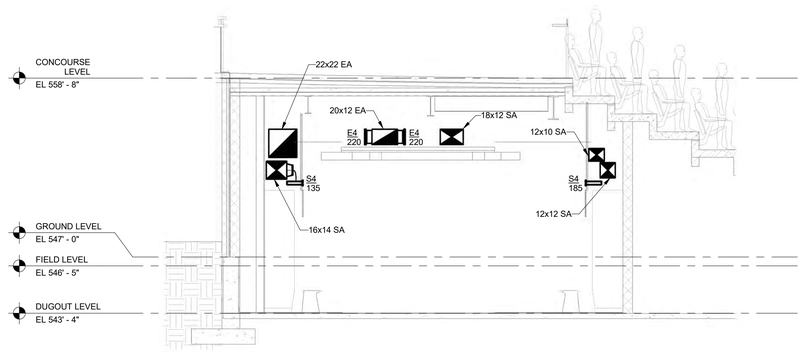
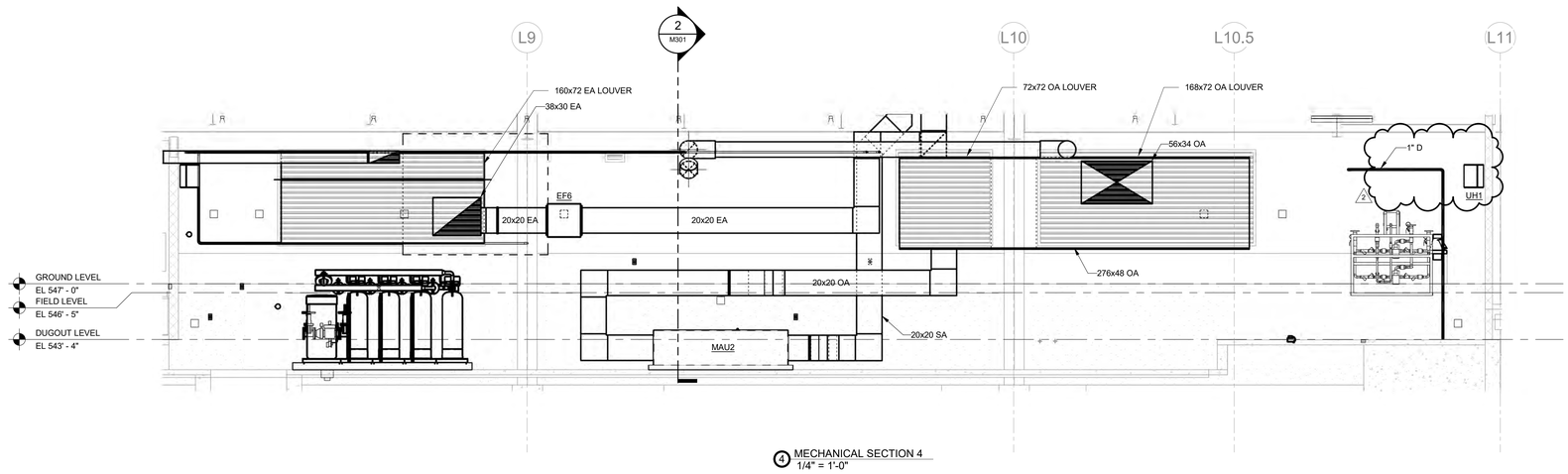
1/4" = 1'-0"



3 MECHANICAL SECTION 3
1/4" = 1'-0"



4 MECHANICAL SECTION 4
1/4" = 1'-0"

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PROJECT

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Huntington, WV 25755

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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Kansas City, MO 64108
HTTP://AECOM.COM

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AECOM
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Morgantown, WV 26501
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AECOM
277 West Nationwide Blvd.
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AUDIO/VISUAL

Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT

D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

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530 N. Wood St. Unit C
Chicago, IL 60622
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REGISTRATION

ZACHARY JAMES OLDHAM REGISTERED 23923 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

MECHANICAL SECTIONS

SHEET NUMBER

M301

Project Management Initials:
Designer: CRW
Checked: ZJO
Approved: Approver
ANSI D 22"x34"
Document Set-M301-MECHANICAL SECTIONS
Last Plotted: 12/11/2019 4:40:28 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_MECH.rvt
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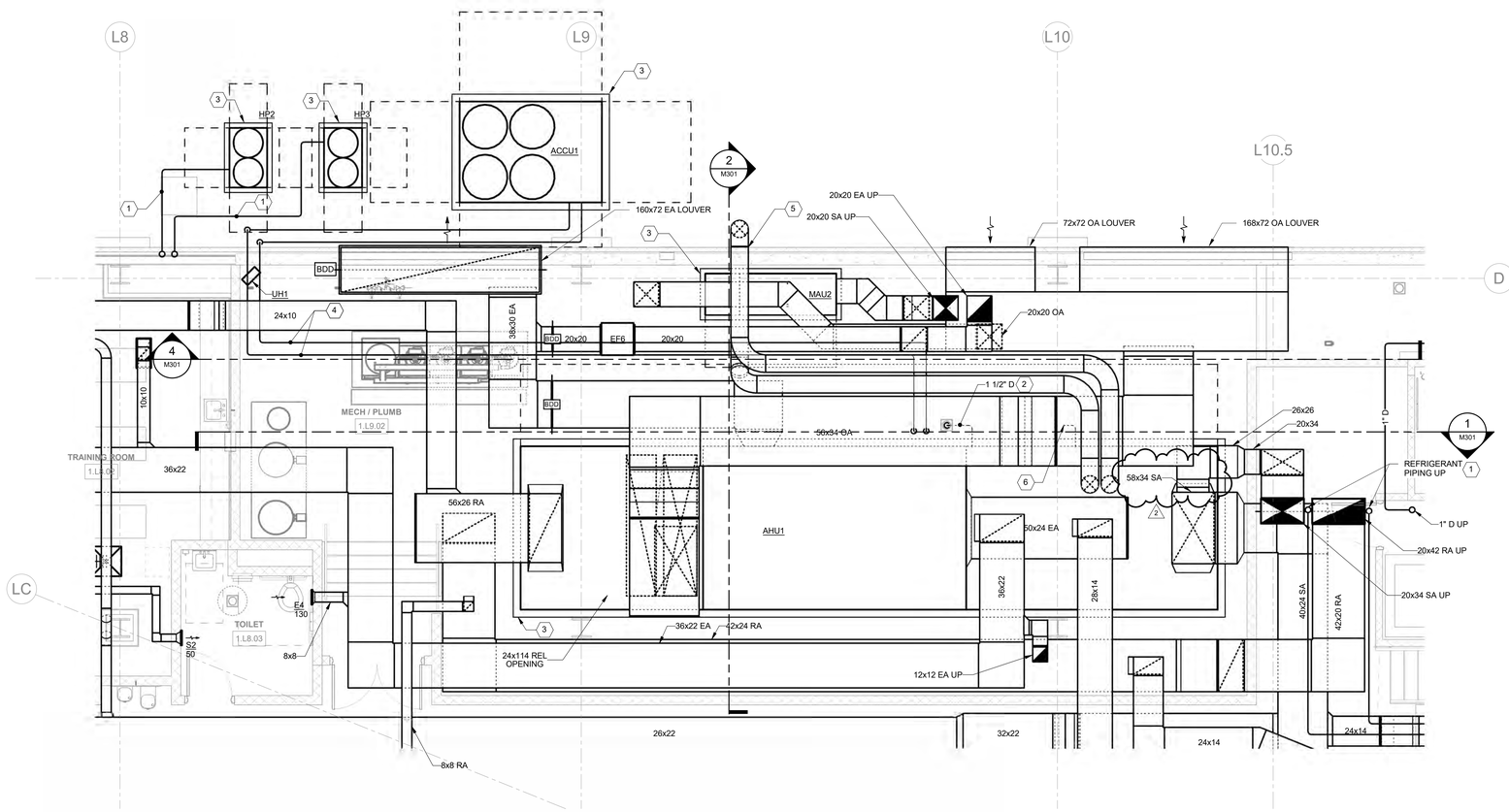
KEYNOTES

1. SINGLE LINE REFRIGERANT LINES SHOWN SCHEMATIC IN NATURE FOR VRF SYSTEM READABILITY. HVAC CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL REFRIGERANT PIPING LINE SETS, SIZING, ROUTING, AND ALL ACCESSORIES WITH VRF EQUIPMENT MANUFACTURER. PIPE SIZING SHALL BE BASED ON ACTUAL FIELD DEVELOPED PIPE LENGTHS. ALL REFRIGERANT PIPING SHALL BE FULLY INSULATED. ALL REFRIGERANT PIPING OUTDOORS SHALL BE JACKETED WITH ALUMINUM . AN ENGINEERING REFRIGERANT PIPING INSTALLATION DIAGRAM SHALL BE INCLUDED AS PART OF THE SHOP DRAWING PROCESS. THIS SUBMITTAL SHALL INCLUDE A SITE SPECIFIC 1/4" SCALE INSTALLATION DOCUMENT SET INDICATING ALL REQUIRED LINE SIZES, TRAPS, ACCESSORIES, PITCHING, RISERS, AND INSTALLATION REQUIREMENTS IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. (TYPICAL).
2. ROUTE CONDENSATE TO NEAREST FLOOR DRAIN AND SPILL. SECURE PIPING TO WALL/COLUMN/FLOOR AS REQUIRED TO AVOID BREAKAGE/TRIP HAZARD. COORDINATE WITH PLUMBING FOR EXACT LOCATIONS OF FLOOR DRAINS.
3. 4" CONCRETE EQUIPMENT PAD.
4. SIZE AND ROUTE INSULATED REFRIGERANT PIPING FROM ACCU1 TO AHU1 PER MANUFACTURERS RECOMMENDATIONS.
5. COMBUSTION AIR INTAKE AND GAS HEATER FLUE SHALL BE SIZED AND ROUTED PER MANUFACTURERS INSTRUCTIONS USING FINAL CONTRACTOR COORDINATED ROUTING. SEE DETAILS.
6. ROUTE GAS HEATER AND FLUE CONDENSATE TO CONDENSATE NEUTRALIZER KIT AND SPILL IN NEAREST FLOOR DRAIN. SECURE PIPING TO FLOOR AS REQUIRED TO AVOID BREAKAGE/TRIP HAZARD. COORDINATE WITH PLUMBING FOR EXACT LOCATIONS OF FLOOR DRAINS.



1 DUGOUT LEVEL HVAC DUCTWORK PLAN - ENLARGED MECHANICAL ROOM
1/4" = 1'-0"

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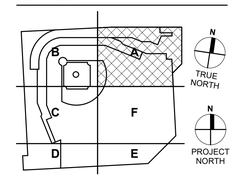
KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
MECHANICAL ENLARGED PLANS

SHEET NUMBER
M401

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Last Plotted: 12/11/2019 4:40:34 PM
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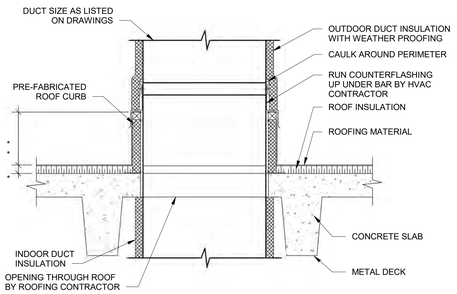
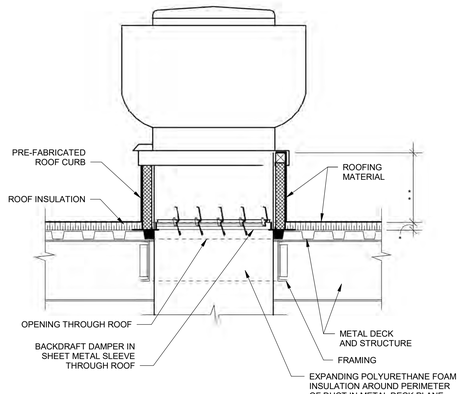


* VARIES SEE ARCHITECTURAL ROOF PLAN

* * 18" MIN. (REFER TO ROOF PLAN)

NOTE: ALL ROOF OPENINGS BY GENERAL TRADES CONTRACTOR.

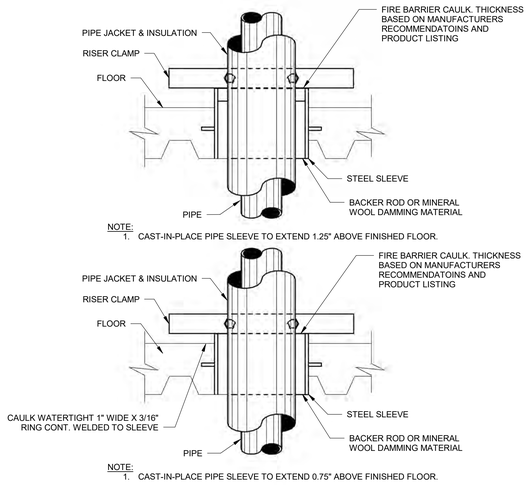
1 DUCT THROUGH ROOF DETAIL
NTS



* VARIES SEE ARCHITECTURAL ROOF PLAN

* * 12" MIN.

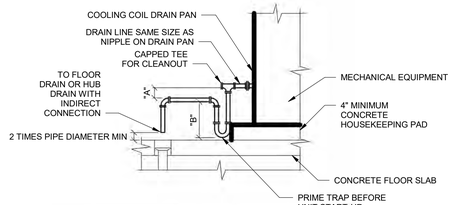
2 ROOF MOUNTED EXHAUST FAN DETAIL
NTS



NOTE:
1. CAST-IN-PLACE PIPE SLEEVE TO EXTEND 1.25" ABOVE FINISHED FLOOR.

NOTE:
1. CAST-IN-PLACE PIPE SLEEVE TO EXTEND 0.75" ABOVE FINISHED FLOOR.

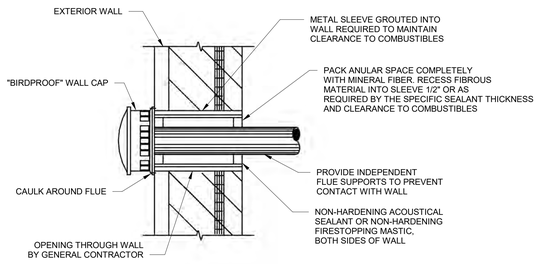
3 TYPICAL FLOOR PENETRATION DETAIL
NTS



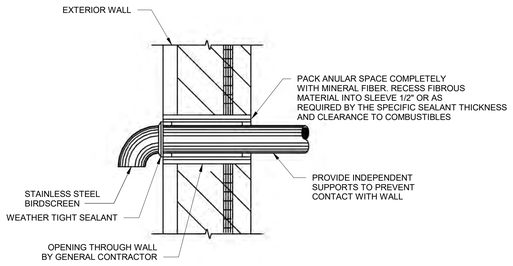
	A(IN)	B(IN)
DRAWTHRU COIL	FAN INLET STATIC	"A"/2+1
BLOWTHRU COIL	2" MIN.	FAN DISCHARGE STATIC PLUS 1"

NOTE: CONTRACTOR TO ADJUST THICKNESS OF HOUSEKEEPING PAD AS NECESSARY TO ACCOMMODATE CONDENSATE DRAINS.

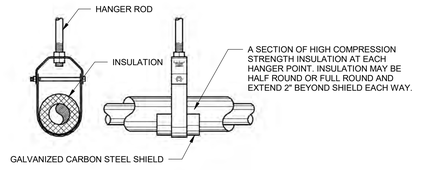
4 CONDENSATE DRAIN PIPING DETAIL
NTS



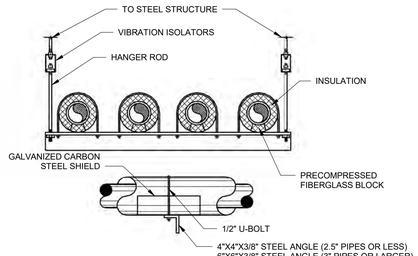
5 EXHAUST FLUE SIDE WALL DETAIL
NTS



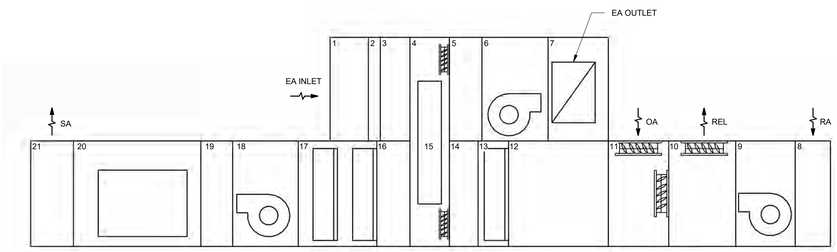
6 COMBUSTION AIR SIDE WALL DETAIL
NTS



7 PIPING HANGER DETAIL 1
NTS

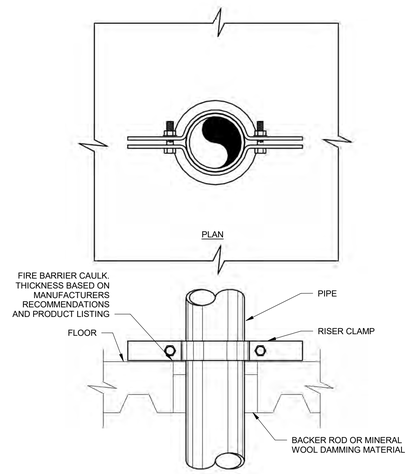


8 PIPING HANGER DETAIL 2
NTS



9 AHU1 DETAIL
NTS

AHU SECTIONS	
POS#	MODULE
1	INLET PLENUM
2	FILTER SECTION
3	ACCESS SECTION
4	ENERGY RECOVERY WHEEL SECTION
5	ACCESS SECTION
6	EXHAUST FAN
7	DISCHARGE PLENUM
8	INLET PLENUM
9	RETURN FANS
10	MIXING BOX / ECONOMIZER
11	MIXING BOX / ECONOMIZER
12	ACCESS SECTION
13	FILTER SECTION
14	ACCESS SECTION
15	HEAT WHEEL
16	ACCESS SECTION
17	STAGGERED AND SPLIT COOLING COIL SECTION
18	SUPPLY FANS
19	ACCESS SECTION
20	GAS HEATER SECTION
21	DISCHARGE PLENUM



10 RISER SUPPORTS DETAIL
NTS

Project Management Initials: Designer: CRW Checked: ZJO Approved: Approver ANSI D 22"x34"

Document Set-M501-MECHANICAL DETAILS
Last Plotted: 12/11/2019 4:45:37 PM
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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
MECHANICAL DETAILS

SHEET NUMBER
M501

PROJECT SCHEDULE NOTES

1	24" CURB.
2	PROVIDE WITH GFCI OUTLET.
3	16" CURB.
4	PROVIDE WITH DISCONNECT SWITCH.
5	8" CURB.
6	EXHAUST AIR DISCHARGE CONNECTION FROM END OF UNIT.
7	PROVIDE HEATERS WITH FLUSH MOUNT FRAME. EACH AREA TO HAVE SOLID STATE CONTROL PACKAGE COMPRISED OF THE FOLLOWING: EACH DUGOUT - 208V, 3 PHASE, 3-RELAY CONTROL PANEL AND 1 ZONE ANALOG CONTROL WITH DIGITAL TIMER.
8	PROVIDE WITH 2 STAGE HEAT AND 2 STAGE RELAY KIT. HEAT SHIELD, AND FIXED MOUNTING BRACKET.
9	CONTRACTOR TO COORDINATE THE USE OF MANUFACTURER PROVIDED OR FIELD FABRICATED INSULATED PLENUM.

PROJECT SCHEDULE NOTES

10	PROVIDE ADJUSTABLE AIR PATTERN CONTROLLER.
11	PROVIDE WITH CONCEALED TAPERED MOUNTING FRAME.
12	PROVIDE HEATER WITH INTEGRAL DISCONNECT CONTROL TRANSFORMER/CONTACTOR. SUMMER FAN SWITCH. TWO STAGE THERMOSTAT (INTEGRAL UNLESS NOTED OTHERWISE ON FLOOR PLANS), FACTORY PROVIDED CEILING/WALL BRACKET AND ADJUSTABLE LOUVERS.
13	75 CFM OUTSIDE AIR.
14	MOUNT DIRECTLY ON ROOF; NO CURB. SEE ARCHITECTURE FOR FLASHING DETAIL.
15	OUTSIDE AIR DUCT TO BE BALANCED FOR 20 CFM DUCTED DIRECTLY TO UNIT.
16	EC MOTOR.
17	PROVIDE CUSTOM COLOR SELECTED BY THE ARCHITECT. COLOR OF DIFFUSER AND FASTENERS TO MATCH COLOR OF CONTIGUOUS WALL.

PROJECT SCHEDULE NOTES

18	PROVIDE HEATERS WITH FLUSH MOUNT FRAME. EACH AREA TO HAVE SOLID STATE CONTROL PACKAGE COMPRISED OF THE FOLLOWING: SUITES - 480V, 3 PHASE, 4-RELAY CONTROL PANEL AND EACH SUITE HAS A DEDICATED ZONE ANALOG CONTROL WITH DIGITAL TIMER. MEETING ROOM - 480V, 3 PHASE, 3-RELAY CONTROL PANEL AND 1 ZONE ANALOG CONTROL WITH DIGITAL TIMER. OUTDOOR CLUB - 480V, 3 PHASE, 6-RELAY CONTROL PANEL AND 2 ZONE ANALOG CONTROL WITH DIGITAL TIMER.
19	12" CURB.
20	MOUNT ON MINIMUM 12" HIGH EQUIPMENT RAILS.
21	PROVIDE WITH PROPORTIONAL SSR HEATER CONTROLS.
22	PROVIDE HEATERS WITH RECESSED T-BAR MOUNTING FRAME. EACH CONCESSIONS AREA TO HAVE SOLID STATE CONTROL PACKAGE COMPRISED OF 208V, 3 PHASE RELAY CONTROL PANEL AND ANALOG CONTROLLER WITH DIGITAL TIMER.

PROJECT SCHEDULE NOTES

23	PROVIDE GREENHECK BACKDRAFT DAMPER WITH ADJUSTABLE PRESSURE CONTROL AND COUNTER-BALANCE OR APPROVED EQUAL. ADJUST THE PRESSURE CONTROL TO OPEN THE DAMPER IN THE EVENT THE CONCESSION ROLL-UP WINDOW SHUTTERS ARE NOT MANUALLY OPENED.
24	PROVIDE GREENHECK BACKDRAFT DAMPER WITH ADJUSTABLE PRESSURE CONTROL AND COUNTER-BALANCE OR APPROVED EQUAL. ADJUST THE PRESSURE CONTROL TO OPEN THE DAMPER IN THE EVENT THE VENDOR COMMISSARY DOOR IS CLOSED.
25	
26	
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INDOOR FAN COIL SCHEDULE

UNIT DATA			BASIS OF DESIGN		PERFORMANCE DATA				HEATING DATA			COOLING DATA					ELECTRICAL DATA				GENERAL DATA		
TAG	LOCATION	OUTDOOR UNIT TAG	MANUFACTURER	MODEL	TYPE	AIRFLOW (CFM)	ESP (IN WG)	DRIVE TYPE	CAPACITY (MBH)	EAT DB (°F)	LAT DB (°F)	TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	MCA	MOCP	VOLTS	PHASE	EMERGENCY POWER	WEIGHT (LBS)	SCHEDULE NOTES
FC01	1.L11.07 STO	HP4	JOHNSON CONTROLS INC	YIDM054B22S	DUCTED	1,271	0.00	DIRECT	37.5	60.0	90.0	50.4	43.9	80.0	67.0	60.0	53.0	4.3	15	208	1	No	97	
FC02	1.L11.07 STO	HP4	JOHNSON CONTROLS INC	YIDM054B22S	DUCTED	1,271	0.00	DIRECT	37.5	60.0	90.0	50.4	43.9	80.0	67.0	60.0	53.0	4.3	15	208	1	No	97	
FC03	2.L11.03 ELECT. / IDF	HP4	JOHNSON CONTROLS INC	TIWM015B21S	WALL MOUNTED	530	0.00	DIRECT	10.4	60.0	90.0	14.0	10.4	80.0	67.0	60.0	58.0	0.4	15	208	1	No	37	
FC04	3.L9.04 CORRIDOR	HP4	JOHNSON CONTROLS INC	YIDM008B22S	DUCTED	335	0.00	DIRECT	5.5	60.0	86.0	7.4	6.0	80.0	67.0	62.0	59.0	1.0	15	208	1	No	57	
FC05	3.L5.02 SUITE 4	HP3	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	11.9	70.0	89.0	15.3	12.7	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC06	3.L5.01 SUITE 3	HP3	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	11.9	70.0	89.0	15.3	12.7	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC07	3.L4.02 SUITE 2	HP3	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	11.9	70.0	89.0	15.3	12.7	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC08	3.L4.01 SUITE 1	HP3	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	11.9	70.0	89.0	15.3	12.7	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC09	3.L2.03 IDF ROOM	HP3	JOHNSON CONTROLS INC	TIWM030B21S	WALL MOUNTED	777	0.00	DIRECT	19.8	60.0	90.0	26.5	19.4	80.0	67.0	60.0	54.0	0.7	15	208	1	No	40	
FC10	3.L2.05 CORRIDOR	HP3	JOHNSON CONTROLS INC	YIDM036B22S	DUCTED	1,183	0.00	DIRECT	23.7	70.0	95.0	30.5	26.8	78.0	65.0	58.0	56.0	3.8	15	208	1	No	97	13
FC11	3.L1.04 SCOREBOARD / SOUND / REPLAY	HP2	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	9.5	70.0	89.0	12.1	10.1	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC12	3.L1.03 PA ANNOUNCER / OFFICIAL SCORER	HP2	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	9.5	70.0	89.0	12.1	10.1	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC13	3.L1.02 TV BOOTH	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC14	3.L1.01 CAMERA	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC15	3.R1.01 HOME RADIO	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC16	3.R1.02 VISITING RADIO	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC17	3.R1.03 STUDENT RADIO	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC18	3.R1.04 EMERITUS / VIS. AD SUITE	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC19	3.R2.01 WORKROOM	HP2	JOHNSON CONTROLS INC	YICM012B21S	CASSETTE	459	0.00	DIRECT	6.3	70.0	88.0	8.1	6.2	78.0	65.0	67.0	60.0	0.8	15	208	1	No	35	
FC20	3.R3.01 WRITING PRESS	HP2	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	9.5	70.0	89.0	12.1	10.1	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	
FC21	3.R3.01 WRITING PRESS	HP2	JOHNSON CONTROLS INC	YICM018B21S	CASSETTE	565	0.00	DIRECT	9.5	70.0	89.0	12.1	10.1	78.0	65.0	63.0	59.0	1.0	15	208	1	No	37	

OUTDOOR HEAT PUMP SCHEDULE

UNIT DATA		BASIS OF DESIGN		COMPRESSOR DATA					COOLING CAPACITY		HEATING CAPACITY		ELECTRICAL DATA						GENERL DATA		
													CIRCUIT 1		CIRCUIT 2						
TAG	FUNCTION	MANUFACTURER	MODEL	CAPACITY (TONS)	REFRIG TYPE	TYPE	HOT GAS BYPASS	IEER	CAPACITY (MBH)	AMBIENT (°F)	CAPACITY (MBH)	AMBIENT (°F)	MCA	MOCP	MCA	MOCP	VOLTS	PHASE	EMERGENCY POWER	WEIGHT (LBS)	SCHEDULE NOTES
HP2	VRF FAN COILS	JOHNSON CONTROLS INC	YVAHR144B42S	12.0	R-410A	SCROLL	No	23.90	30.9	105.3	95.0	81.9	0.0	30.0	35.0			460	3	No	772	4
HP3	VRF FAN COILS	JOHNSON CONTROLS INC	YVAHR144B42S	12.0	R-410A	SCROLL	No	22.55	29.5	118.2	95.0	91.0	0.0	30.0	35.0			460	3	No	772	4
HP4	VRF FAN COILS	JOHNSON CONTROLS INC	YVAHR144B42S	12.0	R-410A	SCROLL	No	22.55	29.5	122.2	95.0	90.9	0.0	30.0	35.0			460	3	No	772	4

CHANGE OVER BOX SCHEDULE

UNIT DATA		BASIS OF DESIGN		PERFORMANCE DATA			ELECTRICAL DATA				GENERAL DATA		
TAG	LOCATION	MANUFACTURER	MODEL	SERVICE	# OF PORTS	CAPACITY (MBH)	MCA	MOCP	VOLTS	PHASE	EMERGENCY POWER	WEIGHT (IBS)	SCHEDULE NOTES
COB1	3.L2.05 CORRIDOR	JOHNSON CONTROLS INC	COB12M264B22S	HP2	12	105.3	0.6	15	208	1	No	80	
COB2	3.L9.04 CORRIDOR	JOHNSON CONTROLS INC	COB12M264B22S	HP3	12	118.2	0.6	15	208	1	No	80	
COB3	1.L11.07 STO	JOHNSON CONTROLS INC	COB12M264B22S	HP4	12	122.2	0.6	15	208	1	No	80	

DUCTLESS SPLIT SYSTEM SCHEDULE (DX)

INDOOR UNIT DATA				BASIS OF DESIGN		INDOOR COOLING DATA			INDOOR HEATING DATA				INDOOR ELECTRICAL DATA					OUTDOOR UNIT DATA		OUTDOOR PERFORMANCE DATA				COMPRESSOR DATA		OUTDOOR ELECTRICAL DATA					
TAG	LOCATION	FUNCTION	TYPE	MANUFACTURER	INDOOR MODEL	AIRFLOW (CFM)	TOTAL COOLING CAPACITY (MBH)	SENSIBLE COOLING CAPACITY (MBH)	HEAT PUMP	HEATING CAPACITY (MBH)	COP	FILTER (MERV)	POWERED FROM OUTDOOR UNIT	MCA	MOCP	VOLTS	PHASE	EMERGENCY POWER	TAG	OUTDOOR MODEL	SUMMER AMBIENT (°F)	WINTER AMBIENT (°F)	EER	SEER	REFRIG TYPE	TYPE	MCA	MOCP	VOLTS	PHASE	EMERGENCY POWER	SCHEDULE NOTES
FC22	2.R12.02 5th AVE. ENTRY TICKETING	SUPPLY	CASSETTE	JOHNSON CONTROLS INC	DHR24NKB21S	770	23.3	14.0	Yes	19.0	2.93	6	No	1	15	208	1	No	HP1	DHR24CSB21S	95.0	0.0	10.65	18	R-410A	SCROLL	24	40	208	1	No	15, 20

TERMINAL BOX SCHEDULE (ELECTRIC REHEAT) BY TYPE

UNIT DATA		BASIS OF DESIGN		COOLING AIRFLOW DATA		HEATING DATA (BASED ON 65% OF MAX COOLING AIRFLOW RANGE)							
				MAX AIRFLOW RANGE									
TAG	NECK SIZE (IN)	MANUFACTURER	MODEL	MIN CFM	MAX CFM	MAX APD (IN WG)	CAPACITY (KW)	EAT DB (°F)	LAT DB (°F)	STAGES	VOLTS	PHASE	EMERGENCY POWER	SCHEDULE NOTES
TB1	6	JCI	TSS	80	300	0.25	2.5	55.0	95.0	2	277	1	No	21
TB2	8	JCI	TSS	301	600	0.26	4.0	55.0	95.0	3	277	1	No	21
TB3	10	JCI	TSS	601	900	0.28	8.0	55.0	95.0	3	277	1	No	21
TB4	12	JCI	TSS	901	1500	0.38	13.0	55.0	95.0	3	277	1	No	21
TB5	14	JCI	TSS	1501	1800	0.39	22.0	55.0	95.0	3	277	1	No	21
TB6	16	JCI	TSS	1801	2800	0.43	26.0	55.0	95.0	3	277	1	No	21

INFRARED HEATER SCHEDULE (ELECTRIC)

	BASIS OF DESIGN		ELECTRICAL DATA				ELECTRICAL DATA	PANEL DIMENSIONS		
TAG	MANUFACTURER	MODEL	CAPACITY (WATTS)	VOLTS	PHASE	MCA	EMERGENCY POWER	LENGTH (IN)	WIDTH (IN)	SCHEDULE NOTES
EIH1	INFRATECH	W-25	2500.0	208	1	12	No	39.00	8.19	18, 2
EIH2	INFRATECH	WD-60	6000.0	277	1	29	No	61.25	8.19	
EIH3	INFRATECH	W-25	2500.0	208	1	12	No	39.00	8.19	22

INFRARED HEATER SCHEDULE (GAS)

	BASIS OF DESIGN		PERFORMANCE DATA		ELECTRICAL DATA			GENERAL DATA			
TAG	MANUFACTURER	MODEL	HIGH INPUT CAPACITY (BTU/HR)	LOW INPUT CAPACITY (BTU/HR)	MCA	VOLTS	PHASE	LENGTH (IN)	DEPTH (IN)	WEIGHT	SCHEDULE NOTES
GIH1	SPACE-RAY	WB35-N7	35,000	24,000	0.1	120	1	48.00	11.80	55	8

AIR DEVICE SCHEDULE

UNIT DATA		BASIS OF DESIGN			LINEAR DATA			GENERAL DATA			
TAG	FUNCTION	MANUFACTURER	MODEL	FACE SIZE	LENGTH (IN)	# OF SLOTS	SLOT WIDTH (IN)	MATERIAL	INTEGRAL VOLUME DAMPER	MAX NC	SCHEDULE NOTES
S1	SUPPLY	PRICE	ASPD	24" X 24"				ALUMINUM	No	20	17
S2	SUPPLY	PRICE	620	NECK SIZE + 1.75"				ALUMINUM	No	20	
S3	SUPPLY	PRICE	JS		48	1	1	ALUMINUM	No	20	9, 10
S4	SUPPLY	PRICE	JS		48	1	1	ALUMINUM	No	20	9, 10, 11
R1	RETURN	PRICE	80	24" X 12"				ALUMINUM	No	20	
R2	RETURN	PRICE	80	24" X 24"				ALUMINUM	No	20	
R3	RETURN	PRICE	80	48" X 24"				ALUMINUM	No	20	
R4	RETURN	PRICE	600	12" X 12"				ALUMINUM	No	20	
R5	RETURN	PRICE	600	18" X 12"				ALUMINUM	No	20	
R6	RETURN	PRICE	600	24" X 24"				ALUMINUM	No	20	
E1	EXHAUST	PRICE	80	24" X 12"				ALUMINUM	No	20	
E2	EXHAUST	PRICE	80	24" X 24"				ALUMINUM	No	20	
E3	EXHAUST	PRICE	80	48" X 24"				ALUMINUM	No	20	
E4	EXHAUST	PRICE	600	12" X 12"				ALUMINUM	No	20	
E5	EXHAUST	PRICE	600	18" X 12"				ALUMINUM	No	20	
E6	EXHAUST	PRICE	600	24" X 12"				ALUMINUM	No	20	
E7	EXHAUST	PRICE	600	30" X 12"				ALUMINUM	No	20	
E8	EXHAUST	PRICE	97L	38" X 26"				ALUMINUM	No	20	

AECOM

PROJECT
MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

ZACHARY JAMES CRUMAY REGISTERED 23923 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

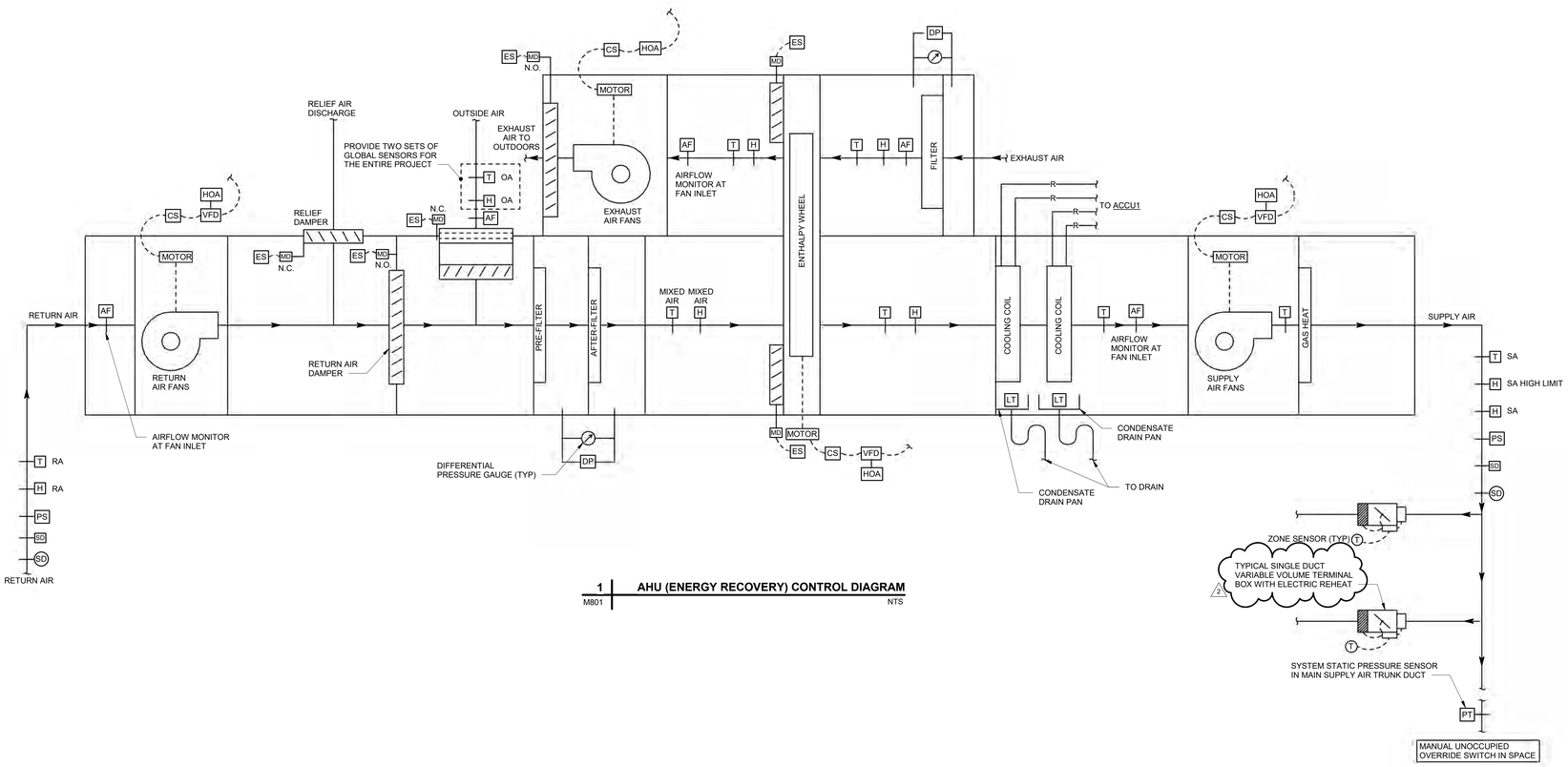
PROJECT NUMBER
60590790

SHEET TITLE
MECHANICAL SCHEDULES

SHEET NUMBER
M602

AIR HANDLING UNIT (ENERGY RECOVERY)

1. THIS AHU IS A VARIABLE AIR VOLUME UNIT. THE UNIT HAS A DRAW THROUGH CONFIGURATION AND CONSISTS OF SUPPLY FANS, RETURN FANS, MIXING BOX, FILTERS, GAS HEATER, DX COOLING COILS, ENTHALPY ENERGY RECOVERY WHEEL, EXHAUST FANS, AND AIR FLOW MEASURING DEVICES. THIS UNIT HAS AN ECONOMIZER CYCLE. THE AHU IS PROVIDED WITH A SUPPLY FAN VFD AND RETURN FAN VFD. THE AHU IS PROVIDED WITH AN EXHAUST FAN VFD FOR BALANCING PURPOSES ONLY. ONCE THE AHU IS BALANCED, THE EXHAUST FAN VFD SHALL BE LOCKED AT THAT SPEED.
2. THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING UNIT:
   A. AHU1
3. SYSTEM OPERATION: THE AHU SHALL OPERATE BASED ON AN OCCUPIED/UNOCCUPIED TIME OF DAY SCHEDULE WITH MANUAL OVERRIDE LOCATED IN THE SPACE AS WELL AS A MANUAL OVERRIDE THROUGH THE BAS. COORDINATE LOCATION OF MANUAL OVERRIDE WITH OWNER.
4. SYSTEM START UP/AHU OCCUPIED MODE: WHEN THE AHU IS ENABLED TO START, THE UNIT'S RETURN AIR AND EXHAUST AIR DAMPERS SHALL OPEN, AND THE OUTDOOR AIR AND RELIEF DAMPERS SHALL CLOSE. ONCE THE DAMPERS ARE IN THE CORRECT POSITION, AS DETERMINED BY DAMPER END SWITCHES, THE SUPPLY FANS, RETURN FANS, AND EXHAUST FANS SHALL START. ONCE THE SUPPLY FANS AND RETURN FANS START, THE OUTDOOR AIR, RETURN AIR, AND RELIEF AIR DAMPERS SHALL MODULATE TO PROVIDE THE MINIMUM OUTDOOR AIR FLOW. THE OUTSIDE AIR DAMPER SHALL BE NORMALLY CLOSED. AN OUTSIDE AIRFLOW MEASURING STATION SHALL MEASURE THE AMOUNT OF OUTSIDE AIR. ONCE THE MINIMUM OUTDOOR AIR FLOW IS BEING PROVIDED, THE ENERGY RECOVERY WHEEL SEQUENCE SHALL BE ENABLED.
5. MORNING WARM UP / COOL DOWN: THE BAS SHALL ENABLE THE AHU TO START IN ADVANCE OF THE SCHEDULED OCCUPIED TIME, VIA AN ADAPTIVE OPTIMAL START SEQUENCE. THE UNIT SHALL ENTER A MORNING WARM UP / COOL DOWN MODE IF NECESSARY BASED ON SPACE TEMPERATURE. DURING MORNING WARM UP / COOL DOWN, THE OUTDOOR AIR, EXHAUST AIR, AND RELIEF DAMPER SHALL REMAIN CLOSED, AND THE RETURN AIR DAMPER SHALL REMAIN OPEN. ONCE THE OCCUPIED SPACE TEMPERATURE SETPOINT IS REACHED, THE SYSTEM SHALL ENTER OCCUPIED MODE. SHOULD THE SPACE TEMPERATURES NOT REACH THE OCCUPIED SETPOINT BEFORE THE SCHEDULED OCCUPIED TIME, OR REACH SETPOINT TOO EARLY, THE ADAPTIVE OPTIMAL START SEQUENCE SHALL AUTOMATICALLY ADJUST FOR SUBSEQUENT STARTS.
6. NIGHT SETBACK / AHU UNOCCUPIED MODE: THE BAS SHALL SHUTDOWN THE AHU USING THE SYSTEM SHUTDOWN SEQUENCE. IF ANY SPACE TEMPERATURE DROPS BELOW THE UNOCCUPIED HEATING 60 DEGREE F (ADJUSTABLE) SETPOINT OR ABOVE THE UNOCCUPIED COOLING 85 DEGREE F (ADJUSTABLE) SETPOINT, THE AHU SHALL BE ENABLED. WHEN THE AHU IS ENABLED TO START, THE UNIT'S RETURN AIR DAMPER SHALL OPEN, AND THE OUTDOOR AIR, EXHAUST AIR, AND RELIEF DAMPERS SHALL CLOSE. ONCE THE DAMPERS ARE IN THE CORRECT POSITION, AS DETERMINED BY DAMPER END SWITCHES, THE SUPPLY FAN AND RETURN SHALL START. DURING UNOCCUPIED AHU OPERATION, THE OUTDOOR AIR, EXHAUST AIR, AND RELIEF DAMPER SHALL REMAIN CLOSED, AND THE RETURN AIR DAMPER SHALL REMAIN OPEN. THE AHU SHALL CONTINUE TO OPERATE A MINIMUM OF 5 MINUTES (ADJUSTABLE) AFTER SATISFACTION OF THE UNOCCUPIED SPACE TEMPERATURE SETPOINT. THE SUPPLY AND RETURN FANS AIRFLOW SHALL BE SYNCED. THIS MODE SHALL BE ABLE TO BE INITIATED/SCHEDULED BY THE OWNER THROUGH THE BAS FRONT END.
7. FAN CONTROL: REMOTE STATIC PRESSURE TRANSMITTERS LOCATED IN EACH MAIN SUPPLY AIR DUCT AT LOCATIONS ABOUT 2/3 THE LENGTH OF THE SUPPLY DUCT SHALL VARY THE SUPPLY FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE AT A CONSTANT LEVEL OF 1.0" W.G. (ADJUSTABLE). THE RETURN FAN SHALL TRACK THE SUPPLY AIR FAN, BY MODULATING TO MAINTAIN A FIXED OFFSET BETWEEN MEASURED SUPPLY AND RETURN AIR VOLUME. THE FOLLOWING INITIAL FIXED OFFSETS (ADJUSTABLE) SHALL BE MAINTAINED AND SHALL BE MODIFIED AS NECESSARY BY THE BALANCING CONTRACTOR AND CONTROL CONTRACTOR DURING THE CONSTRUCTION, START UP, AND VERIFICATION PROCESS:
   A. AHU1: 11,500 CFM
8. COOLING CONTROL: THE AIR HANDLING UNIT'S INTEGRAL CONTROLLER SHALL USE THE MANUFACTURER CONTROLLER'S STANDARD CONTROL SEQUENCE OF OPERATION TO MODULATE THE DX COOLING CAPACITY TO MAINTAIN THE DISCHARGE SUPPLY AIR 52 DEGREE F (ADJUSTABLE) TEMPERATURE SETPOINT. THE CONTROLS SHALL PROHIBIT THE UNIT FROM SIMULTANEOUSLY COOLING AND HEATING.
9. HEATING CONTROL: THE NATURAL GAS BURNER SHALL BE HARDWIRED FOR ENABLE/DISABLE, STATUS, AND MODULATING CONTROL. HEATING CONTROL SHALL BE ENABLED WHENEVER DEHUMIDIFICATION IS REQUIRED OR THE OUTSIDE AIR TEMPERATURE IS BELOW 50 DEGREE F (ADJUSTABLE), AND SUPPLY FAN STATUS IS ON. MODULATE THE NATURAL GAS BURNER TO MAINTAIN A DISCHARGE SUPPLY AIR SETPOINT OF 55 DEGREE F (ADJUSTABLE). THE CONTROLS SHALL PROHIBIT THE UNIT FROM SIMULTANEOUSLY COOLING AND HEATING.
10. STATIC PRESSURE AND SUPPLY TEMPERATURE RESET: THE BAS SHALL MONITOR THE AIRFLOW AND DAMPER POSITION ON EACH AIR TERMINAL. THE BAS SHALL DETERMINE THE CRITICAL AIR TERMINAL (THE AIR TERMINAL WITH THE MOST OPEN DAMPER) TO MAKE NECESSARY INCREMENTAL ADJUSTMENTS, AND THIS REOCCURS EVERY 10 MINUTES (ADJUSTABLE).
    A. IF THE CRITICAL AIR TERMINAL IS GREATER THAN 85% OPEN AND LESS THAN OR EQUAL TO 95% OPEN, THE BAS SHALL CONTINUE TO CONTROL AT THE CURRENT SUPPLY AIR TEMPERATURE AND STATIC PRESSURE SETPOINTS.
    B. IF THE CRITICAL AIR TERMINAL IS MORE THAN 95% OPEN AND THE SUPPLY AIR TEMPERATURE IS AT ITS MINIMUM VALUE OF 55 DEG F (ADJUSTABLE), THE BAS SHALL RESET THE SUPPLY AIR STATIC PRESSURE SETPOINT UP BY INCREMENTS OF 0.25 IN WG UNTIL THE CRITICAL AIR TERMINAL IS AT 90% OPEN OR THE SUPPLY STATIC PRESSURE IS AT ITS PREDETERMINED MAXIMUM (ADJUSTABLE).
    C. IF THE CRITICAL AIR TERMINAL IS MORE THAN 95% OPEN AND THE SUPPLY AIR TEMPERATURE IS GREATER THAN THE MINIMUM SUPPLY AIR TEMPERATURE (55 DEG F ADJUSTABLE), THE SUPPLY AIR TEMPERATURE SHALL BE RESET DOWN IN 0.5 DEG F (ADJUSTABLE) INCREMENTS UNTIL THE CRITICAL AIR TERMINAL IS AT 90% OPEN OR MINIMUM SUPPLY AIR TEMPERATURE IS REACHED.
    D. IF THE CRITICAL AIR TERMINAL IS LESS THAN 85% OPEN, THE STATIC PRESSURE SETPOINT SHALL BE RESET DOWN BY INCREMENTS OF 0.25 IN WG UNTIL THE CRITICAL AIR TERMINAL IS AT 90% OPEN.
    E. IF THE CRITICAL AIR TERMINAL IS LESS THAN 85% OPEN AND THE SUPPLY AIR STATIC PRESSURE IS AT ITS PREDETERMINED MINIMUM (ADJUSTABLE), THE SUPPLY AIR TEMPERATURE SETPOINT SHALL BE RAISED AT INCREMENTS OF 0.5 DEG F (ADJUSTABLE) AND THE STATIC PRESSURE SETPOINT HELD CONSTANT UNTIL THE CRITICAL AIR TERMINAL IS AT 90% OPEN OR THE SUPPLY AIR TEMPERATURE REACHES ITS PREDETERMINED MAXIMUM OF 60 DEG F (ADJUSTABLE).
    F. THE ABILITY TO DISREGARD SPECIFIC TERMINAL BOXES AS CRITICAL SHALL BE PROVIDED THROUGH THE BAS FRONT END.
    G. THE BAS FRONT END SHALL DISPLAY WHICH TERMINAL BOX(ES) ARE CRITICAL.
11. ECONOMIZER CONTROL: WHEN THE OUTSIDE AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY, THEN THE DDC CONTROLLER SHALL INITIATE THE ECONOMIZER MODE. MODULATE THE OUTDOOR AIR, RETURN AIR, AND RELIEF AIR DAMPERS TO MAINTAIN THE DISCHARGE SUPPLY AIR TEMPERATURE SETPOINT. WHEN THE OUTSIDE AIR TEMPERATURE EXCEEDS 65 DEGREE F (ADJUSTABLE) OR WHEN THE RETURN AIR ENTHALPY IS LOWER THAN THE OUTSIDE AIR ENTHALPY, THEN THE ECONOMIZER CYCLE SHALL END.
13. ENERGY RECOVERY WHEEL: THE ENERGY RECOVERY WHEEL'S TWO POSITION BYPASS DAMPERS SHALL BE OPEN WHEN THE WHEEL IS DISABLED. THE VARIABLE SPEED WHEEL SHALL BE ENABLED WHEN THE ABSOLUTE VALUE OF THE DIFFERENCE BETWEEN THE WHEEL INLET EXHAUST TEMPERATURE AND THE WHEEL INLET SUPPLY TEMPERATURE IS GREATER THAN 5 DEGREE F (ADJUSTABLE).
    A. COOLING RECOVERY MODE: DURING COOLING MODE THE WHEEL INLET EXHAUST TEMPERATURE IS 5 DEGREE F (ADJUSTABLE) LESS THAN THE WHEEL INLET SUPPLY TEMPERATURE, AND THE UNIT NEEDS COOLING TO SATISFY THE DISCHARGE SUPPLY AIR 55 DEGREE F (ADJUSTABLE) TEMPERATURE SETPOINT. DURING COOLING MODE THE ENERGY RECOVERY WHEEL WILL BE FULL SPEED SINCE THE EXHAUST AIR TEMPERATURE WILL ALWAYS BE GREATER THAN THE DISCHARGE SUPPLY AIR TEMPERATURE SETPOINT.
    B. HEATING RECOVERY MODE: DURING HEATING MODE THE WHEEL INLET EXHAUST TEMPERATURE IS 5 DEGREE F (ADJUSTABLE) GREATER THAN THE WHEEL INLET SUPPLY TEMPERATURE, AND THE UNIT NEEDS HEATING TO SATISFY THE DISCHARGE SUPPLY AIR 55 DEGREE F (ADJUSTABLE) TEMPERATURE SETPOINT. DURING HEATING MODE THE ENERGY RECOVERY WHEEL WILL MODULATE TO MAINTAIN THE DISCHARGE SUPPLY AIR TEMPERATURE SETPOINT.
    C. FROST PROTECTION: WHEN THE WHEEL INLET SUPPLY TEMPERATURE DROPS BELOW 15 DEGREE F (ADJUSTABLE) OR THE WHEEL INLET EXHAUST TEMPERATURE DROPS BELOW THE ENERGY RECOVERY LOW LIMIT SETPOINT OF 39 DEGREE F (ADJUSTABLE), THE ENERGY RECOVERY LOOP WILL CHANGE MODES TO MAINTAIN A MINIMUM WHEEL OUTLET EXHAUST AIR TEMPERATURE OF 39 DEGREE F (ADJUSTABLE) TO PREVENT FREEZING. UPON A LOSS OF ENERGY RECOVERY WHEEL STATUS, THE WHEEL WILL ATTEMPT TO AUTOMATICALLY RESTART UNTIL POSITIVE STATUS IS RECEIVED.
    D. PERIODIC SELF CLEANING: WHEN THE ENERGY RECOVERY WHEEL HAS BEEN STOPPED FOR 3.5 DAYS (ADJUSTABLE), IT WILL BE ENERGIZED FOR 5 SECONDS (ADJUSTABLE) AT MINIMUM SPEED FOR CLEANING AND BLOCKING PROTECTION.
14. SYSTEM SHUTDOWN: WHEN A UNIT IS COMMANDED OFF, THE SUPPLY, EXHAUST, AND RETURN FANS SHALL BE DISABLED, THE OUTDOOR AIR, EXHAUST AIR, AND RELIEF DAMPERS SHALL CLOSE, THE RETURN DAMPER SHALL OPEN, THE HEATING AND COOLING SHALL BE DISABLED AND ENERGY WHEEL SHALL BE DE-ENERGIZED.
15. THE DDC SYSTEM SHALL MONITOR:
    A. THE SUPPLY AND RETURN FANS VFDS.
    B. ENERGY WHEEL VFD.
    C. THE AUTOMATIC DAMPER'S POSITIONS AND DAMPER END SWITCHES.
    D. RETURN AIR, OUTDOOR AIR, MIXED AIR, HEATING DISCHARGE AIR, COOLING DISCHARGE AIR, AND SUPPLY AIR TEMPERATURE.
    E. RETURN AIR, OUTDOOR AIR, AND SUPPLY AIR HUMIDITY.
    F. ENERGY WHEEL'S INLET AND DISCHARGE TEMPERATURE AND HUMIDITIY FOR BOTH THE SUPPLY AND EXHAUST AIRSTREAMS.
    G. RETURN, OUTDOOR, SUPPLY, AND EXHAUST AIRFLOWS VIA AIRFLOW MONITORS.
    H. PRESSURE DROP ACROSS ALL FILTER SECTIONS.
15. SYSTEM ALARMS AND SAFETIES:
    A. IF A FAN IS NOT SENSED TO BE OPERATING OR THE AUTOMATIC DAMPERS FAIL TO OPEN OR CLOSE WHEN REQUIRED, ALARM THE DDC SYSTEM.
    B. IF THE ENERGY RECOVERY WHEEL FAILS TO OPERATE, ALARM THE DDC SYSTEM.
    C. DUCT SMOKE DETECTOR: THE DUCT SMOKE DETECTOR SHALL BE HARDWIRED TO STOP THE AHU SUPPLY AND RETURN FANS ON AN ALARM CONDITION. IN THE EVENT OF SMOKE BEING DETECTED, THE UNIT SHALL BE SHUTDOWN AS SPECIFIED IN THE SYSTEM SHUTDOWN SEQUENCE AND AN ALARM GENERATED. UNIT SHALL REQUIRE A MANUAL RESET.
    D. HIGH/LOW STATIC PRESSURE: IF THE SUPPLY AIR DUCT STATIC PRESSURE EXCEEDS 4" W.G. (ADJUSTABLE), OR THE RETURN AIR DUCT STATIC PRESSURE EXCEEDS -3" W.G. (ADJUSTABLE) A HIGH PRESSURE SWITCH SHALL TRIP THE SUPPLY AND RETURN FANS AND AN ALARM GENERATED.
    E. DIRTY FILTERS: WHEN THE DIFFERENTIAL PRESSURE EXCEEDS THE FILTER MANUFACTURER'S RECOMMENDATIONS FOR DIRTY FILTERS, AN ALARM SHALL BE GENERATED THROUGH THE BAS. CONTRACTOR TO FIELD VERIFY MANUFACTURER'S RECOMMENDED DIFFERENTIAL SETTING.
    F. HIGH HUMIDITY: ALARM THE BAS IF THE SUPPLY AIR HUMIDITY LEVEL RISES TO 80% RH (ADJUSTABLE) OR HIGHER.
    G. CONDENSATE DRAIN PAN OVERFLOW PROTECTION: PROVIDE A CONDENSATE DRAIN PAN FLOAT OR HIGH LIMIT WATER SENSOR TO PREVENT DRAIN PAN OVERFLOW DUE TO A CLOG IN ASSOCIATED DRAIN PIPING. IF HIGH LIMIT IS DETECTED, ALARM THE DDC SYSTEM AND DISABLE COOLING.
    H. OUTDOOR AIR DELIVERY MONITORING: PROVIDE A DIRECT OUTDOOR AIR MEASUREMENT DEVICE CAPABLE OF MEASURING THE OUTDOOR AIR FLOW. ALARM THE BAS CENTRAL MONITORING STATION IF THE OUTDOOR AIR CFM DROPS 10% BELOW THE DESIGN VALUE.



1 | M801 **AHU (ENERGY RECOVERY) CONTROL DIAGRAM** — NTS

AECOM

PROJECT

MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION
TIMOTHY JAMES OLDHAM REGISTERED 23923 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
MECHANICAL SEQUENCE OF OPERATIONS/CONTROLS

SHEET NUMBER
M801

Designer: CRW Checked: ZJO Approved: Approver ANSI D 22"x34"

Project Management Initials:

DEDICATED OUTDOOR AIR UNITS (DOAS) SINGLE ZONE FITOUT (VAV)

1. THESE DOAS ARE CONSTANT AIR VOLUME UNITS. THE UNITS HAVE A DRAW THROUGH CONFIGURATION AND CONSIST OF A SUPPLY FAN, EXHAUST FAN, ENERGY RECOVERY CORE, FILTERS, NATURAL GAS BURNER, DIRECT EXPANSION COOLING COIL, OUTSIDE AIR DAMPER, EXHAUST AIR DAMPER, AND AIR FLOW MEASURING DEVICES.
2. THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING UNITS:
   A. DOAS1
3. SYSTEM OPERATION: THE DOAS SHALL OPERATE BASED ON AN OCCUPIED/UNOCCUPIED TIME OF DAY SCHEDULE WITH MANUAL OVERRIDE THROUGH THE BAS TO PLACE A UNIT IN OCCUPIED MODE. AT THE EXPIRATION OF THIS TIME CONTROLLED OVERRIDE, THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE. COORDINATE LOCATION OF MANUAL OVERRIDES WITH OWNER.
4. SYSTEM START UP/DOAS OCCUPIED MODE: DURING THE OCCUPIED MODE, THE UNIT SHALL OPERATE TO MAINTAIN THE OCCUPIED SETPOINTS OF 74°F IN COOLING (ADJ.) AND 68°F IN HEATING (ADJ.) WHEN THE DOAS IS ENABLED TO START, THE UNIT'S EXHAUST AND OUTDOOR AIR DAMPERS SHALL OPEN. ONCE THE DAMPERS ARE IN THE CORRECT POSITION, AS DETERMINED BY DAMPER END SWITCHES, THE SUPPLY AND EXHAUST FANS SHALL START. THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL BE NORMALLY CLOSED. AN AIRFLOW MEASURING STATION SHALL MEASURE THE AMOUNT OF OUTSIDE AND EXHAUST AIR.
5. MORNING WARM UP / COOL DOWN: THE BAS SHALL ENABLE THE DOAS TO START IN ADVANCE OF THE SCHEDULED OCCUPIED TIME, VIA AN ADAPTIVE OPTIMAL START SEQUENCE. THE ADAPTIVE OPTIMAL START SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULE OCCUPIED PERIOD. THE UNIT SHALL ENTER A MORNING WARM UP / COOL DOWN MODE IF NECESSARY BASED ON SPACE TEMPERATURE. SHOULD THE SPACE TEMPERATURES NOT REACH THE OCCUPIED SETPOINT BEFORE THE SCHEDULED OCCUPIED TIME, OR REACH SETPOINT TOO EARLY, THE ADAPTIVE OPTIMAL START SEQUENCE SHALL AUTOMATICALLY ADJUST FOR SUBSEQUENT STARTS.
6. NIGHT SETBACK / DOAS UNOCCUPIED MODE: THE BAS SHALL SHUTDOWN THE DOAS USING THE SYSTEM SHUTDOWN SEQUENCE. IF ANY SPACE TEMPERATURE DROPS BELOW THE UNOCCUPIED HEATING 55°F (ADJUSTABLE) SETPOINT OR ABOVE THE UNOCCUPIED COOLING 85°F (ADJUSTABLE) SETPOINT, THE DOAS SHALL BE ENABLED. THE DOAS SHALL CONTINUE TO OPERATE A MINIMUM OF 5 MINUTES (ADJUSTABLE) AFTER SATISFACTION OF THE UNOCCUPIED SPACE TEMPERATURE SETPOINT. THE SUPPLY AND EXHAUST FAN'S AIRFLOW SHALL BE SYNCED. THIS MODE SHALL BE ABLE TO BE INITIATED/SCHEDULED BY THE OWNER FOR ALL DOASS THROUGH THE BAS FRONT END.
7. SUPPLY FAN CONTROL: THE SUPPLY FANS SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FANS SHALL HAVE AN ADJUSTABLE MINIMUM RUNTIME. REMOTE STATIC PRESSURE TRANSMITTERS LOCATED IN EACH MAIN SUPPLY AIR DUCT AT LOCATIONS ABOUT 2/3 THE LENGTH OF THE SUPPLY DUCT SHALL VARY THE SUPPLY FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE AT A CONSTANT LEVEL OF 1.0" W.G. (ADJUSTABLE). THE ADJUSTABLE STATIC PRESSURE SETPOINT SHALL BE MODIFIED AS NECESSARY BY THE BALANCING CONTRACTOR, CONTROL CONTRACTOR, AND COMMISSIONING AGENT DURING THE CONSTRUCTION, START UP, AND VERIFICATION PROCESS. BAS/DDC SHALL ENABLE THE SUPPLY FAN ECM CONTROLLER AND PROVIDE THE SPEED SIGNAL THROUGH BACNET. THE ECM CONTROLLER PROVIDES THE STAGING TO EACH ECM FAN. EACH INDIVIDUAL SUPPLY FAN SHALL BE MONITORED FOR FAILURE, STATUS, START/STOP, RUNTIME, AND HAND POSITION. CONTINUOUS AIRFLOW MEASURING FOR EACH INDIVIDUAL FAN, TOTAL SUPPLY AIRFLOW, AND TOTAL SUPPLY FAN ARRAY KW USAGE SHALL BE MONITORED THROUGH THE BAS.
8. EXHAUST FAN CONTROL: THE EXHAUST FANS SHALL BE INTERLOCKED IN UNISON WITH THE SUPPLY FANS AND RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE EXHAUST FANS SHALL HAVE AN ADJUSTABLE MINIMUM RUNTIME. REMOTE STATIC PRESSURE TRANSMITTERS LOCATED IN EACH MAIN EXHAUST AIR DUCT AT LOCATIONS ABOUT 2/3 THE LENGTH OF THE SUPPLY DUCT SHALL VARY THE EXHAUST FAN SPEED TO MAINTAIN DUCT STATIC PRESSURE AT A CONSTANT LEVEL OF 1.0" W.G. (ADJUSTABLE). THE ADJUSTABLE STATIC PRESSURE SETPOINT SHALL BE MODIFIED AS NECESSARY BY THE BALANCING CONTRACTOR, CONTROL CONTRACTOR, AND COMMISSIONING AGENT DURING THE CONSTRUCTION, START UP, AND VERIFICATION PROCESS. BAS/DDC SHALL ENABLE THE EXHAUST FAN ECM CONTROLLER AND PROVIDE THE SPEED SIGNAL THROUGH BACNET. THE ECM CONTROLLER PROVIDES THE STAGING TO EACH ECM FAN. EACH INDIVIDUAL EXHAUST FAN SHALL BE MONITORED FOR FAILURE, STATUS, START/STOP, RUNTIME, AND HAND POSITION. CONTINUOUS AIRFLOW MEASURING FOR EACH INDIVIDUAL FAN, TOTAL EXHAUST AIRFLOW, AND TOTAL EXHAUST FAN ARRAY KW USAGE SHALL BE MONITORED THROUGH THE BAS.
9. COOLING CONTROL: COOLING SHALL BE ENABLED WHENEVER DEHUMIDIFICATION IS REQUIRED OR OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.) AND SUPPLY FAN STATUS IS ON. ON AL CALL FOR COOLING THE UNIT CONTROLLER SHALL MODULATE THE COMPRESSORS, CONDENSER FANS AND EXPANSION VALVE TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT 54°F (ADJ.). THE CONTROLS SHALL PROHIBIT THE UNIT FROM SIMULTANEOUSLY COOLING AND HEATING.
10. HEATING CONTROL: NATURAL GAS BURNER SHALL BE HARDWIRED FOR ENABLE/DISABLE, STATUS, AND MODULATING CONTROL. HEATING CONTROL SHALL BE ENABLED WHENEVER DEHUMIDIFICATION IS REQUIRED OR THE OUTSIDE AIR TEMPERATURE IS BELOW 60°F (ADJ.), AND SUPPLY FAN STATUS IS ON. MODULATE THE NATURAL GAS BURNER TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT OF 68°F (ADJ). THE CONTROLS SHALL PROHIBIT THE UNIT FROM SIMULTANEOUSLY COOLING AND HEATING.
12. DEHUMIDIFICATION MODE: THE CONTROLLER SHALL MEASURE THE SPACE AIR HUMIDITY AND OVERRIDE THE COOLING SEQUENCE TO MAINTAIN SPACE AIR HUMIDITY AT OR BELOW 60% RH (ADJ.) FOR THE AREA SERVED BY THE UNIT. DURING DEHUMIDIFICATION, THE HOT GAS HEATING SHALL BE MODULATED TO MAINTAIN A SETPOINT OF 1°F (ADJ.) LESS THAN THE ZONE COOLING SETPOINT. IF DEHUMIDIFICATION MODE IS ENABLED AND THE UNIT IS IN SUPPLY TEMPERATURE RESET MODE, THE DISCHARGE AIR TEMPERATURE SHALL BE RESET DOWN TO 53°F. DEHUMIDIFICATION SHALL BE ENABLED WHENEVER THE SUPPLY FAN STATUS IS ON AND SPACE HUMIDITY EXCEEDS 60% RH (ADJ.) FOR 5 MINUTES (ADJ.). DEHUMIDIFICATION SHALL REMAIN ACTIVE UNTIL THE SPACE HUMIDITY DROPS BELOW A 10% RH DEADBAND (ADJ.).
12. SUPPLY TEMPERATURE RESET: THE COOLING DISCHARGE AIR SETPOINT SHALL BE CAPABLE OF BEING RESET INCREMENTALLY INCREASED BETWEEN 55°F TO 65°F (ADJ.) PRIOR TO ENTERING THE HEATING MODE. SUPPLY AIR TEMPERATURE RESET SHALL BE THE FIRST STAGE OF HEATING PRIOR TO ENABLING THE NATURAL GAS BURNER. SUPPLY AIR TEMPERATURE RESET SHALL BE OVERRIDDEN VIA A CALL FOR COOLING OR DEHUMIDIFICATION IS ENABLED.
13. SYSTEM SHUTDOWN: WHEN A UNIT IS COMMANDED OFF, THE SUPPLY AND EXHAUST FANS SHALL BE DISABLED, THE OUTDOOR AIR AND EXHAUST DAMPERS SHALL CLOSE, AND THE HEATING SHALL BE DISABLED AND COOLING SHALL BE 100% OFF.
14. AHU SHALL HAVE A MANUAL SHUTDOWN / AUTO MODE SWITCH AT THE DDC CONTROL PANEL. THE MANUAL SHUTDOWN MODE SHALL SHUTDOWN THE UNIT FOR A MAINTENANCE SHUTDOWN AND FOLLOW THE SYSTEM SHUTDOWN SEQUENCE. ONCE UNIT IS MANUALLY SWITCHED BACK INTO THE AUTO MODE AT THE DDC CONTROL PANEL, THE UNIT SHALL RETURN TO NORMAL OPERATION OF THE OCCUPIED/UNOCCUPIED TIME OF DAY SCHEDULE AND FOLLOW THE STARTUP SEQUENCE.
15. THE BAS SHALL MONITOR:
   B. SUPPLY AND EXHAUST FAN STATUS.
   C. COOLING STATUS.
   D. HEATING STATUS.
   E. THE AUTOMATIC DAMPER'S POSITIONS AND DAMPER END SWITCHES.
   F. EXHAUST AIR, OUTDOOR AIR, MIXED AIR, TEMPERATURES UPSTREAM/DOWNSTREAM OF THE HEAT EXCHANGERS, HEATING DISCHARGE AIR, COOLING COIL DISCHARGE AIR, SUPPLY AIR, AND SPACE TEMPERATURES. MIXED AIR TEMPERATURE SENSOR SHALL BE AVERAGING TYPE.
   G. EXHAUST AIR, OUTDOOR AIR, SUPPLY AIR, AND SPACE HUMIDITY.
   H. EXHAUST, OUTDOOR, AND SUPPLY AIRFLOWS VIA AIRFLOW MONITORS.
   I. PRESSURE DROP ACROSS ALL FILTER SECTIONS.
17. SYSTEM ALARMS AND SAFETIES:
   A. IF A FAN IS NOT SENSED TO BE OPERATING OR THE AUTOMATIC DAMPERS FAIL TO OPEN OR CLOSE WHEN REQUIRED, ALARM THE DDC SYSTEM.
   B. DUCT SMOKE DETECTOR: THE DUCT SMOKE DETECTORS SHALL BE HARDWIRED TO STOP THE DOAS SUPPLY AND EXHAUST FANS ON AN ALARM CONDITION. IN THE EVENT OF SMOKE BEING DETECTED, THE UNIT SHALL BE SHUTDOWN AS SPECIFIED IN THE SYSTEM SHUTDOWN SEQUENCE AND AN ALARM GENERATED. UNIT SHALL REQUIRE A MANUAL RESET.
   C. GENERAL FIRE ALARM: HARDWIRE A GLOBAL CONTROL MODULE FROM THE FIRE ALARM TO THE UNIT FOR SHUT DOWN. GENERATE AN ALARM UPON RECEIVING AN ALARM FROM THE FIRE ALARM SYSTEM. SEE FIRE ALARM DRAWINGS FOR MORE INFORMATION.
   D. HIGH/LOW STATIC PRESSURE: IF THE SUPPLY AIR DUCT STATIC PRESSURE EXCEEDS 4" W.G. (ADJUSTABLE), OR THE EXHAUST AIR DUCT STATIC PRESSURE EXCEEDS -3" W.G. (ADJUSTABLE) A HIGH PRESSURE SWITCH SHALL TRIP THE SUPPLY AND EXHAUST FAN AND AN ALARM GENERATED.
   E. DIRTY FILTERS: WHEN THE DIFFERENTIAL PRESSURE EXCEEDS THE FILTER MANUFACTURER'S RECOMMENDATIONS FOR DIRTY FILTERS, AN ALARM SHALL BE GENERATED THROUGH THE BAS. CONTRACTOR TO FIELD VERIFY MANUFACTURER'S RECOMMENDED DIFFERENTIAL SETTING.
   F. LOW TEMPERATURE DETECTION THERMOSTAT (FREEZESTAT): AVERAGING FREEZESTATS SHALL BE HARDWIRED TO STOP THE ASSOCIATED DOAS FANS, IF THE COOLING COIL'S INLET TEMPERATURE DROPS BELOW 20 DEGREE F (ADJ.). IN THE EVENT OF A FREEZESTAT TRIP, THE SUPPLY AND EXHAUST FANS SHALL BE SHUTDOWN AND THE EXHAUST AND OUTSIDE AIR DAMPERS SHALL BE CLOSED, AND AN ALARM SHALL BE GENERATED. TO RESTART THE SYSTEM, ALL DEVICES MUST BE MANUALLY RESET.
   G. CONDENSATE DRAIN PAN OVERFLOW PROTECTION: PROVIDE A CONDENSATE DRAIN PAN FLOAT OR HIGH LIMIT WATER SENSOR TO PREVENT DRAIN PAN OVERFLOW DUE TO A CLOG IN ASSOCIATED DRAIN PIPING. IF HIGH LIMIT IS DETECTED, ALARM THE DDC SYSTEM.
   H. OUTDOOR AIR DELIVERY MONITORING: PROVIDE A DIRECT OUTDOOR AIR MEASUREMENT DEVICE CAPABLE OF MEASURING THE OUTDOOR AIR FLOW. ALARM THE BAS CENTRAL MONITORING STATION IF THE OUTDOOR AIR CFM DROPS 10% (ADJ.). BELOW THE DESIGN VALUE.
   I. SUPPLY AND EXHAUST FAN FAILURE, HAND POSITION, RUNTIME EXCEEDED.
   J. HIGH AND LOW MIXED AIR TEMPERATURES GREATER THAN 90°F AND 45°F (ADJ.)
   K. HIGH AND LOW EXHAUST AIR HUMIDITY GREATER THAN 70% AND 35% (ADJ.).
   L. HIGH AND LOW EXHAUST AIR TEMPERATURE GREATER THAN 90°F AND 45°F (ADJ.).
   K. HIGH AND LOW SUPPLY AIR TEMPERATURE GREATER THAN 120°F AND 45°F (ADJ.).
   L. HIGH CO2 CONCENTRATION GREATER THAN 1000 PPM (ADJ.) IN THE OCCUPIED MODE EITHER AT THE SPACE OR EXHAUST AIR DUCT.
   M. BAS FAILURE: IF COMMUNICATION IS LOST WITH THE BAS, THE AHU SHALL USE ITS DEFAULT SETPOINTS AND OPERATE IN NORMAL MODE.
23. THE CONTROL BANDS, SETPOINT INCREMENT VALUES, SETPOINT DECREMENT VALUES AND ADJUSTMENT FREQUENCIES SHALL BE ADJUSTED AND TUNED TO MAINTAIN MAXIMUM STATIC PRESSURE OPTIMIZATION WITH STABLE SYSTEM CONTROL AND MAXIMUM COMFORT CONTROL.

EXHAUST FANS (CONSTANT VOLUME, AND INTERLOCKED WITH EQUIPMENT)

1. THESE EXHAUST FANS ARE A CONSTANT AIR VOLUME FAN.
2. THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING FANS
   A.EF4 (INTERLOCKED WITH VRF SYSTEM FOR PRESS AREA. FAN TURNS ON WHEN VRF SYSTEM IS ENABLED)
   B. EF5 (INTERLOCKED WITH MAU1)
   C.EF6 (INTERLOCKED WITH MAU2)
3. SYSTEM START UP: THE ASSOCIATED MOTORIZED DAMPER SHALL OPEN AND THE FAN SHALL START ONCE A SIGNAL IS PROVIDED FROM INTERLOCKED EQUIPMENT.
4. THE DDC SYSTEM SHALL MONITOR:
   A.THE STATUS OF THE FAN VIA A CURRENT SENSOR.
   B. DAMPER POSITION
5. SYSTEM ALARMS AND SAFETIES:
   A.IF A FAN IS NOT SENSED TO BE OPERATING, ALARM THE DDC SYSTEM.
   B. IF DAMPER DOES NOT PROVE OPEN, ALARM THE DDC SYSTEM.
6. MONITOR DAMPER COMMAND AND STATUS IF APPLICABLE. FAN SHALL BE INTERLOCKED TO DAMPER SO THAT FAN CANNOT START UNTIL DAMPER IS FULLY OPEN.

DUCTLESS SPLIT SYSTEM

1. THE SEQUENCE OF OPERATION FOR THE DUCTLESS SPLIT SYSTEM SHALL BE THE MANUFACTURER'S HARDWARE AND SOFTWARE WITH STANDARD OPERATING FUNCTIONS. THE DUCTLESS SPLIT SYSTEM, INCLUDING THE OUTDOOR HEAT PUMP UNIT, AND INDOOR FAN COIL UNIT, SHALL OPERATE UNDER THEIR INTERNAL CONTROLS. THE INDOOR AND OUTDOOR UNIT CONTROLS SHALL BE INTERLOCKED PER THE MANUFACTURER'S RECOMMENDATION. THE DUCTLESS SPLIT SYSTEM WILL CONTROL ALL THERMAL EXPANSION VALVES, COMPRESSOR OPERATION, ETC.
2. ALL SETPOINTS, SCHEDULES, ALARMS, AND OPERATION FEATURES SHALL BE THROUGH THE MANUFACTURERS CONTROLS. ALL FEATURES SHALL ALSO BE CAPABLE OF BEING BEING VIEWED, ADJUSTED AND MONITORED THROUGH THE BAS.
3. THE FACTORY SUPPLIED, WALL-MOUNTED THERMOSTAT/CONTROLLER SHALL CONTROL THE INDIVIDUAL INDOOR FAN COIL UNIT TO MAINTAIN SPACE TEMPERATURE SETPOINT.
4. THE SYSTEM SHALL OPERATE ON A TIME OF DAY OCCUPIED/UNOCCUPIED SCHEDULE. OCCUPANCY SHALL BE PREDETERMINED BY THE OWNER AND PROGRAMMED INTO THE DUCTLESS SPLIT CONTROL SYSTEM.
5. ALL SPACES SERVED BY THE DUCTLESS SPLIT SYSTEM SETPOINT SHALL BE 75°F SUMMER AND 70°F WINTER (ALL ADJ.).
6. A BACNET INTERFACE SHALL BE PROVIDED FOR ALARM AND MONITORING THROUGH THE BAS/DDC CONTROL SYSTEM.
7. ALL FAN COIL UNITS SHALL HAVE AN AUXILIARY CONDENSATE OVERFLOW SWITCH INTERLOCKED TO SHUTDOWN THE FAN COIL UNITS AND ALARM BAS/DDC. 2
10. BAS/DDC SHALL MONITOR ALL ALARMS FROM THE SPLIT SYSTEM CONTROLLER.

AIR HANDLING UNIT (100% OUTDOOR AIR CV)

1. AHU IS A CONSTANT AIR VOLUME UNIT. THE UNIT HAS A DRAW THROUGH CONFIGURATION AND CONSISTS OF A SUPPLY FAN, EXHAUST FAN, FILTERS, NATURAL GAS BURNER, DIRECT EXPANSION COOLING COIL, OUTSIDE AIR DAMPER, EXHAUST AIR DAMPER, AND AIR FLOW MEASURING DEVICES. THE AHU IS PROVIDED WITH A SUPPLY FAN VFD AND EXHAUST FAN VFD FOR BALANCING PURPOSES ONLY. ONCE THE AHU IS BALANCED, THE VFD SHALL BE LOCKED AT THAT SPEED.
2. THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING UNITS:
   A. AHU2
3. SYSTEM OPERATION: THE AHU SHALL OPERATE BASED ON AN OCCUPIED/UNOCCUPIED TIME OF DAY SCHEDULE WITH MANUAL OVERRIDE LOCATED IN THE SPACE AS WELL AS A MANUAL OVERRIDE THROUGH THE BAS TO PLACE UNIT IN OCCUPIED MODE. AT THE EXPIRATION OF THIS TIME CONTROLLED OVERRIDE, THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE. COORDINATE LOCATION OF MANUAL OVERRIDE WITH OWNER.
4. SYSTEM START UP/AHU OCCUPIED MODE: DURING THE OCCUPIED MODE, THE UNIT SHALL OPERATE TO MAINTAIN THE OCCUPIED SETPOINTS OF 75 DEGREE F IN COOLING (ADJUSTABLE) AND 70 DEGREE F IN HEATING (ADJUSTABLE). WHEN THE AHU IS ENABLED TO START, THE UNIT'S EXHAUST AND OUTDOOR AIR DAMPERS SHALL OPEN. ONCE THE DAMPERS ARE IN THE CORRECT POSITION, AS DETERMINED BY DAMPER END SWITCHES, THE SUPPLY AND EXHAUST FANS SHALL START. THE OUTSIDE AIR AND EXHAUST DAMPERS SHALL BE NORMALLY CLOSED. AN AIRFLOW MEASURING STATION SHALL MEASURE THE AMOUNT OF OUTSIDE AND EXHAUST AIR.
5. MORNING WARM UP / COOL DOWN: THE BAS SHALL ENABLE THE AHU TO START IN ADVANCE OF THE SCHEDULED OCCUPIED TIME, VIA AN ADAPTIVE OPTIMAL START SEQUENCE. THE ADAPTIVE OPTIMAL START SHALL MINIMIZE THE UNOCCUPIED WARM-UP OR COOL-DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD. THE UNIT SHALL ENTER A MORNING WARM UP / COOL DOWN MODE IF NECESSARY BASED ON SPACE TEMPERATURE. ONCE THE OCCUPIED SPACE TEMPERATURE SETPOINT IS REACHED, THE SYSTEM SHALL ENTER OCCUPIED MODE. SHOULD THE SPACE TEMPERATURES NOT REACH THE OCCUPIED SETPOINT BEFORE THE SCHEDULED OCCUPIED TIME, OR REACH SETPOINT TOO EARLY, THE ADAPTIVE OPTIMAL START SEQUENCE SHALL AUTOMATICALLY ADJUST FOR SUBSEQUENT STARTS.
6. NIGHT SETBACK / AHU UNOCCUPIED MODE: THE BAS SHALL SHUTDOWN THE AHU USING THE SYSTEM SHUTDOWN SEQUENCE. IF ANY SPACE TEMPERATURE DROPS BELOW THE UNOCCUPIED HEATING 50 DEGREE F (ADJUSTABLE) SETPOINT OR ABOVE THE UNOCCUPIED COOLING 90 DEGREE F (ADJUSTABLE) SETPOINT, THE AHU SHALL BE ENABLED. THE AHU SHALL CONTINUE TO OPERATE A MINIMUM OF 5 MINUTES (ADJUSTABLE) AFTER SATISFACTION OF THE UNOCCUPIED SPACE TEMPERATURE SETPOINT. THE SUPPLY AND EXHAUST FAN'S AIRFLOW SHALL BE SYNCED. THIS MODE SHALL BE ABLE TO BE INITIATED/SCHEDULED BY THE OWNER THROUGH THE BAS FRONT END.
7. SUPPLY FAN CONTROL: THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE AN ADJUSTABLE MINIMUM RUNTIME. THE SUPPLY FAN IS PROVIDED WITH A FACTORY MOUNTED VFD. THE SUPPLY FAN WILL OPERATE AT A CONSTANT SPEED SET POINT (ADJUSTABLE) DURING OPERATION.
8. EXHAUST FAN CONTROL: THE EXHAUST FAN SHALL BE INTERLOCKED IN UNISON WITH THE SUPPLY FAN AND RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES. TO PREVENT SHORT CYCLING, THE EXHAUST FAN SHALL HAVE AN ADJUSTABLE MINIMUM RUNTIME. THE EXHAUST FAN IS PROVIDED WITH A FACTORY MOUNTED VFD. THE EXHAUST FAN WILL OPERATE AT A CONSTANT SPEED SET POINT (ADJUSTABLE) DURING OPERATION.
9. COOLING CONTROL: COOLING SHALL BE ENABLED WHENEVER DEHUMIDIFICATION IS REQUIRED OR OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.) AND SUPPLY FAN STATUS IS ON. ON A CALL FOR COOLING THE UNIT CONTROLLER SHALL MODULATE THE COMPRESSORS, CONDENSER FANS, EXPANSION VALVE, AND HOT GAS REHEAT TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT 54°F (ADJ.). THE CONTROLS SHALL PROHIBIT THE UNIT FROM SIMULTANEOUSLY COOLING AND HEATING.
10. HEATING CONTROL: NATURAL GAS BURNER SHALL BE HARDWIRED FOR ENABLE/DISABLE, STATUS, AND MODULATING CONTROL. HEATING CONTROL SHALL BE ENABLED WHENEVER DEHUMIDIFICATION IS REQUIRED OR THE OUTSIDE AIR TEMPERATURE IS BELOW 50°F (ADJ.), AND SUPPLY FAN STATUS IS ON. MODULATE THE NATURAL GAS BURNER TO MAINTAIN DISCHARGE AIR TEMPERATURE SETPOINT OF 85°F (ADJ). THE CONTROLS SHALL PROHIBIT THE UNIT FROM SIMULTANEOUSLY COOLING AND HEATING.
11. DEHUMIDIFICATION MODE: THE CONTROLLER SHALL MEASURE THE SPACE AIR HUMIDITY AND OVERRIDE THE COOLING SEQUENCE TO MAINTAIN SPACE AIR HUMIDITY AT OR BELOW 60% RH (ADJ.) FOR THE AREA SERVED BY THE UNIT. DURING DEHUMIDIFICATION, THE HOT GAS HEATING SHALL BE MODULATED TO MAINTAIN A SETPOINT OF 1°F (ADJ.) LESS THAN THE ZONE COOLING SETPOINT. IF DEHUMIDIFICATION MODE IS ENABLED AND THE UNIT IS IN SUPPLY TEMPERATURE RESET MODE, THE DISCHARGE AIR TEMPERATURE SHALL BE RESET DOWN TO 53°F. DEHUMIDIFICATION SHALL BE ENABLED WHENEVER THE SUPPLY FAN STATUS IS ON AND SPACE HUMIDITY EXCEEDS 60% RH (ADJ.) FOR 5 MINUTES (ADJ.). DEHUMIDIFICATION SHALL REMAIN ACTIVE UNTIL THE SPACE HUMIDITY DROPS BELOW A 10% RH DEADBAND (ADJ.).
12. SUPPLY TEMPERATURE RESET: THE COOLING DISCHARGE AIR SETPOINT SHALL BE CAPABLE OF BEING RESET INCREMENTALLY INCREASED BETWEEN 55°F TO 65°F (ADJ.) PRIOR TO ENTERING THE HEATING MODE. SUPPLY AIR TEMPERATURE RESET SHALL BE THE FIRST STAGE OF HEATING PRIOR TO ENABLING THE NATURAL GAS BURNER. SUPPLY AIR TEMPERATURE RESET SHALL BE OVERRIDDEN VIA A CALL FOR COOLING OR DEHUMIDIFICATION IS ENABLED.
13. SYSTEM SHUTDOWN: WHEN A UNIT IS COMMANDED OFF, THE SUPPLY FAN SHALL BE DISABLED, THE OUTDOOR AIR DAMPER SHALL CLOSE, THE PREHEATING, REHEATING, AND COOLING COIL VALVES SHALL BE 100% CLOSED, AND THE HUMIDIFIER SHALL BE DE-ENERGIZED.
14. THE BAS SHALL MONITOR:
   A. COOLING STATUS.
   B. HEATING STATUS.
   C. THE SUPPLY AND EXHAUST FANS STATUS VIA CURRENT SENSORS AND FAN VFD'S.
   D. THE AUTOMATIC DAMPER'S POSITIONS AND DAMPER END SWITCHES.
   E. OUTDOOR AIR, SUPPLY AIR, AND SPACE TEMPERATURE.
   F. OUTDOOR AIR, SUPPLY AIR, AND SPACE HUMIDITY.
   G. EXHAUST AND SUPPLY AIRFLOWS VIA AIRFLOW MONITORS.
   H. PRESSURE DROP ACROSS ALL FILTER SECTIONS.
   I. ALL ALARMS FROM MANUFACTURER'S INTEGRAL CONTROLLER.
15. SYSTEM ALARMS AND SAFETIES:
   A. IF A FAN IS NOT SENSED TO BE OPERATING OR THE AUTOMATIC DAMPERS FAIL TO OPEN OR CLOSE WHEN REQUIRED, ALARM THE BAS.
   B. HIGH/LOW STATIC PRESSURE: IF THE SUPPLY AIR DUCT STATIC PRESSURE EXCEEDS 3" W.G. (ADJUSTABLE), OR THE EXHAUST AIR DUCT STATIC PRESSURE EXCEEDS -2.5" W.G. (ADJUSTABLE) A HIGH PRESSURE SWITCH SHALL TRIP THE SUPPLY AND EXHAUST FAN AND AN ALARM GENERATED.
   C. DIRTY FILTERS: WHEN THE DIFFERENTIAL PRESSURE EXCEEDS THE FILTER MANUFACTURER'S RECOMMENDATIONS FOR DIRTY FILTERS, AN ALARM SHALL BE GENERATED THROUGH THE BAS. CONTRACTOR TO FIELD VERIFY MANUFACTURER'S RECOMMENDED DIFFERENTIAL SETTING.
   F. HIGH HUMIDITY: ALARM THE BAS IF THE SUPPLY AIR HUMIDITY LEVEL RISES TO 80% RH (ADJUSTABLE) OR HIGHER.
   G. CONDENSATE DRAIN PAN OVERFLOW PROTECTION: PROVIDE A CONDENSATE DRAIN PAN FLOAT OR HIGH LIMIT WATER SENSOR TO PREVENT DRAIN PAN OVERFLOW DUE TO A CLOG IN ASSOCIATED DRAIN PIPING. IF HIGH LIMIT IS DETECTED, ALARM THE BAS AND DISABLE COOLING.
   H. OUTDOOR AIR DELIVERY MONITORING: PROVIDE A DIRECT OUTDOOR AIR MEASUREMENT DEVICE CAPABLE OF MEASURING THE OUTDOOR AIR FLOW.
   I. SUPPLY AND EXHAUST FAN FAILURE.
   J. HIGH/LOW REFRIGERANT PRESSURE: IN THE CASE OF LOW REFRIGERANT PRESSURE, THE COMPRESSORS WILL SHUT DOWN UNTIL REFRIGERANT PRESSURE RETURNS TO NORMAL VALUES AND THE CONTROLLER WILL SEND AN ALARM. IN THE CASE OF HIGH REFRIGERANT PRESSURE, THE COMPRESSORS WILL SHUT DOWN REQUIRING A MANUAL RESET AND CONTROLLER WILL SEND AN ALARM.
   K. BAS FAILURE: IF COMMUNICATION IS LOST WITH THE BAS, THE AHU SHALL USE ITS DEFAULT SETPOINTS AND OPERATE IN NORMAL MODE.

WATER SOFTENER SYSTEM WS1

A.THE BMS SHALL BE INTEGRATED WITH THE WATER SOFTENER SYSTEM.
1. THE FOLLOWING ITEMS SHALL BE PROVIDED THROUGH THE BMS:
   - WHICH VESSEL IS IN REGENERATION

SEWAGE EJECTOR PUMPS SYSTEM SE1 & 2 (CONTROLLER)

A.THE BMS SHALL BE INTEGRATED WITH THE EJECTOR PUMPS SYSTEM.
1. THE FOLLOWING ITEMS SHALL BE PROVIDED THROUGH THE BMS:
   - EJECTOR PUMPS STATUS OPERATING/STANDBY (2 EACH)
   - HIGH LIMIT ALARM
   - HIGH LIMIT OVERRRIDE (BOTH PUMPS ON)
   - LOW LEVEL (PUMPS OFF)

GAS WATER HEATER SYSTEMS GWH1 & GWH2 (INCLUSIVE OF MIXING VALVE AND RECIRCULATION PUMP)

A. THE BMS SHALL BE INTEGRATED WITH THE GAS WATER HEATER SYSTEMS
1. THE FOLLOWING ITEMS SHALL BE PROVIDED THROUGH THE BMS:
   - WATER HEATER OUTLET TEMPERATURE
   - WATER HEATER INLET TEMPERATURE
   - DIGITAL MIXING VALVE HOT WATER INLET TEMPERATURE
   - DIGITAL MIXING VALVE OUTLET TEMPERATURE
   - HOT WATER RECIRCULATION PUMP STATUS

DOMESTIC WATER SERVICE

A. THE BMS SHALL BE INTEGRATED WITH THE DOMESTIC WATER SERVICE
1. THE FOLLOWING ITEMSSHALL BE MONITORED THROUGH THE BMS:
   - MONITOR DRAIN DISCHARGE AT MAIN SERVICE BACKFLOW PREVENTER

INFRARED HEATER (ELECTRIC AND NATURAL GAS)

1. THE INFRARED HEATERS SHALL BE WIRED THROUGH THE INFRARED HEATER CONTROLLER. THE INFRARED HEATING SHALL BE ENABLED AND MODULATED BY THE WALL MOUNTED CONTROL. WHEN OUTDOOR TEMPERATURE IS ABOVE 50°F (ADJ), THE HEATERS SHALL BE LOCKED OUT.
2. BAS/DDC SHALL MONITOR ALL ALARMS AND ON/OFF STATUS. 2

TERMINAL BOXES

1. THE VAV BOX CONTROLLER SHALL CONTROL THE VAV BOX DAMPER AND ELECTRIC REHEAT TO MAINTAIN THE VAV BOX'S SPACE TEMPERATURE SETPOINT. ALL SETPOINTS SHALL BE ADJUSTABLE THROUGH THE BAS.
2. WHEN THE SPACE TEMPERATURE RISES ABOVE THE SPACE TEMPERATURE SETPOINT, THE CONTROLLER SHALL MODULATE THE VAV BOX DAMPER FROM ITS MINIMUM AIRFLOW POSITION TO ITS MAXIMUM AIRFLOW POSITION TO MAINTAIN THE SPACE TEMPERATURE SETPOINT.
3. ON A FALL IN SPACE TEMPERATURE BELOW THE SPACE TEMPERATURE SETPOINT, THE CONTROLLER SHALL MODULATE THE VAV BOX DAMPER TO ITS MINIMUM AIRFLOW POSITION.
4. ON A CONTINUED FALL IN SPACE TEMPERATURE BELOW THE SPACE TEMPERATURE SETPOINT, THE CONTROLLER SHALL MODULATE THE VAV BOX ELECTRIC REHEAT WHERE APPLICABLE.
5. THE DDC SYSTEM SHALL MONITOR SPACE TEMPERATURE, DAMPER POSITION, ELECTRIC REHEAT, AIRFLOW, DISCHARGE AIR TEMPERATURE, AND MODE (COOLING, HEATING).
6. UNOCCUPIED TERMINAL BOX AIRFLOW RESET: ALL TERMINAL BOXES SHALL HAVE A PROGRAMMABLE UNOCCUPIED AIRFLOW SETPOINT THAT CAN BE USED TO REDUCE THE MINIMUM AIRFLOW DURING UNOCCUPIED TIMES. UNOCCUPIED TERMINAL BOX AIRFLOW RESET IS ACTIVATED THROUGH THE DDC SYSTEM FOR AN ENTIRE AHU.
7. UNOCCUPIED SPACE TEMPERATURE RESET: ALL TERMINAL BOXES SHALL HAVE A PROGRAMMABLE UNOCCUPIED COOLING AND HEATING SPACE TEMPERATURE SETPOINT THAT CAN BE USED TO REDUCE THE AMOUNT OF COOLING AND HEATING DURING UNOCCUPIED TIMES. UNOCCUPIED SPACE TEMPERATURE RESET IS ACTIVATED THROUGH THE DDC SYSTEM FOR AN ENTIRE AHU.

UNIT HEATER (ELECTRIC)

1. THE UNIT CONSISTS OF A SUPPLY FAN, AND ELECTRIC HEATING COIL.
2. THE UNIT SHALL BE STARTED AND STOPPED THROUGH INTEGRAL SELF CONTAINED CONTROLS AND MONITORED THROUGH THE DDC SYSTEM.
3. A WALL MOUNTED TEMPERATURE SENSOR SHALL CYCLE THE FAN AND ELECTRIC HEATING COIL TO MAINTAIN THE DESIRED SPACE TEMPERATURE.
4. ALARM THE DDC SYSTEM IF THE UNIT FAILS TO OPERATE AS DETERMINED BY A CURRENT SENSOR.
5. PROVIDE SEPARATE WALL-MOUNTED SPACE TEMPERATURE SENSOR ADJACENT TO THE FACTORY SUPPLIED THERMOSTAT TO MONITOR THE SPACE TEMPERATURE THROUGH THE DDC SYSTEM. AN ALARM SHALL BE GENERATED AT THE DDC SYSTEM IF THE SPACE TEMPERATURE DROPS BELOW A LOW TEMPERATURE SETPOINT OF 45°F (ADJ.).

ELECTRICAL POWER MONITORING SYSTEMS

A.THE POWER MONITORING SYSTEM WILL MONITOR ELECTRICAL DEVICES LIKE METERS, TRIP UNITS, AND EQUIPMENT. BOTH TOTALIZED (CONSUMPTION) VALUES AND INSTANTANEOUS (DEMAND) VALUE SHALL BE INTEGRATED.

1. THE FOLLOWING POINTS SHALL BE MONITORED BY THE BMS WHEN AVAILABLE FROM THE MAIN METERING DEVICES:
   - REAL ENERGY KWHR
   - DEMAND REAL POWER KWD
   - TRUE POWER FACTOR TOTAL
   - REAL ENERGY KWHR
   - CURRENT PH A
   - CURRENT PH B
   - CURRENT PH C
   - CURRENT NEUTRAL
   - CURRENT 3-PH AVERAGE
   - CURRENT APPARENT RMS
   - VOLTAGE A-B
   - VOLTAGE B-C
   - VOLTAGE C-A
   - VOLTAGE AVERAGE
   - VOLTAGE A-N
   - VOLTAGE B-N
   - VOLTAGE C-N
   - REAL POWER PH A KW
   - REAL POWER PH B KW
   - REAL POWER PH C KW
   - REAL POWER TOTAL KW
   - THE AVERAGE AND MAXIMUM LOADING (CURRENT AND POWER) VALUES OF THE CIRCUIT, AND PERCENTAGE LOADS COMPARED TO THE BREAKER SIZE.

GENERATORS

A.THE BMS SHALL PROVIDE A SINGLE VIEW FOR THE GENERATOR AND FUEL TANK MONITORING STATUS AND ALARMS. THIS IS A CRUCIAL VIEW WHEN POWER OUTAGE SITUATIONS OCCUR AND MECHANICAL EQUIPMENT IS BROUGHT BACK ONLINE AS THE GENERATOR RAMPS UP TO FULL CAPACITY AND THEN RUNS THROUGHOUT AN OUTAGE. THE BMS SYSTEM SHALL DISPLAY VIA A GRAPHICAL USER INTERFACE ALL MONITORED POINTS FOR THE GENERATORS. THE USER SHALL HAVE THE ABILITY TO RECEIVE ALARMS FROM STATUS POINT BASED ON A DEFINED SEQUENCE OF EVENTS.

1. THE FOLLOWING POINTS SHALL BE MONITORED BY THE BMS WHEN AVAILABLE FROM THE GENERATOR:
   - AC VOLTMETER
   - AC AMMETER
   - GENERATOR RUNNING
   - GENERATOR CONTROL 'NOT-IN-AUTO' MODE ALARM
   - FUEL FLOW
   - EMERGENCY STOP SWITCH ACTIVATED
   - GENERATOR OVERLOAD ALARM
   - FAILURE OF COMMUNICATION LINK

DRY CONTACTS SHALL BE ACCEPTABLE FOR THIS INTEGRATION WHEN MONITORING GENERATOR RUN STATUS.

VARIABLE REFRIGERANT FLOW (VRF) SYSTEM

1. THE SEQUENCE OF OPERATION FOR THE VRF SYSTEM SHALL BE THE MANUFACTURER'S HARDWARE AND SOFTWARE WITH STANDARD OPERATING FUNCTIONS. THE VRF SYSTEM, INCLUDING THE OUTDOOR HEAT PUMP UNITS, INDOOR FAN COILS, AND CHANGE-OVER BOXES SHALL OPERATE UNDER THEIR INTERNAL CONTROLS. THE INDOOR AND OUTDOOR UNIT CONTROLS SHALL BE INTERLOCKED PER THE MANUFACTURER'S RECOMMENDATION. THE VRF CONTROL SYSTEM WILL CONTROL ALL THERMAL EXPANSION VALVES, COMPRESSOR OPERATION, ETC.
2. ALL SETPOINTS, SCHEDULES, ALARMS, AND OPERATION FEATURES SHALL BE THROUGH THE MANUFACTURER'S CONTROLS. ALL FEATURES SHALL ALSO BE CAPABLE OF BEING BEING VIEWED, ADJUSTED AND MONITORED THROUGH THE BAS.
3. THE FACTORY SUPPLIED, WALL-MOUNTED THERMOSTAT/CONTROLLER SHALL CONTROL THE INDIVIDUAL INDOOR FAN COIL UNITS TO MAINTAIN SPACE TEMPERATURE SETPOINT. EACH INDOOR UNIT SHALL MODULATE BASED ON THE RETURN AIR TEMPERATURE SENSED AT EACH UNIT IN ORDER TO MAINTAIN SETPOINT.
4. THE VRF SYSTEM SHALL OPERATE ON A TIME OF DAY OCCUPIED/UNOCCUPIED SCHEDULE. OCCUPANCY SHALL BE PREDETERMINED BY THE OWNER AND PROGRAMMED INTO THE VRF CONTROL SYSTEM.
5. VRF SYSTEM SHALL BE CAPABLE TO SIMULTANEOUSLY PROVIDE HEATING AND COOLING TO DIFFERENT SPACES.
6. ALL OCCUPIED SPACES SERVED BY THE VRF SYSTEM SETPOINT SHALL BE 75°F SUMMER AND 70°F WINTER (ALL ADJ.).
7. ALL UNOCCUPIED SPACES SERVED BY THE VRF SYSTEM SETPOINT SHALL BE 85°F SUMMER AND 60°F WINTER (ALL ADJ.).
8. A BACNET INTERFACE SHALL BE PROVIDED FOR ALARM AND MONITORING THROUGH THE BAS/DDC CONTROL SYSTEM.
9. ALL FAN COIL UNITS SHALL HAVE AN AUXILIARY CONDENSATE OVERFLOW SWITCH INTERLOCKED TO SHUTDOWN THE FAN COIL UNITS AND ALARM BAS/DDC. 2
10. BAS/DDC SHALL MONITOR ALL ALARMS FROM THE VRF CONTROLLERS.

VENTILATION EXHAUST FANS (CONSTANT VOLUME, AND ON/OFF)

1. THESE EXHAUST FANS ARE A CONSTANT AIR VOLUME FAN.
2. THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING FANS
   A.EF1
   B. EF2
   C.EF3
3. ~~SYSTEM START UP: THE FAN SHALL BE CAPABLE OF BEING STARTED AND STOPPED MANUALLY, ACTIVATED VIA THERMOSTAT AND MONITORED THROUGH THE DDC SYSTEM.~~
4. A WALL MOUNTED THERMOSTAT SHALL OPEN A DAMPER AND CYCLE THE FAN TO MAINTAIN 80°F SPACE TEMPERATURE (ADJUSTABLE). 2
5. ~~THE DDC SYSTEM SHALL MONITOR:~~
   A.THE STATUS OF THE FAN VIA A CURRENT SENSOR.
   B. ZONE TEMPERATURE.
   C.DAMPER POSITION
5. SYSTEM ALARMS AND SAFETIES:
   A.IF A FAN IS NOT SENSED TO BE OPERATING, ALARM THE DDC SYSTEM.
   B. IF DAMPER DOES NOT PROVE OPEN, ALARM THE DDC SYSTEM.
6. MONITOR DAMPER COMMAND, POSITION AND STATUS VIA END SWITCHES. FAN SHALL BE INTERLOCKED TO DAMPER SO THAT FAN CANNOT START UNTIL DAMPERS ARE FULLY OPEN.

ELEVATOR CONTROLS

A. THE BMS SHALL BE INTEGRATED WITH THE ELEVATORS CONTROLLER TO ENABLE MONITORING AND CONTROL OF CARD ACCESS BY PERSONS, FLOORS SELECTED, AND LOGGED FOR FUTURE INVESTIGATION PURPOSES. ELEVATOR FUNCTIONALITY CAN BE MANAGED BY SIMPLY SWIPING A CARD AND ENTERING AN ACCESS CODE AND THE ELEVATOR CONTROL SYSTEM PRIORITIZES THIS REQUEST AND DIRECTS A CAB DIRECTLY TO THEIR FLOOR FOR THAT PERSON'S USE. THIS COULD BE EMPLOYED FOR EMERGENCY ACCESS FOR DOCTORS OR CODE BLUE SITUATIONS THROUGH THE BMS.
B. BASED ON THE ELEVATOR VENDOR'S CAPABILITY, THE ACCESS CONTROL SYSTEM (ACS) SHALL SEND A FLOOR ALLOWED MESSAGE BASED ON A VALIDATED CARD SWIPE. THE MESSAGE SHALL BE LOGGED AS AN ACCESS EVENT IN THE ACS WITH KNOWN INFORMATION. THE ACS SHALL BE ABLE TO SEND ADDITIONAL REQUESTS WITHIN 2 SECONDS OF PROCESSING THE LAST, WITHOUT INTERRUPTING THE PREVIOUS REQUEST. THE ACS SHALL BE ABLE TO RECEIVE AND PROCESS A MESSAGE FROM THE ECS WHEN AN ENABLED BUTTON IS PRESSED AND SHALL CREATE AN ACCESS EVENT BASED ON THE BUTTON SELECTED. IF MULTIPLE BUTTONS ARE PRESSED, IT SHALL LOG EACH. THE ACS SHALL SEND PRIORITY CREDENTIALS WHICH DIRECT THE ELEVATOR TO GO DIRECTLY TO THE FLOOR OF THE NEXT BUTTON PUSHED OVERRIDING ALL PREVIOUS REQUESTS.

1. AT A MINIMUM, THE BMS SHALL MONITOR THE FOLLOWING POINTS (TYPICAL OF 4):
   - STANDBY POWER OPERATION
   - STANDBY-POWERED LOWERING.
   - BATTERY-POWERED LOWERING.
   - AUTOMATIC DISPATCHING OF LOADED CAR.
   - NUISANCE CALL CANCEL
   - EMERGENCY HOSPITAL SERVICE AT ALL FLOORS.
   - INDEPENDENT SERVICE FOR ELEVATOR
   - LOADED-CAR BYPASS.
   - CAR POSITION
   - DOOR POSITION
   - IN-CAR EMERGENCY PHONE USE ALARM
   - NEXT DESTINATION PER CAR
   - CURRENT TRAVEL DIRECTION
   - ACTIVE FLOOR CALLS
   - CURRENT MODE/SERVICE STATUS
   - REMOVE CAR FROM SERVICE
   - RETURN CAR TO SERVICE
   - HALL CALL UP DEMAND
   - HALL CALL DOWN DEMAND

INTERIOR & EXTERIOR CAMERAS

A.THE BMS SHALL BE INTEGRATED WITH THE SECURITY CAMERA SYSTEM TO PROVIDE ACCESS EVENTS OR ALARMS.

FIRE ALARM & FIRE PROTECTION

A.THE BMS SHALL BE INTEGRATED WITH THE FIRE ALARM AND FIRE PROTECTION SYSTEMS TO CERTAIN FIRE SYSTEM ALARM OR TROUBLE POINTS AND PRESENT ON THE SAME GRAPHIC FLOOR PLANS.

1. THE FOLLOWING ALARMS AND MONITORED POINTS SHALL BE PROVIDED FROM FIRE ALARM AND FIRE PROTECTION PANELS:
   - LOSS OF COMMUNICATION ALARM
   - SPRINKLER SYSTEM ALARM
   - FIRE DETECTION ALARM

MAKEUP AIR UNITS

1. MAU'S ARE CONSTANT AIR VOLUME 100% OUTSIDE AIR UNITS. THE UNITS HAVE A DRAW THROUGH CONFIGURATION AND CONSIST OF A SUPPLY FAN, FILTER, NATURAL GAS DIRECT-FIRED BURNER, OUTSIDE AIR DAMPER, AND AIR FLOW MEASURING DEVICES. THE MAU'S ARE PROVIDED WITH A SUPPLY FAN VFD FOR BALANCING PURPOSES ONLY. ONCE THE MAU'S ARE BALANCED, THE VFD SHALL BE LOCKED AT THAT SPEED. MAU'S SHALL BE INTERLOCKED WITH THEIR ASSOCIATED EXHAUST FANS FOR OPERATION.
2. THIS SEQUENCE OF OPERATION APPLIES TO THE FOLLOWING UNITS:
   A. MAU1 (INTERLOCKED WITH EF5)
   B. MAU2 (INTERLOCKED WITH EF6)
3. SYSTEM OPERATION: THE MAU'S SHALL OPERATE BASED ON AN OCCUPIED/UNOCCUPIED TIME OF DAY SCHEDULE WITH MANUAL OVERRIDE THROUGH THE BAS TO PLACE A UNIT IN OCCUPIED MODE. AT THE EXPIRATION OF THIS TIME CONTROLLED OVERRIDE, THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.
4. SYSTEM START UP/MAU OCCUPIED MODE: DURING THE OCCUPIED MODE, THE UNIT SHALL OPERATE AT A CONSTANT AIRFLOW RATE. WHEN THE MAU IS ENABLED TO START, THE OUTDOOR AIR DAMPER SHALL OPEN. ONCE THE DAMPER IS IN THE CORRECT POSITION, AS DETERMINED BY DAMPER END SWITCHES, THE SUPPLY FAN SHALL START. IF THE SPACE TEMPERATURE, AS SENSED BY SPACE TEMPERATURE SENSOR, IS BELOW 59 DEGREE F, THE UNIT SHALL AUTOMATICALLY GO INTO HEATING MODE AND THE BURNER SHALL MODULATE TO MAINTAIN SETPOINT. IF THE SPACE TEMPERATURE IS ABOVE 59 DEGREE F, THEN THE HEATING IS LOCKED OUT, BUT THE FAN SHALL RUN AT THE CONSTANT AIRFLOW RATE.
5. MORNING WARM UP: THE BAS SHALL ENABLE THE MAU TO START IN ADVANCE OF THE SCHEDULED OCCUPIED TIME, VIA AN ADAPTIVE OPTIMAL START SEQUENCE. THE ADAPTIVE OPTIMAL START SHALL MINIMIZE THE UNOCCUPIED WARM-UP PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULE OCCUPIED PERIOD. THE UNIT SHALL ENTER A MORNING WARM UP MODE IF NECESSARY BASED ON SPACE TEMPERATURE. ONCE THE OCCUPIED SPACE TEMPERATURE SETPOINT IS REACHED, THE SYSTEM SHALL ENTER OCCUPIED MODE. SHOULD THE SPACE TEMPERATURES NOT REACH THE OCCUPIED SETPOINT BEFORE THE SCHEDULED OCCUPIED TIME, OR REACH SETPOINT TOO EARLY, THE ADAPTIVE OPTIMAL START SEQUENCE SHALL AUTOMATICALLY ADJUST FOR SUBSEQUENT STARTS.
6. NIGHT SETBACK / MAU UNOCCUPIED MODE: THE BAS SHALL SHUTDOWN THE MAU USING THE SYSTEM SHUTDOWN SEQUENCE. IF ANY SPACE TEMPERATURE DROPS BELOW THE UNOCCUPIED HEATING 40°F (ADJUSTABLE) SETPOINT, THE MAU SHALL BE ENABLED. WHEN THE MAU IS ENABLED TO START, THE UNIT'S OUTDOOR AIR DAMPER SHALL OPEN. ONCE THE DAMPER IS IN THE CORRECT POSITION, THE SUPPLY FAN SHALL START. THE MAU SHALL CONTINUE TO OPERATE A MINIMUM OF 5 MINUTES (ADJUSTABLE) AFTER SATISFACTION OF THE UNOCCUPIED SPACE TEMPERATURE SETPOINT. THIS MODE SHALL BE ABLE TO BE INITIATED/SCHEDULED BY THE OWNER FOR ALL MAU'S THROUGH THE BAS FRONT END.
7. SUPPLY FAN CONTROL: THE SUPPLY FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN UNLESS SHUTDOWN ON SAFETIES. THE SUPPLY FAN SHALL BE INTERLOCKED TO OPERATE WITH THEIR ASSOCIATED EXHAUST FAN. TO PREVENT SHORT CYCLING, THE SUPPLY FAN SHALL HAVE AN ADJUSTABLE MINIMUM RUNTIME. SUPPLY FAN SHALL BE MONITORED FOR FAILURE, STATUS, START/STOP, RUNTIME, AND HAND POSITION. SUPPLY AIRFLOW SHALL BE MONITORED THROUGH THE BAS.
8. HEATING CONTROL: NATURAL GAS BURNER SHALL BE HARDWIRED FOR ENABLE/DISABLE, STATUS, AND MODULATING CONTROL. HEATING CONTROL SHALL BE ENABLED WHENEVER THE OUTSIDE AIR TEMPERATURE IS BELOW 55°F (ADJ.), ZONE TEMPERATURE IS BELOW HEATING SETPOINT, AND SUPPLY FAN STATUS IS ON. UPON A DROP IN SPACE TEMPERATURE, MODULATE THE NATURAL GAS BURNER TO MAINTAIN THE SPACE TEMPERATURE SETPOINT 59°F. DISCHARGE AIR TEMPERATURE (DAT) SHALL NOT EXCEED THE MAXIMUM DAT 90°F OR THE MINIMUM DAT 55°F.
9. OUTSIDE AIR CONTROL: OPEN OA DAMPER TO 100% OPEN IN CONJUNCTION WITH THE SUPPLY FAN OPERATION.
10. FLUSH MODE: WHEN THE CARBON MONOXIDE LEVEL REACHES IT'S LEVEL SETPOINT, A FIVE MINUTE TIME DELAY WILL ENERGIZE TO DISABLE THE BURNER. THIS OCCURS WHETHER THE MAU IS IN THE OFF, ON OR AUTO MODES.
11. SYSTEM SHUTDOWN: WHEN A UNIT IS COMMANDED OFF, THE SUPPLY FAN SHALL BE DISABLED, THE OUTDOOR AIR DAMPER SHALL CLOSE, THE HEATING SHALL BE DISABLED.
12. EACH INDIVIDUAL UNIT SHALL HAVE A MANUAL SHUTDOWN / AUTO MODE SWITCH AT THE DDC CONTROL PANEL. THE MANUAL SHUTDOWN MODE SHALL SHUTDOWN THE UNIT FOR A MAINTENANCE SHUTDOWN AND FOLLOW THE SYSTEM SHUTDOWN SEQUENCE. ONCE UNIT IS MANUALLY SWITCHED BACK INTO THE AUTO MODE AT THE DDC CONTROL PANEL, THE UNIT SHALL RETURN TO NORMAL OPERATION OF THE OCCUPIED/UNOCCUPIED TIME OF DAY SCHEDULE AND FOLLOW THE STARTUP SEQUENCE.
13. THE BAS SHALL MONITOR:
   A. FAN STATUS VIA CURRENT SENSORS AND FAN VFD.
   B. THE AUTOMATIC DAMPER'S POSITIONS AND DAMPER END SWITCHES.
   C. HEATING STATUS
   D. OUTDOOR AIR, SUPPLY AIR, AND SPACE TEMPERATURE.
   E. OUTDOOR AIR, SUPPLY AIR, AND SPACE HUMIDITY.
   F. SUPPLY AIRFLOWS VIA AIRFLOW MONITORS.
   G. PRESSURE DROP ACROSS FILTER.
   H. ALL ALARMS FROM MANUFACTURER'S INTEGRAL CONTROLLER.
14. SYSTEM ALARMS AND SAFETIES:
   A. IF A FAN IS NOT SENSED TO BE OPERATING OR THE AUTOMATIC DAMPERS FAIL TO OPEN OR CLOSE WHEN REQUIRED, ALARM THE BAS.
   B. HIGH STATIC PRESSURE: IF THE SUPPLY AIR DUCT STATIC PRESSURE EXCEEDS 3" W.G. (ADJUSTABLE), A HIGH PRESSURE SWITCH SHALL TRIP THE SUPPLY FAN AND AN ALARM GENERATED.
   C. DIRTY FILTERS: WHEN THE DIFFERENTIAL PRESSURE EXCEEDS THE FILTER MANUFACTURER'S RECOMMENDATIONS FOR DIRTY FILTERS, AN ALARM SHALL BE GENERATED THROUGH THE BAS. CONTRACTOR TO FIELD VERIFY MANUFACTURER'S RECOMMENDED DIFFERENTIAL SETTING.
   D. GAS BURNER FAILURE.
   E. BAS FAILURE: IF COMMUNICATION IS LOST WITH THE BAS, THE MAU SHALL USE ITS DEFAULT SETPOINTS AND OPERATE IN NORMAL MODE.

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PROJECT

MARSHALL UNIVERSITY BASEBALL STADIUM
1 John Marshall Drive
Huntington, WV 25755

THE HERD

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL

AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL

AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION

AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL

Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT

D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE

S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

ZACHARY JAMES OLDHAM
REGISTERED
23823
STATE OF
WEST VIRGINIA
PROFESSIONAL ENGINEER
11-15-19

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

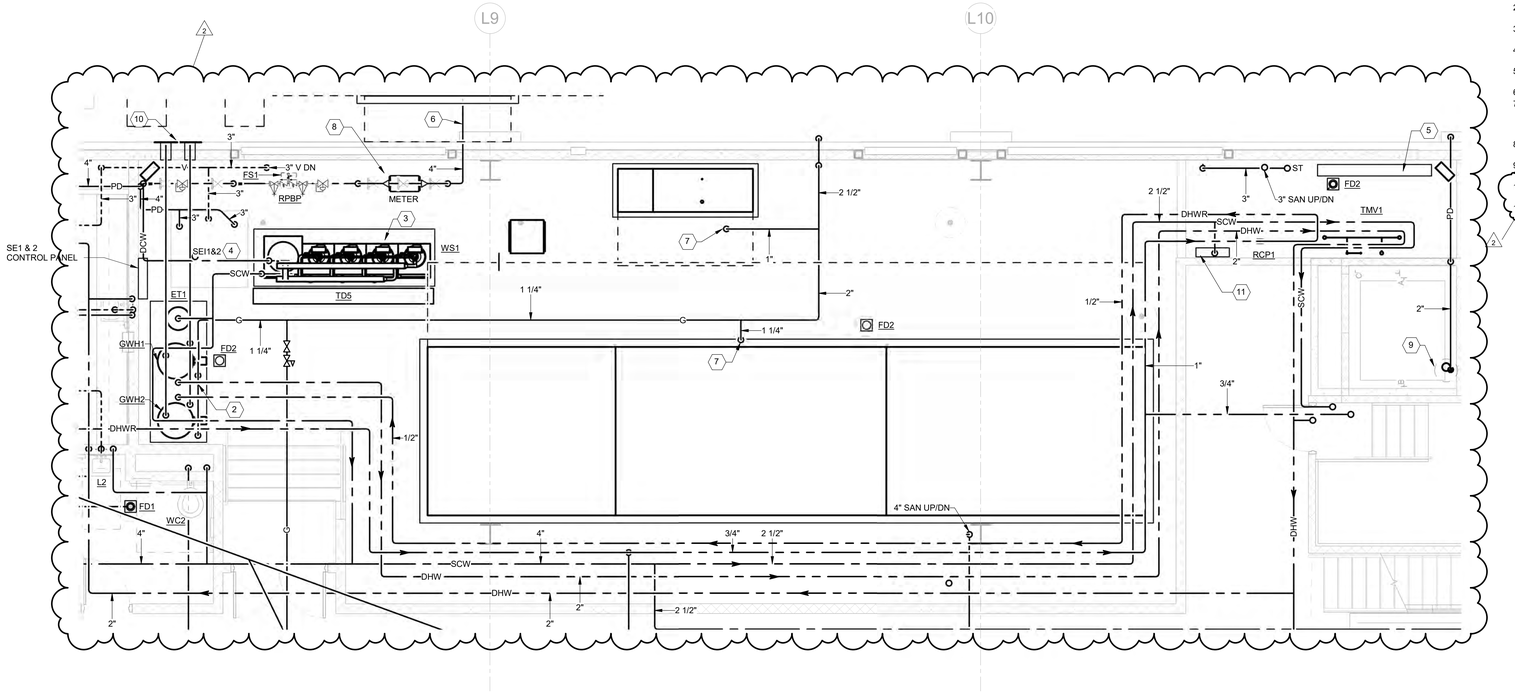
MECHANICAL SEQUENCE OF OPERATIONS/CONTROLS

SHEET NUMBER

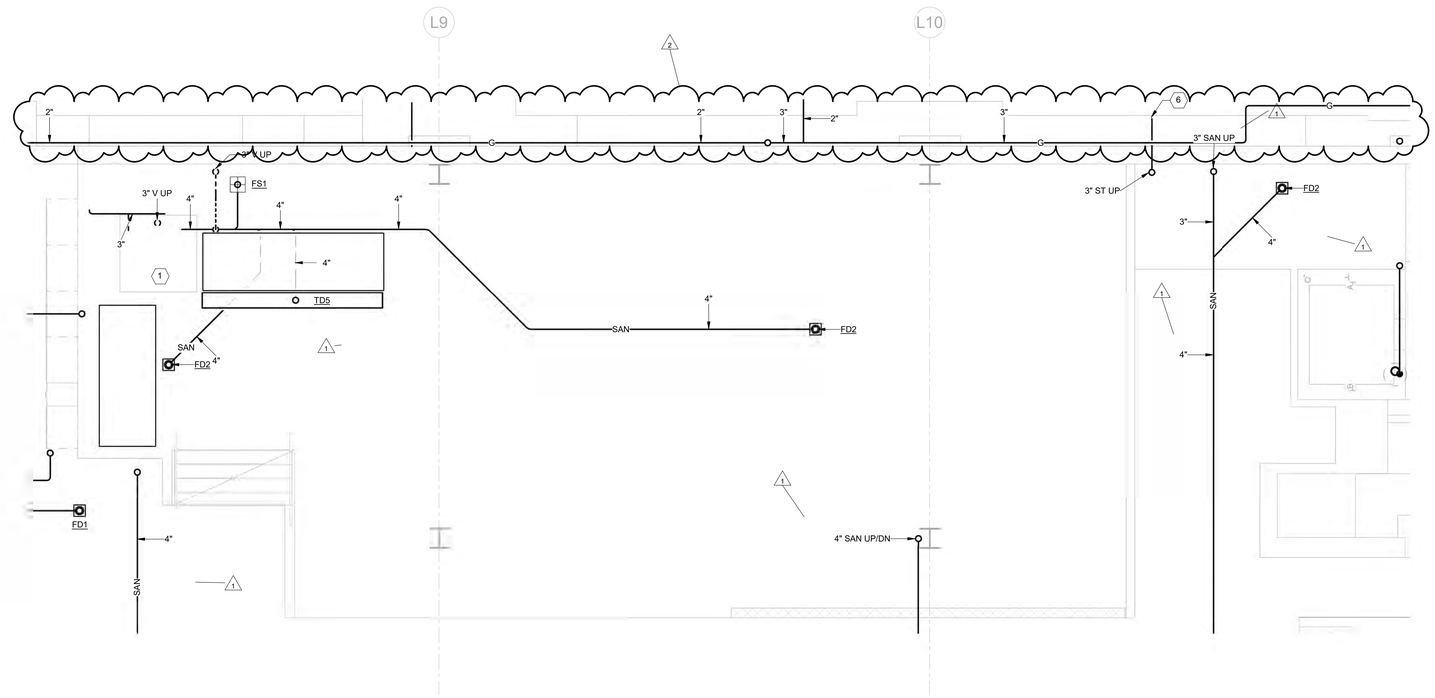
M802

KEYNOTES

1 CONCRETE SUMP PIT FURNISHED BY OTHERS. SEE STRUCTURAL DRAWINGS FOR DETAILS.
2 REFER TO GAS WATER HEATER DETAIL ON SHEET P501.
3 REFER TO WATER SOFTENER DETAIL ON SHEET P501.
4 REFER TO SEWAGE EJECTOR DETAIL ON SHEET P503.
5 FIRE PROTECTION WATER SERVICE ENTRANCE. REFER TO FIRE PROTECTION SERIES DRAWINGS.
6 SEE CIVIL PLAN FOR CONTINUATION.
7 DROP DOWN WITH GAS LINE ALONG SIDE OF HVAC EQUIPMENT AND MAKE FINAL CONNECTION. PROVIDE SHUT-OFF VALVE, REGULATOR AND DIRT LEG IN LINE.
8 REFER TO DOMESTIC WATER SERVICE DETAIL ON SHEET P501.
9 REFER TO ELEVATOR SUMP PUMP DETAIL ON SHEET P501.
10 CONCENTRIC VENT KIT FOR 4" INTAKE AND EXHAUST FROM GWH SYSTEM.
11 DROP DOWN WITH 3/4" SCW TO ELECTRONIC TRAP PRIMER MOUNTED WITH BOTTOM AT 4' 0" AFF. EXTEND TRAP PRIMER LINES TO NEARBY FD2'S AND FS1 IN MECHANICAL ROOM.



1 ENLARGED PLAN AT MECH ROOM - DUGOUT LEVEL
P404 Scale: 1/4" = 1'-0"



2 ENLARGED PLAN AT MECH ROOM - DUGOUT LEVEL UNDERGROUND
P404 Scale: 1/4" = 1'-0"

AECOM

PROJECT
Marshall University Baseball Stadium

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

ANTHONY JAMES OLIVIANI REGISTERED 23823 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 11-15-19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

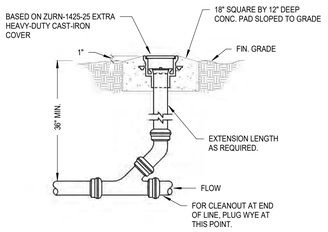
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2
1	12/02/2019	ADDENDUM 1

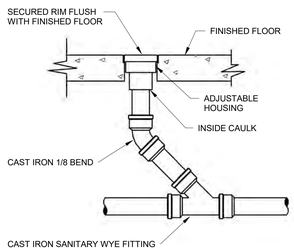
PROJECT NUMBER
60590790

SHEET TITLE
PLUMBING ENLARGED PLANS

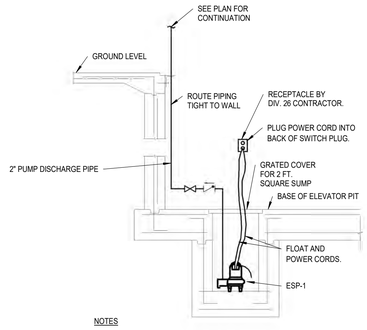
SHEET NUMBER 1
P404



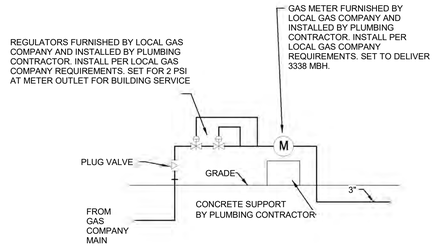
1 GRADE CLEANOUT DETAIL — P501 — NTS



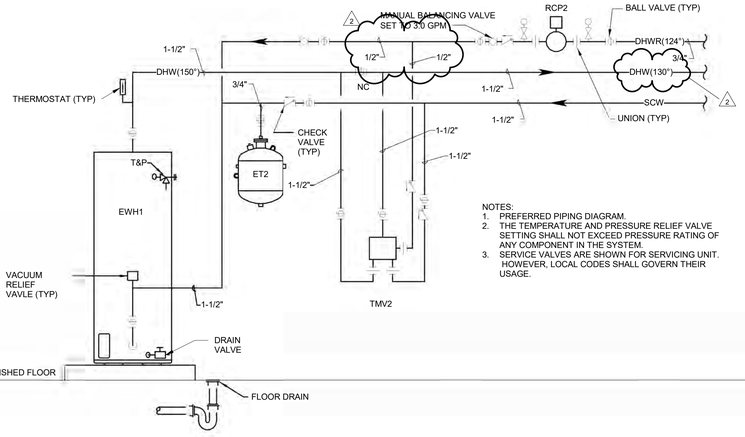
2 FLOOR CLEANOUT — P501 — NTS



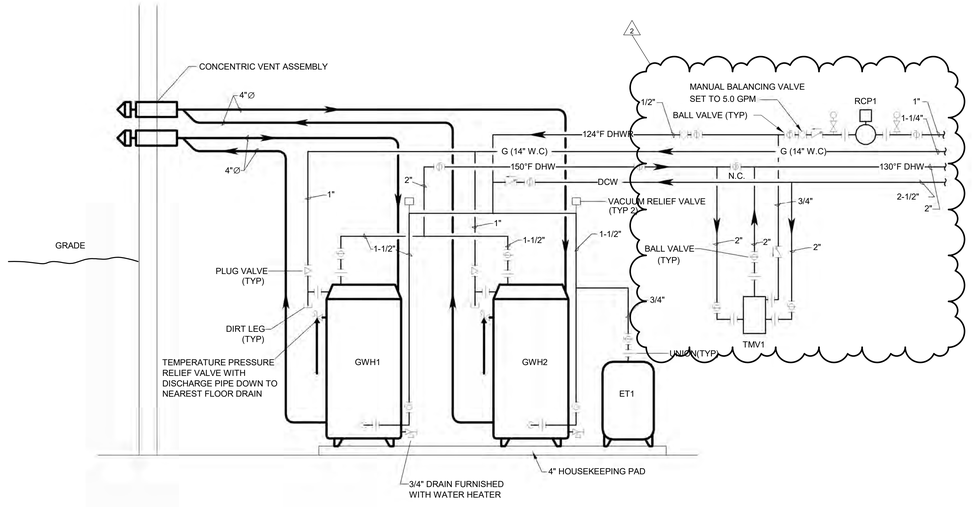
3 ELEVATOR SUMP PUMP ESP-1 DETAIL — P501 — NTS



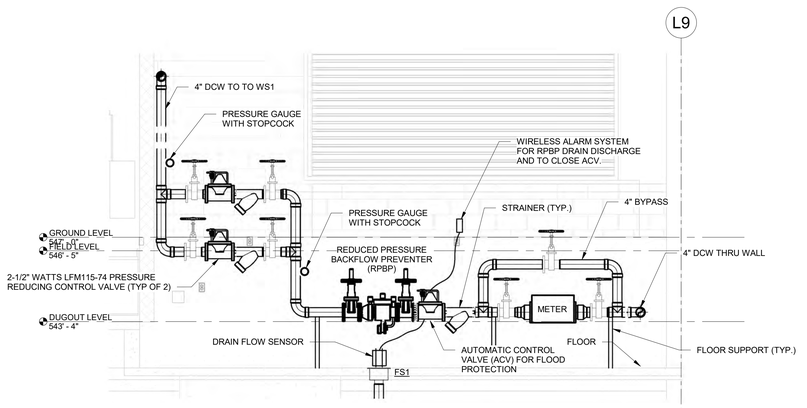
4 GAS SERVICE ENTRY DETAIL — P501 — NTS



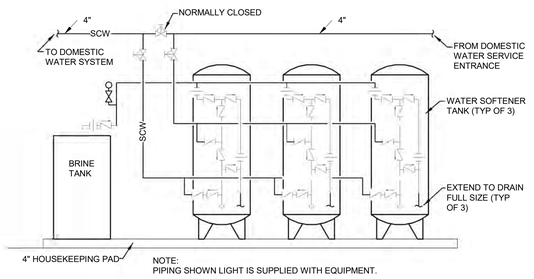
5 ELECTRIC WATER HEATER DETAIL — P501 — NTS



6 GAS FIRED WATER HEATER DETAIL — P501 — NTS



7 WATER SERVICE ENTRY DETAIL — P501 — NTS



8 WATER SOFTENER DETAIL — P501 — NTS

AECOM

PROJECT
Marshall University Baseball Stadium

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

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AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

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AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

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D A Hogan & Associates
119 1st Ave S., #110
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S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
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REGISTRATION

ANTHONY JAMES GUBIANI REGISTERED 23323 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER — 11-15-19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PLUMBING DETAILS

SHEET NUMBER 1
P501

Project Management Initials: Designer: TCF Checked: HCH Approved: Approver ANSI D 22"x34"
SORT: 4-Document Set-P501-PLUMBING DETAILS
Last Plotted: 12/10/2019 7:21:42 PM
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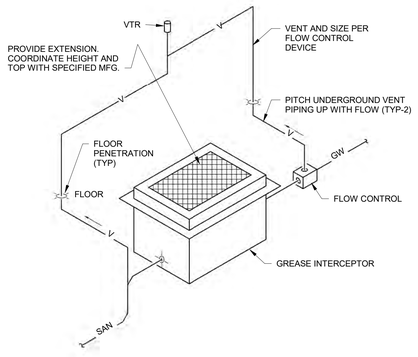
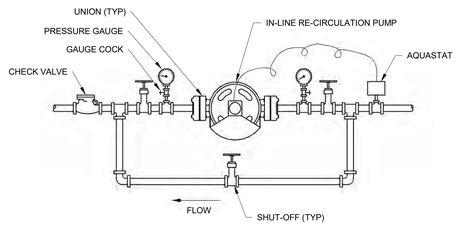
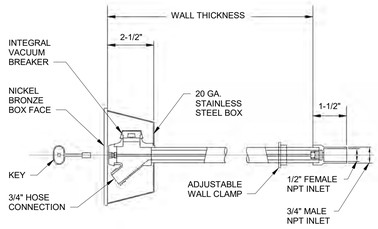


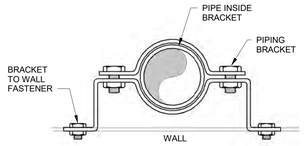
1 GREASE INTERCEPTOR PIPING DETAIL
P502 NTS



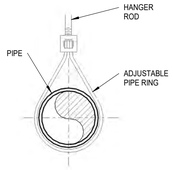
2 HOT WATER RECIRCULATION PUMP
P502 NTS



3 NON-FREEZE HOSE BIBB
P502 NTS

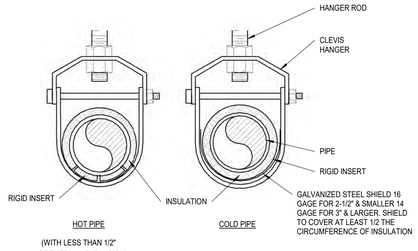


4 PIPE ALONG WALL DETAIL
P502 NTS



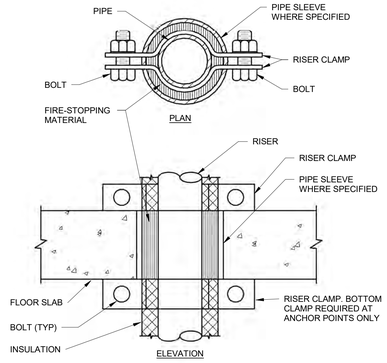
STEEL PIPE - STEEL BAND
COPPER PIPE - PLASTIC COATED BAND

5 PIPE HANGER FOR UNISULATED PIPE
P502 NTS



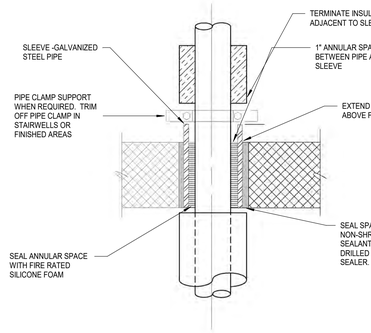
NOTE
WHEN USING CPVC PIPING FOR DOMESTIC AND LABORATORY HOT WATER, INSTALL A CONTINUOUS ALUMINUM TAPE BETWEEN CABLE AND INSULATION.

6 TYPICAL PIPE HANGERS FOR INSULATED PIPE
P502 NTS

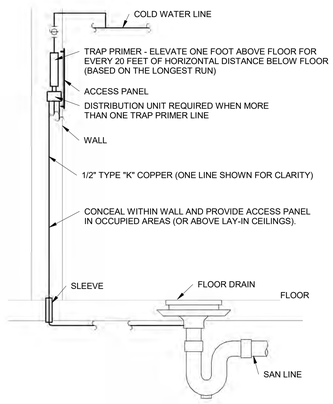


DETAIL NOTES:
1. PROVIDE ANCHORS ONLY WHERE SHOWN ON DRAWINGS. EXTEND SLEEVE ABOVE FLOOR WHERE SPECIFIED.

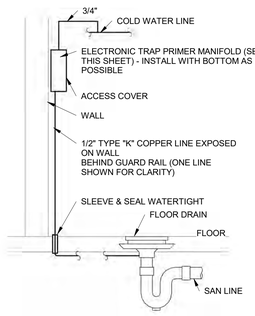
7 SUPPORT / ANCHOR FOR PIPE RISERS
P502 NTS



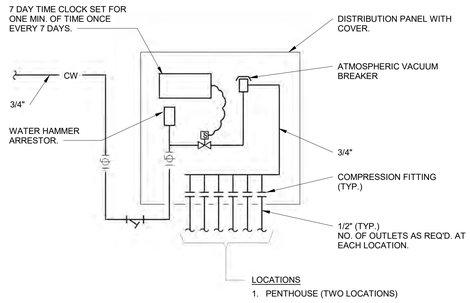
8 TYPICAL PIPE FLOOR SLEEVE
P502 NTS



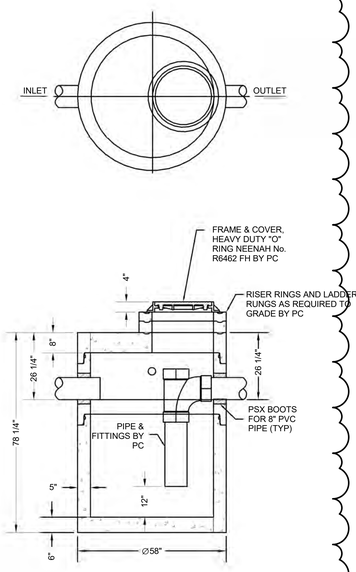
9 TRAP PRIMER DETAIL
P502 NTS



10 TRAP PRIMER DISTRIBUTION SYSTEM DETAIL
P502 NTS



△2



11 SOLIDS INTERCEPTOR
P502 NTS

AECOM

PROJECT
Marshall University Baseball Stadium

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
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Morgantown, WV 26501
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STRUCTURAL
AECOM
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New York, NY 10004
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MEP/FIRE PROTECTION
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530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

ZACHARY JAMES OLIVANTI (REGISTERED) 23823 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 11-15-19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

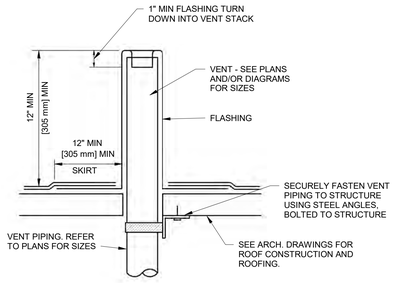
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

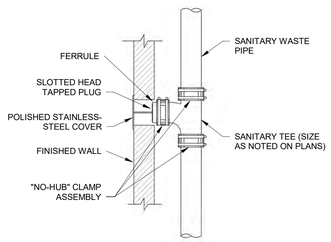
PROJECT NUMBER
60590790

SHEET TITLE
PLUMBING DETAILS

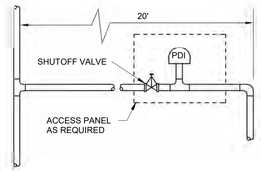
SHEET NUMBER 1
P502



1 VENT THROUGH ROOF DETAIL
P503 NTS



2 WALL CLEANOUT DETAIL
P503 NTS



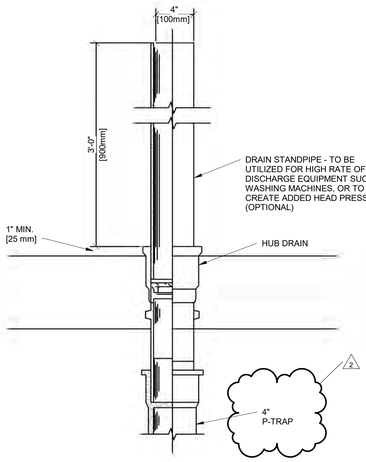
DETAIL NOTES:
1. FOR BRANCH LINES 20' OR LESS, INSTALL WATER HAMMER ARRESTER BETWEEN LAST TWO FIXTURES.
2. FOR BRANCH LINES OVER 20' TWO WATER HAMMER ARRESTER UNITS SHOULD BE USED. THE SECOND ONE PLACED AT THE MIDPOINT OF THE LINE.

WATER HAMMER ARRESTER SCHEDULE

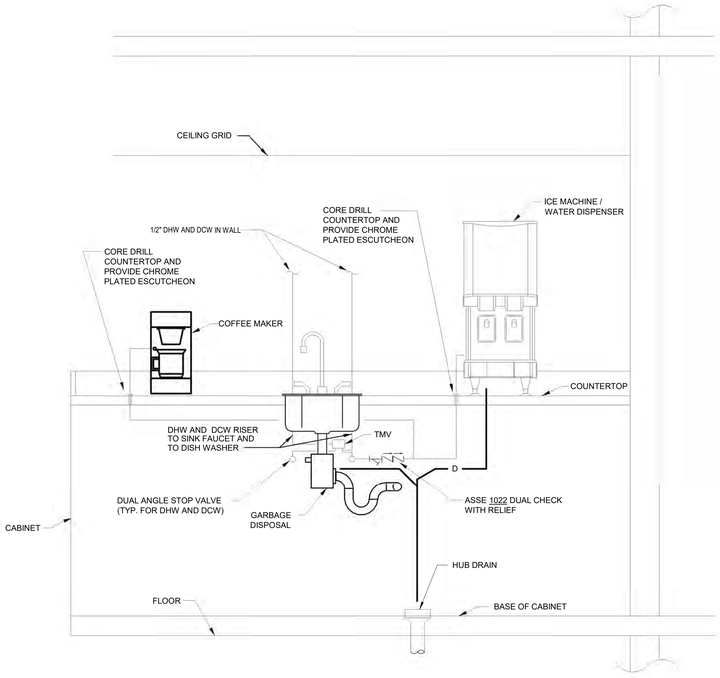
PDI *	A	B	C	D	E	F
FIXTURE UNITS	1-11	12-32	33-60	61-113	114-154	155-330
PIPE SIZE	3/4"	1"	1"	1"	1"	1"

* PDI = PLUMBING AND DRAINAGE INSTITUTE.

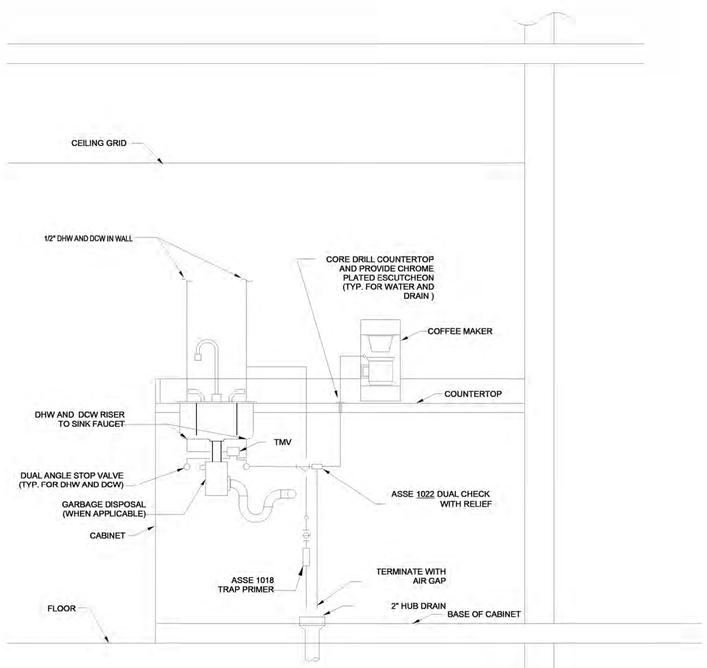
3 WATER HAMMER ARRESTER DETAIL
P503 NTS



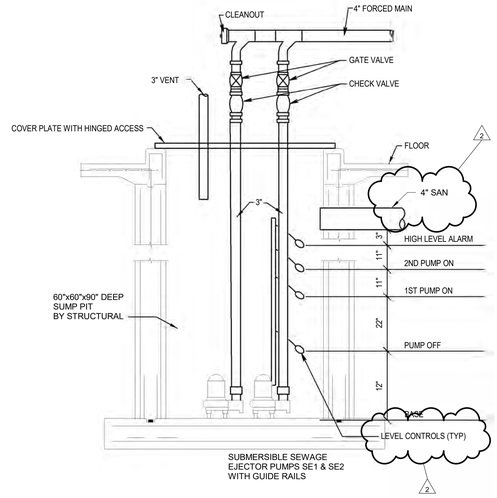
4 TYPE "W" HUB DRAIN WITH STANDPIPE
P503 NTS



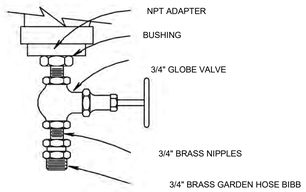
5 SINK WITH COFFEE AND ICE MACHINE
P503 NTS



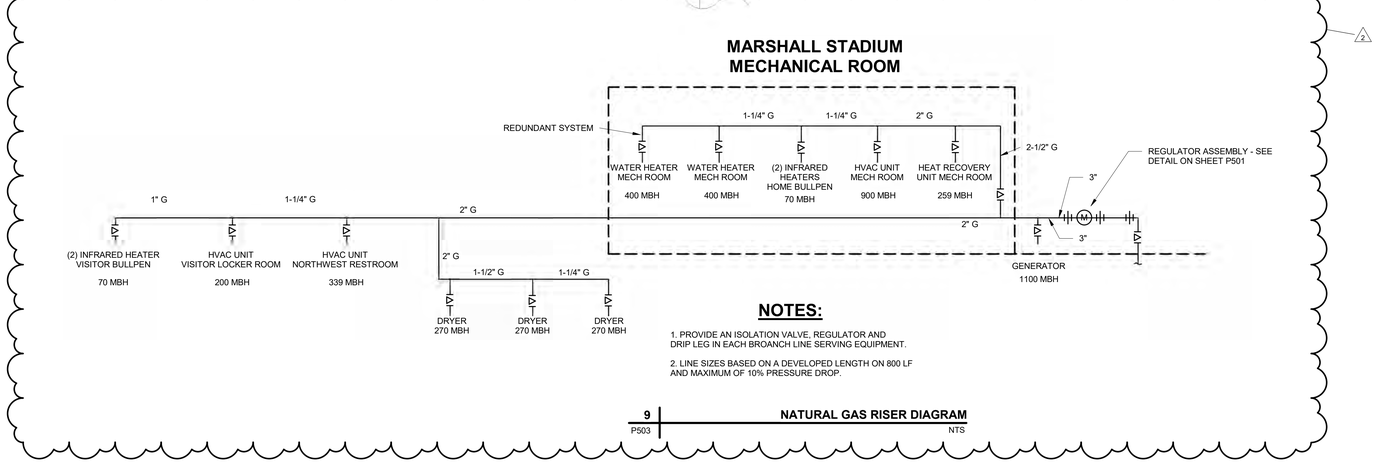
6 SINK WITH COFFEE MAKER
P503 NTS



7 DUPLEX SEWAGE EJECTOR
P503 NTS



8 DRAIN VALVE DETAIL
P503 NTS



NOTES:

1. PROVIDE AN ISOLATION VALVE, REGULATOR AND DRIP LEG IN EACH BROANCH LINE SERVING EQUIPMENT.
2. LINE SIZES BASED ON A DEVELOPED LENGTH ON 800 LF AND MAXIMUM OF 10% PRESSURE DROP.

9 NATURAL GAS RISER DIAGRAM
P503 NTS

AECOM

PROJECT
Marshall University Baseball Stadium

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
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MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

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D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

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INTERIM

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11/15/19

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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PLUMBING DETAILS

SHEET NUMBER 1
P503

PLUMBING FIXTURE SCHEDULE

UNIT DATA			BASIS OF DESIGN										ROUGH-IN SIZE (IN)				
			FIXTURE		TRIM		SUPPLY/STOP		P-TRAP		MISC						
TAG	TYPE	DESCRIPTION	MANUFACTURER	MODEL	MANUFACTURER	MODEL	MANUFACTURER	MODEL	MANUFACTURER	MODEL	MANUFACTURER	MODEL	DCW	DHW	SAN	V	SCHEDULE NOTES
EWC1	WATER COOLER	ELECTRIC WATER COOLER WITH BOTTLE FILLING STATION. HANDS-FREE WITH UVC-LED TREATMENT AT THE DISPENSE POINT. EXTERNAL STREAM HEIGHT ADJUSTMENT ON LOWER UNIT, FOUR ANTIMICROBIAL COPPER PUSH PADS PER FOUNTAIN, BUILT IN FILTER MONITOR AND BOTTLE COUNTER.	OASIS	PG8EBQSL			MCGUIRE	165LK	MCGUIRE	8902C			1/2"	0"	1 1/2"	1 1/2"	
L1	LAVATORY	WHITE VITREOUS CHINA, WALL MOUNTED WITH HANGER AND OVERFLOW. DRILLED FOR CONCEALED ARM CARRIER. 4" CENTERS LESS SOAP DISPENSER HOLE. PROVIDE POLISHED CHROME-PLATED CAST BREASS FAUCET WITH INTEGRAL SHANKS, QUARTER TURN CERAMIC DISC CARTRIDGES AND A 4" LONG INTEGRAL CAST SPOUT AND A 2.2 GPM PRESSURE COMPENSATING AERATOR, VANDAL-RESISTANT COLOR CODED METAL LEVER HANDLES.	KOHLER	K-2005	ZURN	Z81101	MCGUIRE	165LK	MCGUIRE	8902C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
L2	LAVATORY	WHITE VITREOUS CHINA, ADA WALL MOUNTED WITH HANGER AND OVERFLOW. DRILLED FOR CONCEALED ARM CARRIER. 4" CENTERS LESS SOAP DISPENSER HOLE. PROVIDE POLISHED CHROME-PLATED CAST BREASS FAUCET WITH INTEGRAL SHANKS, QUARTER TURN CERAMIC DISC CARTRIDGES AND A 4"	KOHLER	K-2005	ZURN	Z81101	MCGUIRE	165LK	MCGUIRE	8902C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
L3	LAVATORY	WHITE OVAL UNDERMOUNT SINK, GEOMETRIC OVAL BASIN WITH VERTICAL SIDES AND OVERFLOW DRAIN. HOLE OPENING IS TO BE 14X17" PROVIDE BRUSHED NICKLE WRIST BLADE FAUCETS.	KOHLER	K-2881	DELTA	1959LF-BL	MCGUIRE	165LK	MCGUIRE	8902C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
MS1	MOP SINK	12" MOP SERVICE BASIN WTH 6" DOP FRONT. ONE PIECE, PRECAST TERRAZZO MADE OF BLACK AND WHITE MARBLE CHIPS IN GRAY PORTLAND CEMENT WITH STAINLESS STEEL CAPS ON THRESHOLDS. GDC QUICK DRAIN CONNECTORS, VANDAL PROOF DRAIN.	FIAT	TSBC1610	ZURN	Z841M1-RC	MCGUIRE	165LK	MCGUIRE	8902C	MAINLINE	ML101EZ	1/2"	1/2"	3"	1 1/2"	
MS2	MOP SINK	12" MOP SERVICE BASIN WTH 6" DOP FRONT. ONE PIECE, PRECAST TERRAZZO MADE OF BLACK AND WHITE MARBLE CHIPS IN GRAY PORTLAND CEMENT WITH STAINLESS STEEL CAPS ON THRESHOLDS. GDC QUICK DRAIN CONNECTORS, VANDAL PROOF DRAIN.	FIAT	TSB3010	ZURN	Z841M1-RC	MCGUIRE	165LK	MCGUIRE	8902C	MAINLINE	ML101EZ	1/2"	1/2"	3"	1 1/2"	
S1	SINK	18X18" SINGLE BOWL 18-GUAGE STAINLESS STEEL UNDERMOUNT KITCHEN SINK. PROVIDE GOOSENECK FAUCET.	KOHLER	K-3335	DELTA	1959LF-BL	MCGUIRE	165LK	MCGUIRE	8912C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
S2	SINK	18X18" SINGLE BOWL 18-GUAGE STAINLESS STEEL UNDERMOUNT KITCHEN SINK. PROVIDE GOOSENECK FAUCET.	KOHLER	K-3335	DELTA	1959LF-AR	MCGUIRE	165LK	MCGUIRE	8912C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
S3	SINK	UNDERMOUNT DOUBLE BOWL 18 GAUGE STAINLESS STEEL SINK, 9-1/2" IN DEPTH, REAR DRAIN, PROVIDE BRUSHED NICKLE GOOSENECK FAUCET.	KOHLER	K-3171-HCF	DELTA	19939Z-SD-DST	MCGUIRE	165LK	MCGUIRE	8912C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
S4	SINK	15X20" UNDERMOUNT KITCHEN SINK IN IVORY WHITE WITH A SATIN FINISH. PROVIDE GOOSENECK ARTIC STAINLESS FAUCET.	LG HAUSYS	2318	DELTA	1959LF-AR	MCGUIRE	165LK	MCGUIRE	8912C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
S5	SINK	27" STAINLESS STEEL SINGLE BOWL LAUNDRY SINK. 8" OFFSET, 16 GUAGE STAINLESS STEEL. PROVIDE GOOSENECK FAUCET	LG HAUSYS	1517	DELTA	1959LF-AR	MCGUIRE	165LK	MCGUIRE	8912C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	1 1/2"	PROVIDE TMV
S6	SINK	18X18" SINGLE BOWL 18-GUAGE STAINLESS STEEL UNDERMOUNT KITCHEN SINK. PROVIDE GOOSENECK FAUCET.	SIGNATURE HARDWARE	934482	T&S BRASS AND BRONZE	PB-8WOSN14FZKZC	MCGUIRE	165LK	MCGUIRE	8912C	MAINLINE	ML101EZ	1/2"	1/2"	1 1/2"	2"	PROVIDE TMV
SH1	SHOWER	SHOWER TRIM TO BE FURNIGHED BY OTHERS, SEE ARCHITECTURE FOR TRIM DETAILS. DRIAN, TMV, AND SHOWER HEADS TO BE PROVIDED BY PLUMBING CONTRACTOR. PROVIDE DELTA 570147 AND ASSOCIATED HARDWARE. ALL HARDWARE FINISH TO BE A BRUSHED NICKEL.	BY OTHERS		DELTA	T17238					DELTA	R10000-UN	1/2"	1/2"	2"	1 1/2"	
SH2	SHOWER	ADA SHOWER TRIM TO BE FURNIGHED BY OTHERS, SEE ARCHITECTURE FOR TRIM DETAILS. DRIAN, TMV, AND SHOWER HEADS TO BE PROVIDED BY PLUMBING CONTRACTOR. PROVIDE DELTA 570147 AND ASSOCIATED HARDWARE. ALL HARDWARE FINISH TO BE A BRUSHED NICKEL.	BY OTHERS		DELTA	T17238					DELTA	R10000-UN	1/2"	1/2"	2"	1 1/2"	
SH3	SHOWER	SOLID SURFACE SHOWER SURROUND. ADA COMPLIANT, 36"X36" INSIDE CLEAR. SEE ARCHITECTURE FINISH LEGEND FOR COLORING.	INPRO	36X36	DELTA	T17238							1/2"	1/2"	2"	1 1/2"	ONLY PROVIDE SHOWER HEAD AND TRIM
SH4	SHOWER	SOLID SURFACE SHOWER SURROUND. ADA COMPLIANT, 36"X36" INSIDE CLEAR. SEE ARCHITECTURE FINISH LEGEND FOR COLORING.	INPRO	36X36	DELTA	T17238							1/2"	1/2"	2"	1 1/2"	ONLY PROVIDE SHOWER HEAD AND TRIM
UR1	URINAL	SIPHON-JET, WALL HUNG, WHITE VITREOUS CHINA, ¾" TOP SPUD. INCLUDES INLET AND OUTLET SPUDS AND HANGERS, FLUSH VALVE MANUAL DIAPHRAGM TYPE, FLUSH CONNECTION AND SPUD COUPLING FOR 3/4" TOP SPUD, 0.5 GALLON FLUSH	KOHLER	K-4989-T	SLOAN	ROYAL 186-0.5-SG	N/A	N/A	N/A	N/A	N/A	N/A	3/4"	0"	2"	1 1/2"	
UR2	URINAL	SIPHON-JET, WALL HUNG, WHITE VITREOUS CHINA, ¾" TOP SPUD. INCLUDES INLET AND OUTLET SPUDS AND HANGERS, FLUSH VALVE MANUAL DIAPHRAGM TYPE, FLUSH CONNECTION AND SPUD COUPLING FOR 3/4" TOP SPUD, 0.5 GALLON FLUSH, ADA COMPLIANT.	KOHLER	K-4989-T	SLOAN	ROYAL 186-0.5-SG	N/A	N/A	N/A	N/A	N/A	N/A	3/4"	0"	2"	1 1/2"	17" TO RIM MAX HEIGHT
WC1	WATER CLOSET	SIPHON-JET, WALL HUNG, ELONGATED BOWL, WHITE VITRIOUS CHINA, 1-1/2" TOP SPUD, FLUSH VALVE MANUAL DIAPHRAGM TYPE, FLUSH CONNECTION AND SPUD COUPLING FOR 1-1/2" TOP SPUD, 1" SCREWDRIVER BACK CHECK ANGLE STOP, 1.28 GALLON FLUSH. SEAT: OPEN FRONT SEAT FOR ELONGATED BOWL, NO COVER, STAINLESS STEEL HINGE WTH CHECK, COLOR WHITE	AMERICAN STANDARD	2856.128	SLOAN	ROYAL 111-1.28-SF	N/A	N/A	N/A	N/A	CHURCH	295CT	1"	0"	4"	2"	
WC2	WATER CLOSET	SIPHON-JET, WALL HUNG, ELONGATED BOWL, WHITE VITRIOUS CHINA, 1-1/2" TOP SPUD. FLUSH VALVE MANUAL DIAPHRAGM TYPE, FLUSH CONNECTION AND SPUD COUPLING FOR 1-1/2" TOP SPUD, 1" SCREWDRIVER BACK CHECK ANGLE STOP, 1.28 GALLON FLUSH. SEAT: OPEN FRONT SEAT FOR ELO	AMERICAN STANDARD	2856.128	SLOAN	ROYAL 111-1.28-SF	N/A	N/A	N/A	N/A	CHURCH	295CT	1"	0"	4"	2"	17" TO RIM AND MAX 44" TO HANDLE, HANDLE ON WIDE SIDE OR STALL

PLUMBING SPECIALTIES SCHEDULE

UNIT DATA			BASIS OF DESIGN		
TAG	FUNCTION	DESCRIPTION	MANUFACTURER	MODEL	SCHEDULE NOTES
TD1	TRENCH DRAIN	TRENCH DRAIN SYSTEM 16.25' LONG CENTERED IN THE DUGOUT. PROVIDE ADA/HEEL PROOF STAINLESS STEEL GRATE.	ACO	K100S	GRATE TYPE 410Q #98866 39"
TD2	TRENCH DRAIN		ACO	K100S	GRATE TYPE 412Q # 98879 19"
TD3	TRENCH DRAIN	TRENCH DRAIN SYSTEM 11.6'L X 1'W CENTERED BEHIND THE WASHERS. PROVIDE STAINLESS STEEL GRATE, LINEN SCREEN AND WATERPROOFING MEMBRANE.	ACO	S300K	
TD4	TRENCH DRAIN	TRENCH DRAIN SYSTEM 6' LONG CENTERED BETWEEN THE TWO WALLS. BOTTOM OUTLET CLOSEST TO WALL. PROVIDE ADA/HEEL PROOF STAINLESS STEEL GRATE.	ACO	K100S	GRATE TYPE 410Q #98866 39"
TD5	TRENCH DRAIN	TRENCH DRAIN SYSTEM 12'L X 1'W CENTERED WITH THE WATER SOFTENER. PROVIDE STAINLESS STEEL GRATE, LINEN SCREEN AND WATERPROOFING MEMBRANE.	ACO	S300K	

WATER SOFTENER SCHEDULE

UNIT DATA			BASIS OF DESIGN		PERFORMANCE DATA					CAPACITY / SALT DOSAGE		ELECTRICAL DATA			GENERAL DATA		
TAG	LOCATION	FUNCTION	MANUFACTURER	MODEL	INCOMING HARDNESS (PPM)	CONTINUOUS FLOW (GPM)	PEAK FLOW (GPM)	WPD (PSIG)	BACK WASH FLOW (GPM)	MIN (LBS)	MAX (LBS)	FLA	PHASE	VOLTS	TANK DIA (IN)	WEIGHT (LBS)	SCHEDULE NOTES
WS1	MECH ROOM	WATER SOFTENING	WATER CONTROL CORP	SE-120 QUAD DE30 01	120	120.0	256.0	15.0	7.0	6	45	1	1	120	21.0		

PUMP SCHEDULE

UNIT DATA			BASIS OF DESIGN		PERFORMANCE DATA					MOTOR DATA						GENERAL DATA		
TAG	LOCATION	FUNCTION	MANUFACTURER	MODEL	PUMP TYPE	FLUID TYPE	FLOW (GPM)	EXT WPD (FT HD)	EWT (°F)	HP	RPM	PHASE	VOLTS	VFD	EMERGENCY POWER	REDUNDANT	WEIGHT (LBS)	SCHEDULE NOTES
RCP1	MECH ROOM	GWH SYSTEM	XYLEM B & G	PL36B	CIRCULATOR	HOT WATER	5.0	33.0	124.0	0.17	3300	1	115	No	No	No	0	
RCP2	MECH ROOM	EWH1 SYSTEM	XYLEM B & G	PL36B	CIRCULATOR	HOT WATER	2.0	35.0	124.0	0.17	3300	1	115	No	No	No	0	

GAS FIRED WATER HEATER SCHEDULE

UNIT DATA			BASIS OF DESIGN		PERFORMANCE DATA			GENERAL DATA		ELECTRICAL DATA			
Type Mark	LOCATION	FUNCTION	MANUFACTURER	MODEL	STORAGE CAPACITY (GAL)	RECOVERY @ 100°F RISE (GAL/HR)	INPUT CAPACITY (MBH)	EFF (%)	FLUE SIZE (IN)	WATER CONNECTION (IN)	AMPS	VOLTS	PHASE	SCHEDULE NOTES
GWH1	MECH ROOM	HOT WATER	A. O. SMITH	BTH-300A	119.0	349.0	300.0	96	4"	1 1/2"	10	120	1	
GWH2	MECH ROOM	HOT WATER	A. O. SMITH	BTH-300A	119.0	349.0	300.0	96	4"	1 1/2"	10	120	1	

INTERCEPTOR SCHEDULE

UNIT DATA			BASIS OF DESIGN		PERFORMANCE DATA		PIPING CONNECTIONS	
TAG	FUNCTION	MATERIAL	MANUFACTURER	MODEL	MIN. CAPACITY (GAL)	FLOW RATE (GPM)	SAN INLET & OUTLET (IN)	SCHEDULE NOTES
SI1	INDIRECT DRAINAGE	CONCRETE	E.C. BABBERT	0-4	400	546	8	

ELECTRIC WATER HEATER SCHEDULE

UNIT DATA		BASIS OF DESIGN		PERFORMANCE DATA			ELECTRICAL DATA				
TAG	FUNCTION	MANUFACTURER	MODEL	STORAGE CAPACITY (GAL)	RECOVERY @ 100°F RISE (GAL/HR)	WATER CONNECTION (IN)	FLA	CAPACITY (KW)	VOLTS	PHASE	SCHEDULE NOTES
EWH1	VISITORS JANITOR CLOSET	A. O. SMITH	DEN-120	119.0	41.0	3/4"		10.0	208	3	TWO 5 KW ELEMENTS-SIMULATANEOUS

EXPANSION TANK SCHEDULE

UNIT DATA		BASIS OF DESIGN		PERFORMANCE DATA			
TAG	FUNCTION	MANUFACTURER	MODEL	TANK VOLUME (GAL)	ACCEPTANCE VOLUME (GAL)	AIR PRECHARGE (PSIG)	SCHEDULE NOTES
ET1	GWH SYSTEM	AMTROL	ST-60VC	25.0	11.0	55.0	
ET2	EWH SYSTEM	AMTROL	ST-12C	6.4	2.2	55.0	

THERMOSTATIC MIXING VALVE SCHEDULE

TYPE MARK	LOCATION	FUNCTION	MANUFACTURER	MODEL	MIN FLOW (GPM)	MAX FLOW (GPM)	FLOW (GPM)	WPD (PSI)	LWT (°F)	INLET SIZE (IN)	OUTLET SIZE (IN)	PHASE	VOLTS	SCHEDULE NOTES
TMV1	MECH ROOM	GWH SYSTEM	ARMSTRONG INTERNATIONAL	DRV40	5 GPM	56 GPM	56 GPM	7.50 psi	130 °F	1 1/2"	1 1/2"	1	120 V	
TMV2	MECH ROOM	EWH SYSTEM	ARMSTRONG INTERNATIONAL	DRV25R	2 GPM	22 GPM	22 GPM	7.00 psi	130 °F	1"	1"	1	120 V	

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Marshall University Baseball Stadium

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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AECOM
150 Clay St., Suite 410
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New York, NY 10004
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MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

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D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PLUMBING SCHEDULES

SHEET NUMBER 1
P601

1A DUGOUT LEVEL LIGHTING PLAN - AREA A
1/8" = 1'-0"

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PROJECT
Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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150 Clay St., Suite 410
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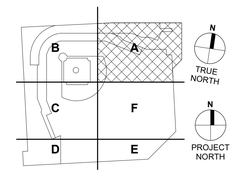

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
DUGOUT LEVEL LIGHTING PLAN - AREA A

SHEET NUMBER 1
E101A

DOCUMENT SET-E101A-DUGOUT LEVEL LIGHTING PLAN - AREA A
Last Plotted: 12/11/2019 12:09:15 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E602.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.

1A DUGOUT LEVEL LIGHTING PLAN - AREA B
1/8" = 1'-0"

DOCUMENT SET: E101B-DUGOUT LEVEL LIGHTING PLAN - AREA B
Last Printed: 12/11/2019 12:09:20 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt

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PROJECT

Marshall Baseball Electrical

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
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Lenexa, KS 66214
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D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

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Chicago, IL 60622
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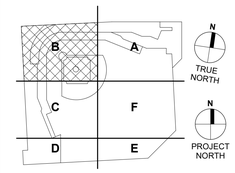
KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

DUGOUT LEVEL LIGHTING PLAN - AREA B

SHEET NUMBER 1

E101B

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E502.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.

1A CONCOURSE LEVEL LIGHTING PLAN - AREA A
1/8" = 1'-0"

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PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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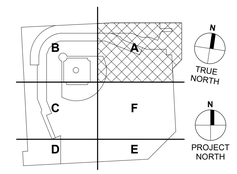

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL LIGHTING PLAN - AREA A

SHEET NUMBER 1
E102A

DOCUMENT SET-E102A-CONCOURSE LEVEL LIGHTING PLAN - AREA A
Last Plotted: 12/11/2019 12:09:28 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt
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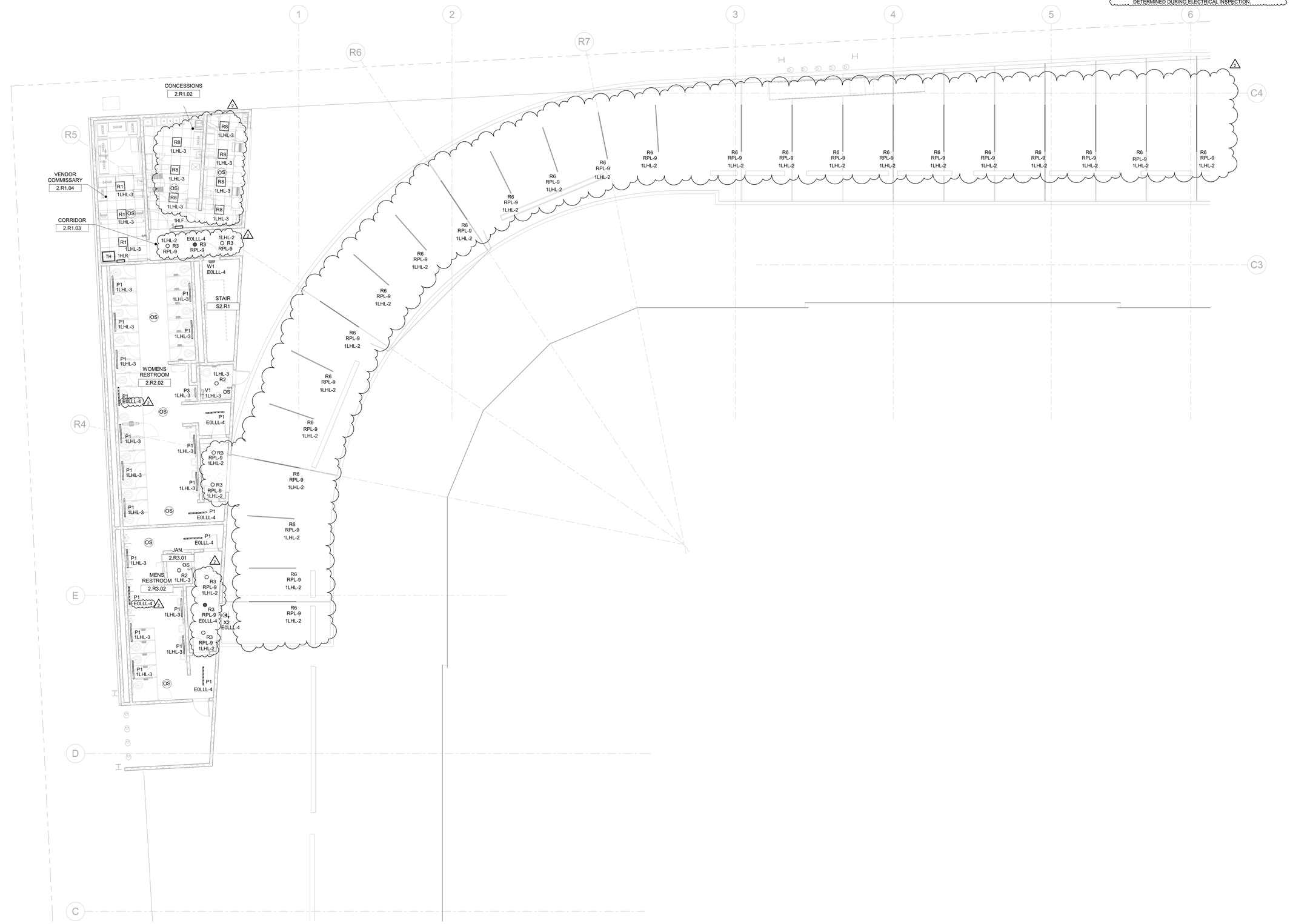
GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E502.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.



1A CONCOURSE LEVEL LIGHTING PLAN - AREA B
1/8" = 1'-0"

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PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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AECOM
150 Clay St., Suite 410
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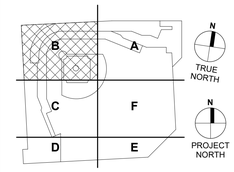

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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL LIGHTING PLAN - AREA B

SHEET NUMBER 1

E102B

DOCUMENT SET-E102B-CONCOURSE LEVEL LIGHTING PLAN - AREA B
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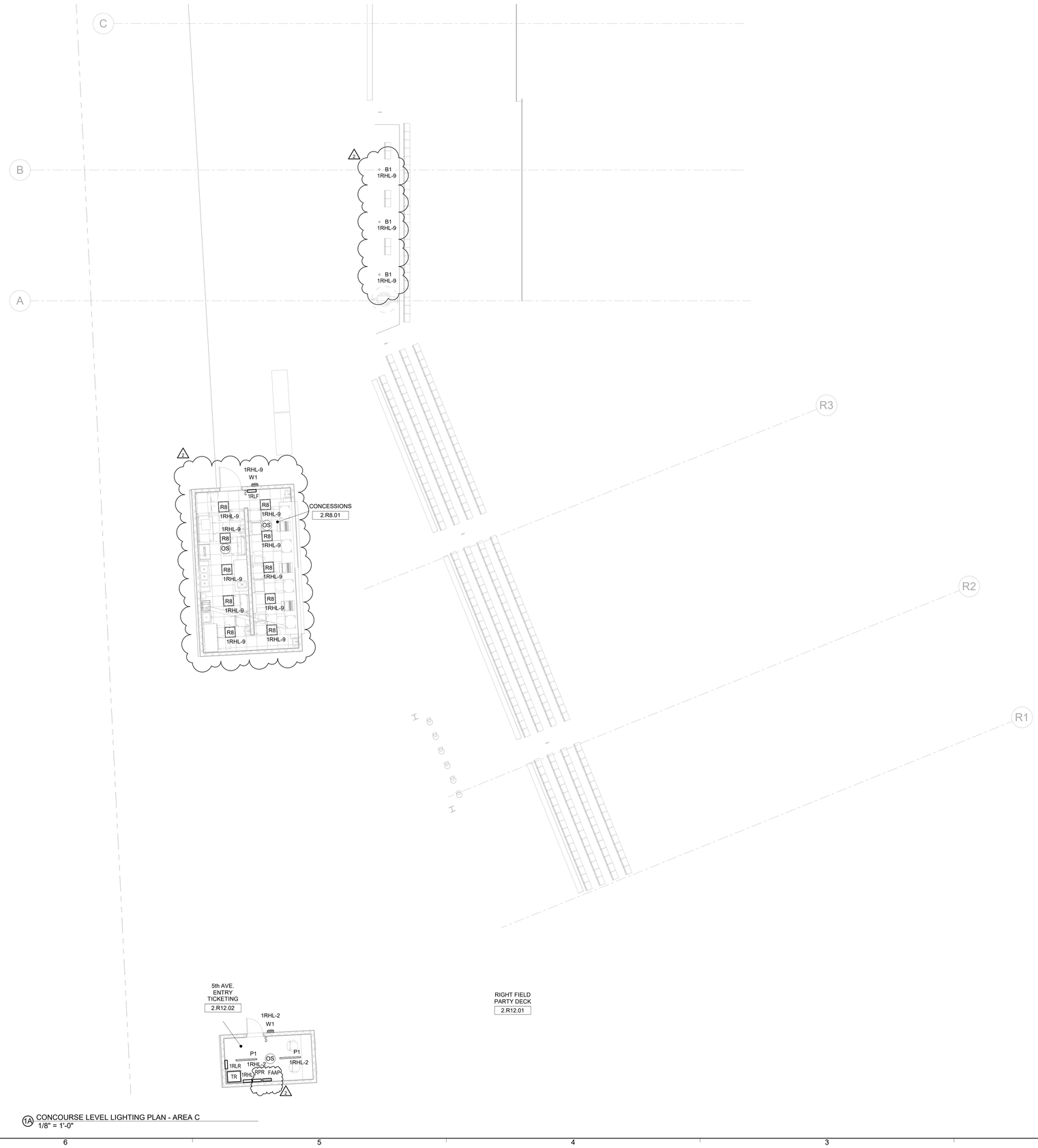

1A CONCOURSE LEVEL LIGHTING PLAN - AREA C
1/8" = 1'-0"

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
2 C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E502.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.

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PROJECT

Marshall Baseball Electrical

THE HERD

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
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125 Broad Street, 15th Floor
New York, NY 10004
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277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

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Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

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Seattle, WA 98104
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KEY PLAN

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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

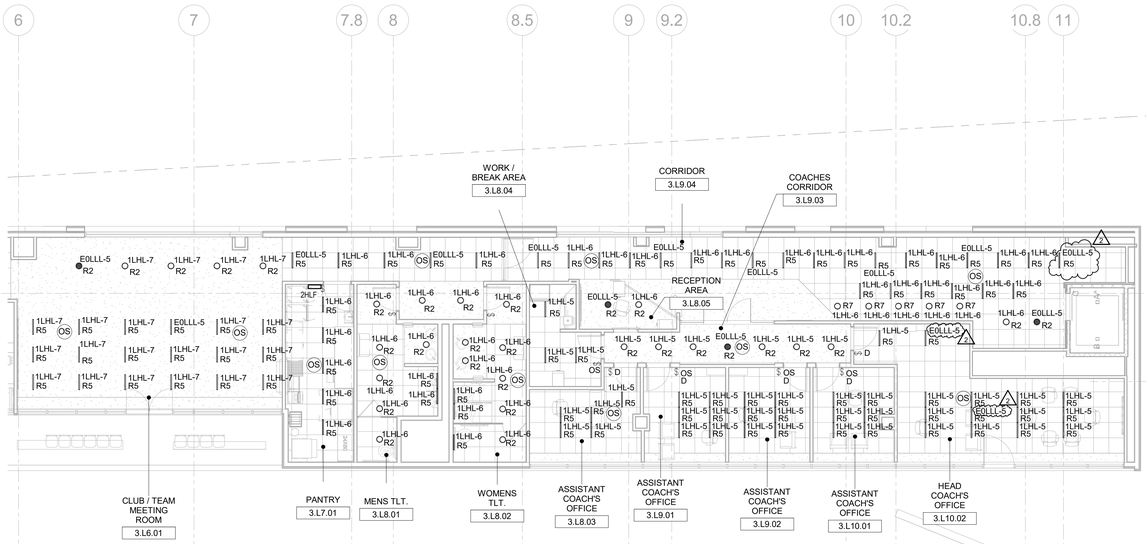
60590790

SHEET TITLE

CONCOURSE LEVEL LIGHTING PLAN - AREA C

SHEET NUMBER 1

E102C



1A PRESS LEVEL LIGHTING PLAN - AREA A
1/8" = 1'-0"

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
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E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.

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PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
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STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

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277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
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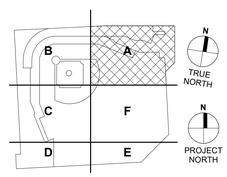
11/15/19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL LIGHTING PLAN - AREA A

SHEET NUMBER 1

E103A

1A PRESS LEVEL LIGHTING PLAN - AREA B
1/8" = 1'-0"

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E502.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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Lenexa, KS 66214
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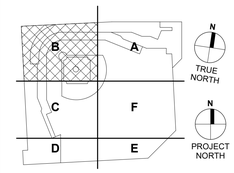


ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL LIGHTING PLAN - AREA B

SHEET NUMBER 1

E103B

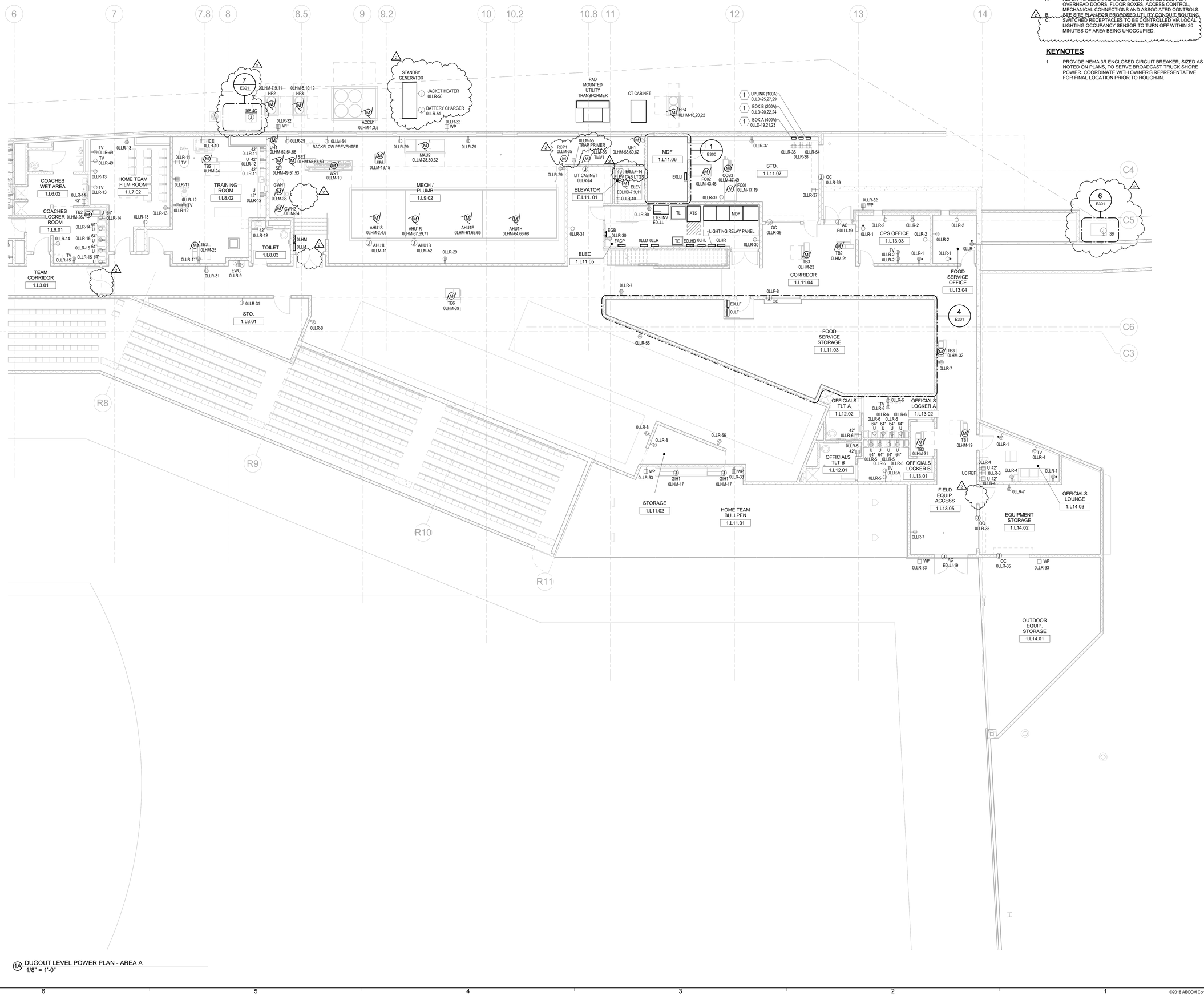
Project Management Initials:
Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"
DOCUMENT SET: E103B-PRESS LEVEL LIGHTING PLAN - AREA B
Last Plotted: 12/11/2019 12:09:48 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt
Printed on ___% Post-Consumer Recycled Content Paper

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. ~~SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING~~
C. SWITCHED RECEPTACLES TO BE CONTROLLED VIA LOCAL LIGHTING OCCUPANCY SENSOR TO TURN OFF WITHIN 20 MINUTES OF AREA BEING UNOCCUPIED.

KEYNOTES

1 PROVIDE NEMA 3R ENCLOSED CIRCUIT BREAKER, SIZED AS NOTED ON PLANS, TO SERVE BROADCAST TRUCK SHORE POWER. COORDINATE WITH OWNER'S REPRESENTATIVE FOR FINAL LOCATION PRIOR TO ROUGH-IN.



1A DUGOUT LEVEL POWER PLAN - AREA A
1/8" = 1'-0"

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Last Plotted: 12/11/2019 12:09:55 PM
Filename: BIM 360:/60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt

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CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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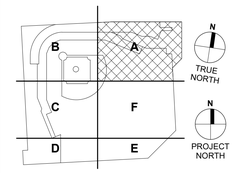

ISSUE/REVISION

I/R	DATE	DESCRIPTION
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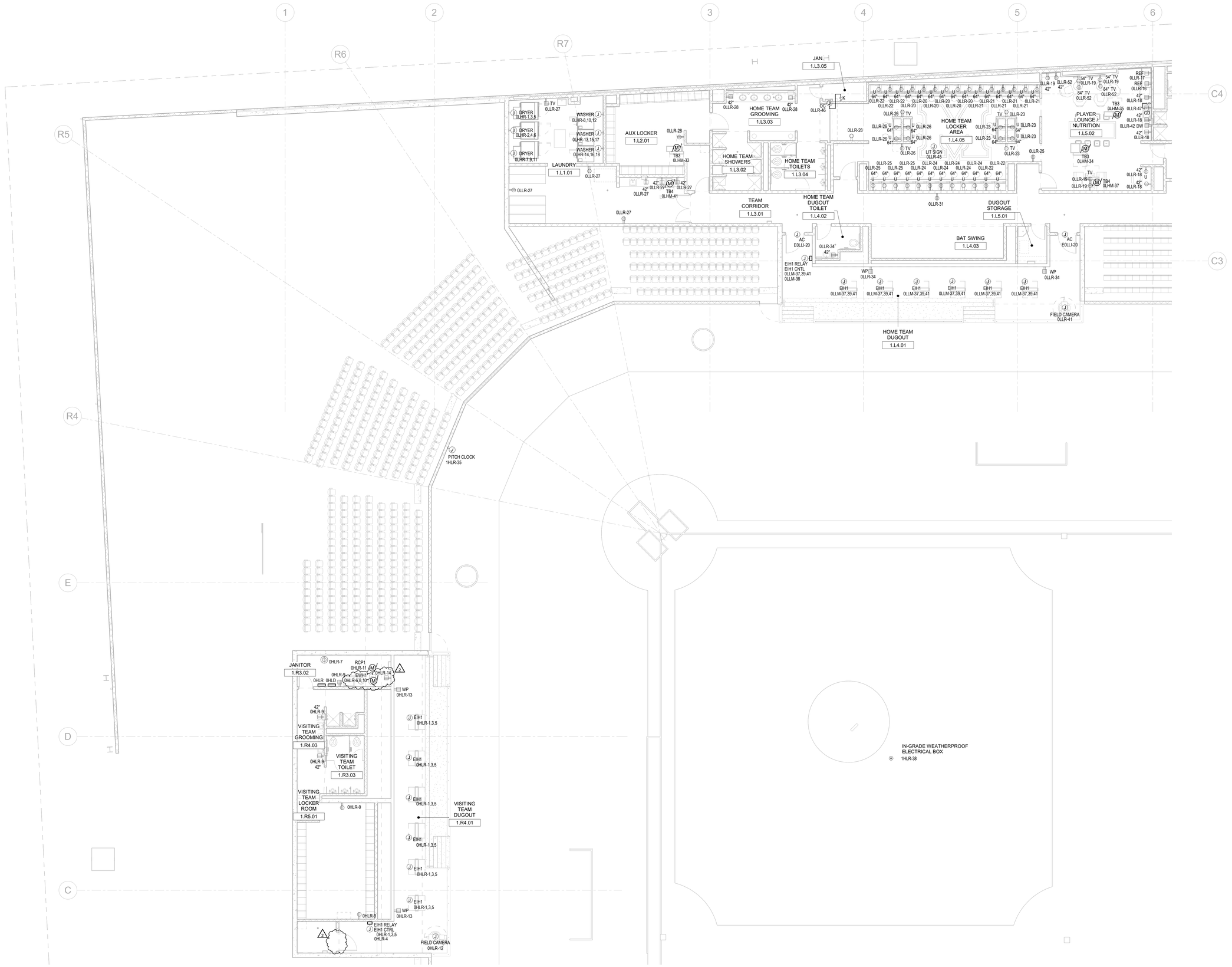
PROJECT NUMBER
60590790

SHEET TITLE
DUGOUT LEVEL POWER PLAN - AREA A

SHEET NUMBER 1
E201A

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING.



1A DUGOUT LEVEL POWER PLAN - AREA B
1/8" = 1'-0"

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT

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Huntington, WV 25755
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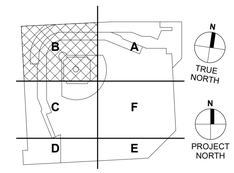


ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

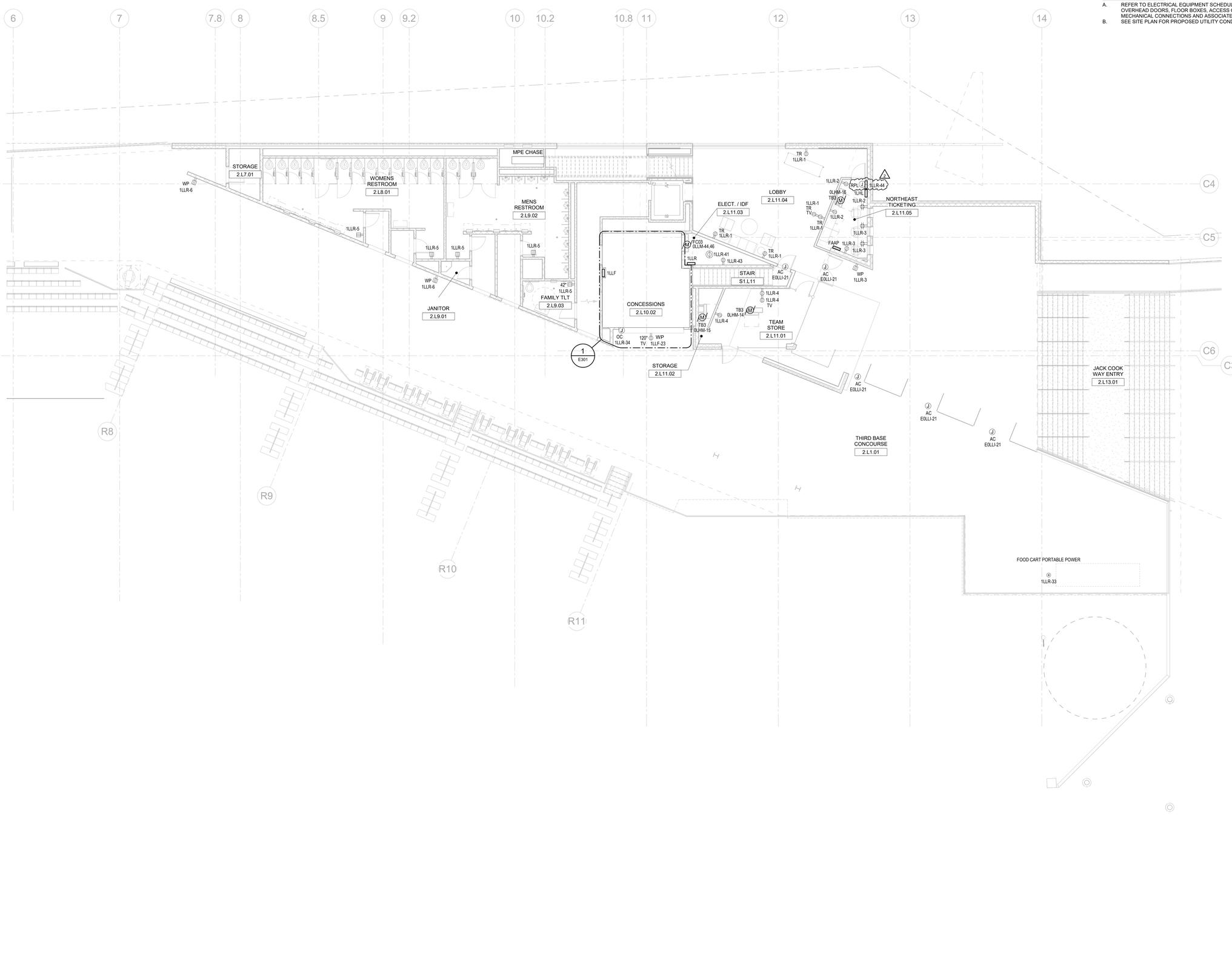
DUGOUT LEVEL POWER PLAN - AREA B

SHEET NUMBER 1

E201B

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING.



1A CONCOURSE LEVEL POWER PLAN - AREA A
1/8" = 1'-0"

AECOM

PROJECT

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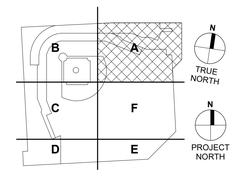

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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL POWER PLAN - AREA A

SHEET NUMBER 1
E202A

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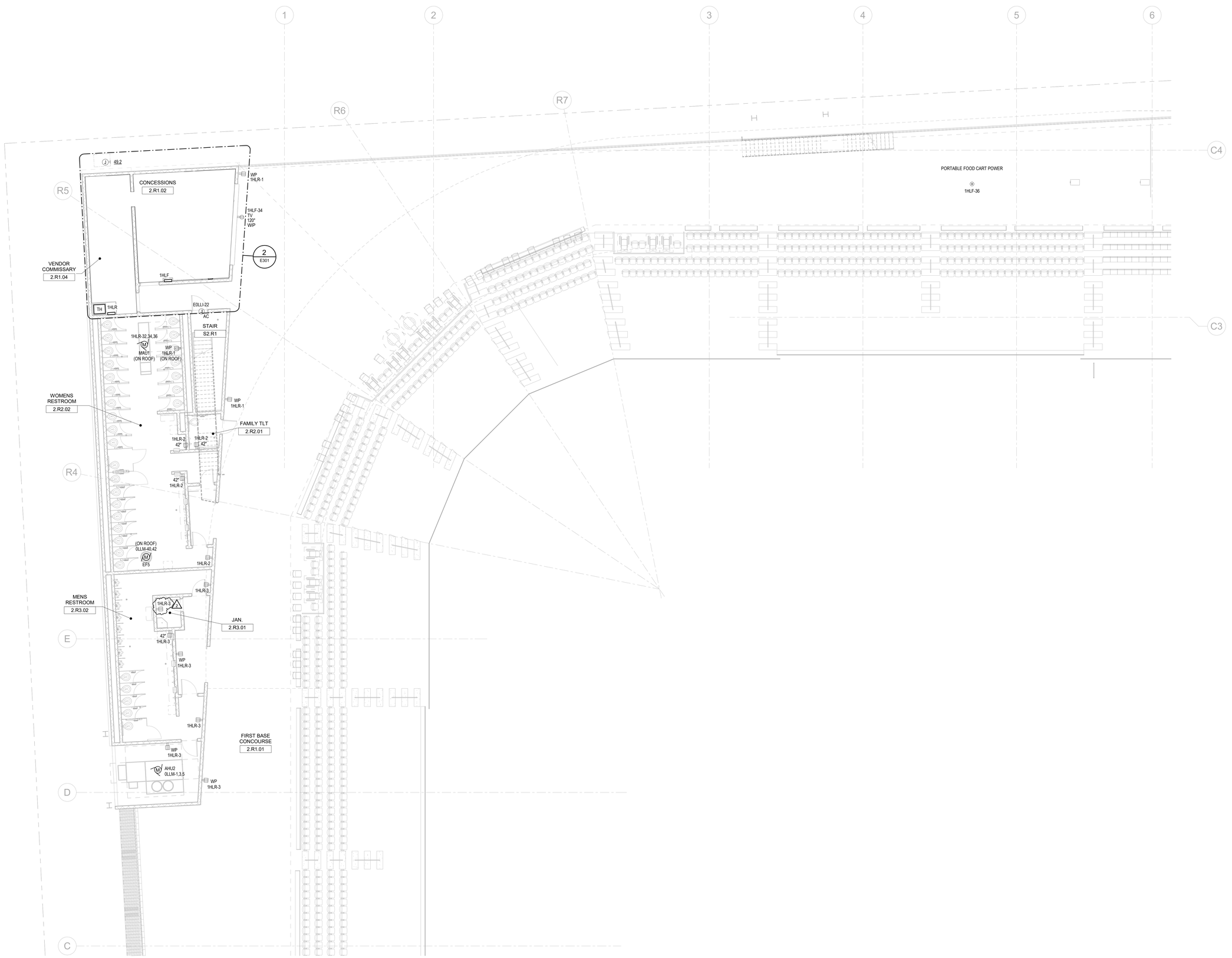
Last Plotted: 12/11/2019 12:10:07 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING.



1A CONCOURSE LEVEL POWER PLAN - AREA B
1/8" = 1'-0"

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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AECOM
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Kansas City, MO 64108
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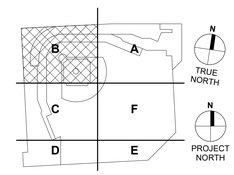


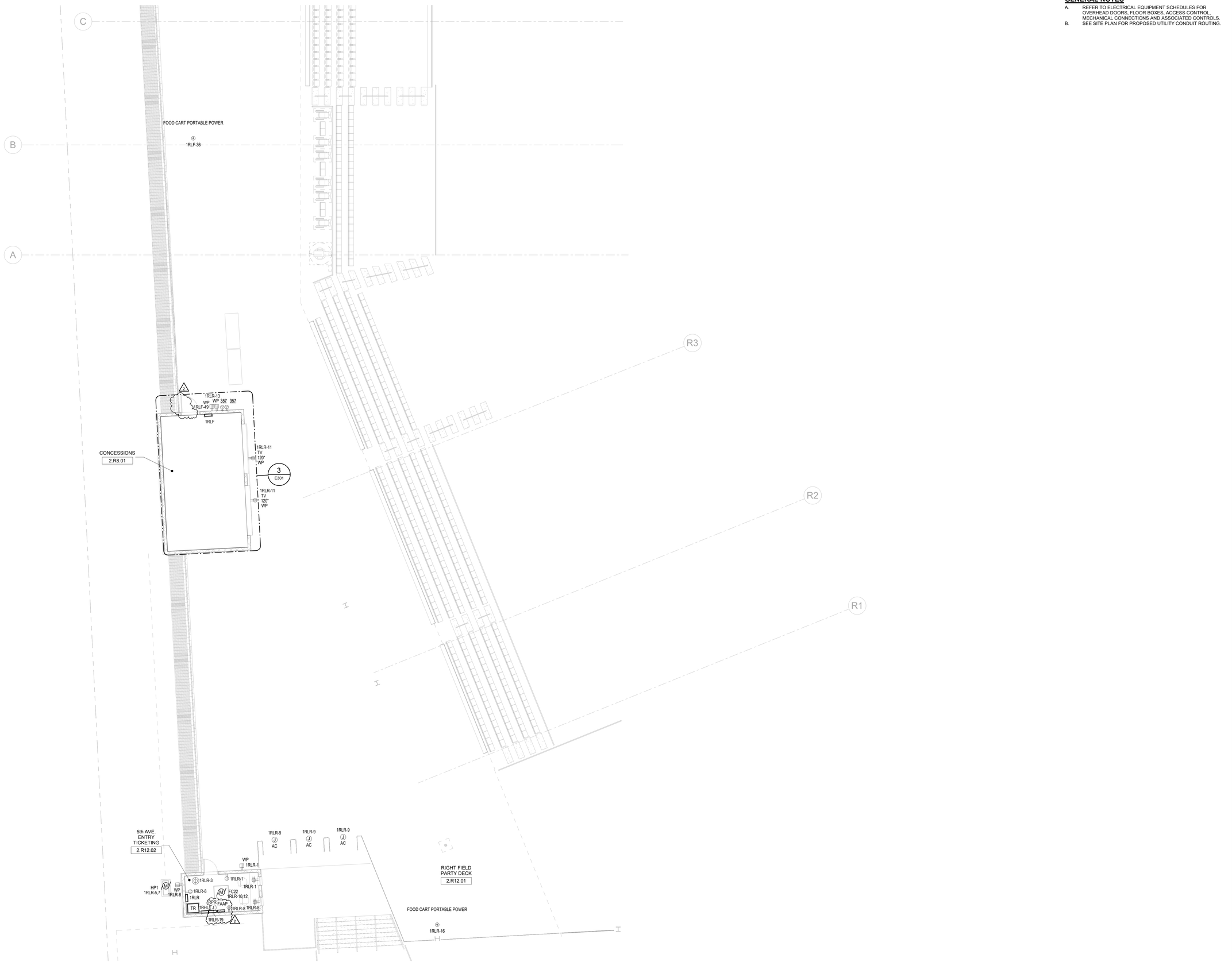
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL POWER PLAN - AREA B

SHEET NUMBER 1
E202B



1A CONCOURSE LEVEL POWER PLAN - AREA C
1/8" = 1'-0"

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING.

AECOM

PROJECT

Marshall Baseball Electrical

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Marshall University
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Kansas City, MO 64108
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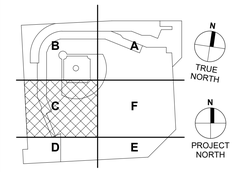


ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

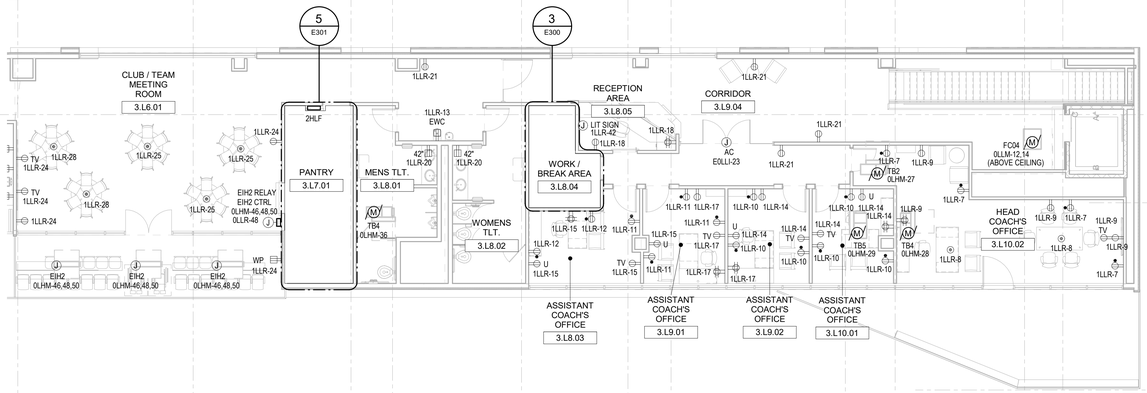
60590790

SHEET TITLE

CONCOURSE LEVEL POWER PLAN - AREA C

SHEET NUMBER 1

E202C



1A PRESS LEVEL POWER PLAN - AREA A
1/8" = 1'-0"

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING
C. SWITCHED RECEPTACLES TO BE CONTROLLED VIA LOCAL LIGHTING OCCUPANCY SENSOR TO TURN OFF WITHIN 20 MINUTES OF AREA BEING UNOCCUPIED.

AECOM

PROJECT

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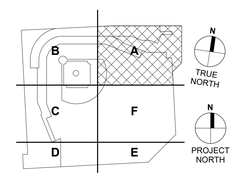


ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL POWER PLAN - AREA A

SHEET NUMBER 1

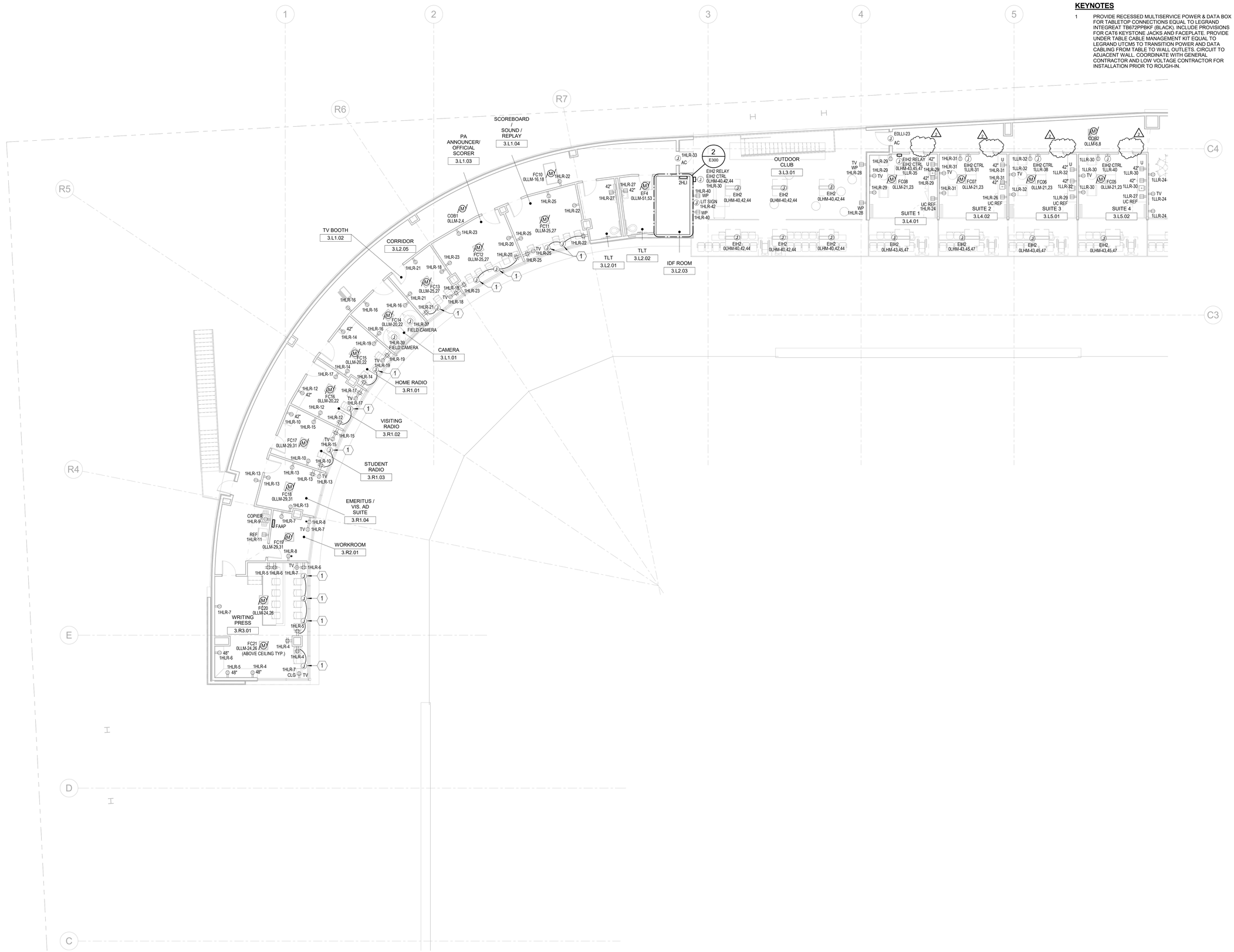
E203A

GENERAL NOTES

A. REFER TO ELECTRICAL EQUIPMENT SCHEDULES FOR OVERHEAD DOORS, FLOOR BOXES, ACCESS CONTROL, MECHANICAL CONNECTIONS AND ASSOCIATED CONTROLS.
B. SEE SITE PLAN FOR PROPOSED UTILITY CONDUIT ROUTING.

KEYNOTES

1 PROVIDE RECESSED MULTISERVICE POWER & DATA BOX FOR TABLETOP CONNECTIONS EQUAL TO LEGRAND INTEGREAT TB672PPBKF (BLACK). INCLUDE PROVISIONS FOR CAT6 KEYSTONE JACKS AND FACEPLATE. PROVIDE UNDER TABLE CABLE MANAGEMENT KIT EQUAL TO LEGRAND UTCM5 TO TRANSITION POWER AND DATA CABLING FROM TABLE TO WALL OUTLETS. CIRCUIT TO ADJACENT WALL. COORDINATE WITH GENERAL CONTRACTOR AND LOW VOLTAGE CONTRACTOR FOR INSTALLATION PRIOR TO ROUGH-IN.



1A PRESS LEVEL POWER PLAN - AREA B
1/8" = 1'-0"

AECOM

PROJECT

Marshall Baseball Electrical

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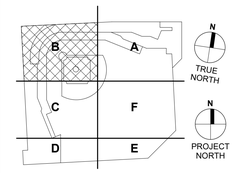

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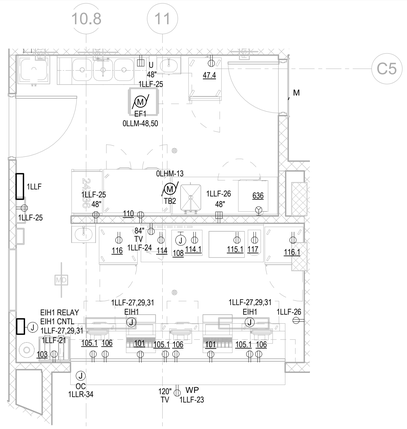
I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL POWER PLAN - AREA B

SHEET NUMBER 1
E203B

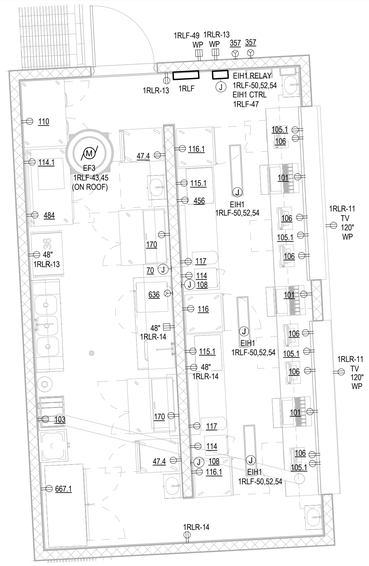
DOCUMENT SET:E203B-PRESS LEVEL POWER PLAN - AREA B
Last Plotted: 12/11/2019 12:10:26 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt



1 | CONCESSIONS 2.L10.02 ENLARGED POWER PLAN
E202A | Scale: 1/4" = 1'-0"

CONCESSIONS 2.L10.02 EQUIPMENT CONNECTION SCHEDULE

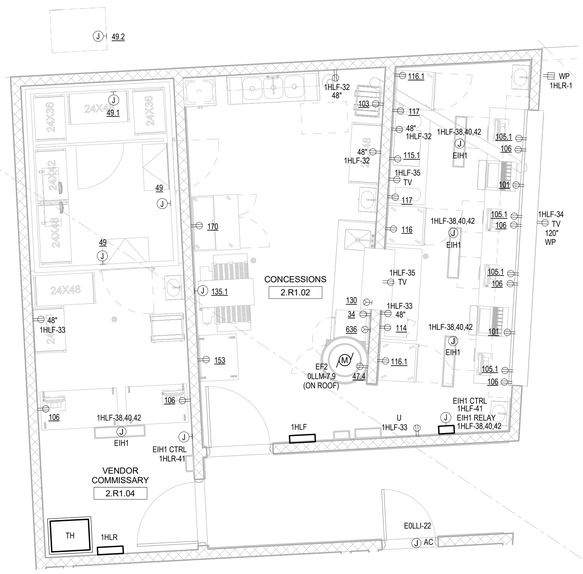
ITEM NO.	EQUITMENT DESCRIPTION	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT NUMBER	Comments
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	1LLF	1	
101	ICE/SODA STATION	120 V	1	1440 VA	1LLF	2	
101	ICE/SODA STATION	120 V	1	1440 VA	1LLF	3	
103	SODA SYSTEM	120 V	1	1440 VA	1LLF	4	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1LLF	5	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1LLF	6	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1LLF	7	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1LLF	8	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1LLF	9	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1LLF	10	
108	MENU BOARD	120 V	1	1920 VA	1LLF	19	
110	REACH-IN REFRIGERATOR - TWO DOOR	120 V	1	780 VA	1LLF	11	
114	PRETZEL CABINET	120 V	1	1440 VA	1LLF	12	
114.1	PRETZEL WARMER	120 V	1	1920 VA	1LLF	13	
115.1	POPCORN POPPER	120 V	1	1920 VA	1LLF	14	
116	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	1920 VA	1LLF	15	
116.1	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	864 VA	1LLF	16	
117	NACHO CHEESE DISPENSER	120 V	1	600 VA	1LLF	17	
636	COUNTERTOP STEAMER	208 V	3	11889 VA	1LLF	18,20,22	



3 | CONCESSIONS 2.R8.01 ENLARGED POWER PLAN
E202C | Scale: 1/4" = 1'-0"

CONCESSIONS 2.R8.01 EQUIPMENT CONNECTION SCHEDULE

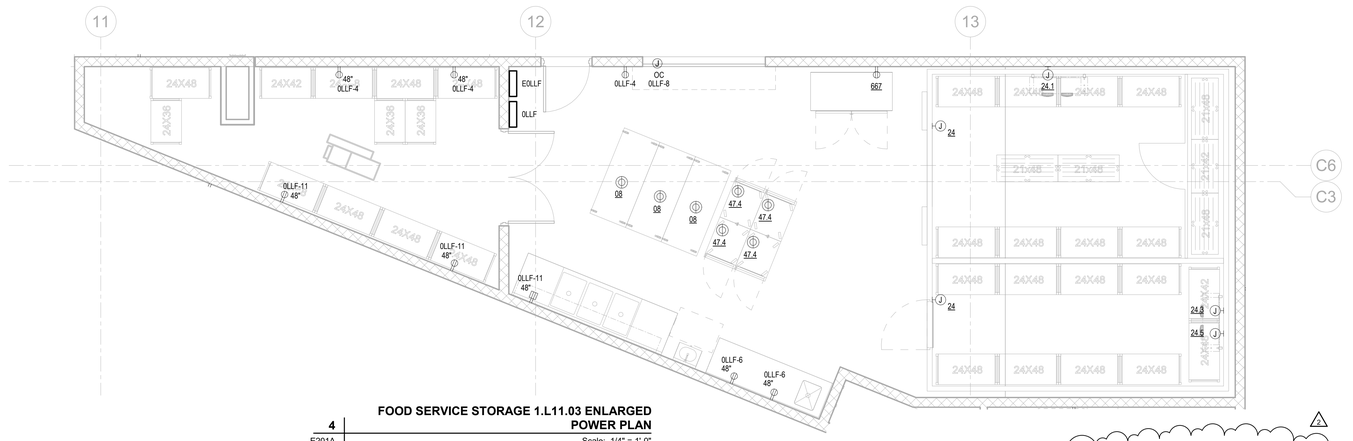
ITEM NO.	EQUITMENT DESCRIPTION	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT NUMBER	Comments
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	1RLF	1	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	1RLF	2	
70	WORK TABLE W/ SINK	120 V	1	1920 VA	1RLF	3	
101	ICE/SODA STATION	120 V	1	1440 VA	1RLF	5	
101	ICE/SODA STATION	120 V	1	1440 VA	1RLF	4	
101	ICE/SODA STATION	120 V	1	1440 VA	1RLF	6	
103	SODA SYSTEM	120 V	1	1440 VA	1RLF	7	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1RLF	8	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1RLF	9	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1RLF	10	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1RLF	11	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1RLF	12	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1RLF	17	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1RLF	16	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1RLF	13	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1RLF	14	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1RLF	15	
108	MENU BOARD	120 V	1	1920 VA	1RLF	18	
108	MENU BOARD	120 V	1	1920 VA	1RLF	19	
110	REACH-IN REFRIGERATOR - TWO DOOR	120 V	1	780 VA	1RLF	20	
114	PRETZEL CABINET	120 V	1	1440 VA	1RLF	21	
114	PRETZEL CABINET	120 V	1	1440 VA	1RLF	22	
114.1	PRETZEL WARMER	120 V	1	1920 VA	1RLF	23	
115.1	POPCORN POPPER	120 V	1	1920 VA	1RLF	24	
115.1	POPCORN POPPER	120 V	1	1920 VA	1RLF	25	
116	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	1920 VA	1RLF	26	
116.1	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	864 VA	1RLF	27	
116.1	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	864 VA	1RLF	28	
117	NACHO CHEESE DISPENSER	120 V	1	600 VA	1RLF	29	
117	NACHO CHEESE DISPENSER	120 V	1	600 VA	1RLF	30	
170	PIZZA PREP REFRIGERATOR	120 V	1	804 VA	1RLF	31	
170	PIZZA PREP REFRIGERATOR	120 V	1	804 VA	1RLF	32	
357	PORTABLE GRILL	208 V	3	1800 VA	1RLF	38,40,42	
357	PORTABLE GRILL	208 V	3	1800 VA	1RLF	44,46,48	
456	POPCORN POPPER	120 V	1	1920 VA	1RLF	33	
484	WORKTOP REFRIGERATOR	120 V	1	1476 VA	1RLF	34	
636	COUNTERTOP STEAMER	208 V	3	11889 VA	1RLF	37,39,41	
667.1	BAGGED ICE CABINET	120 V	1	972 VA	1RLF	35	



2 | CONCESSIONS 2.R1.02 ENLARGED POWER PLAN
E202B | Scale: 1/4" = 1'-0"

CONCESSIONS 2.R1.02 EQUIPMENT CONNECTION SCHEDULE

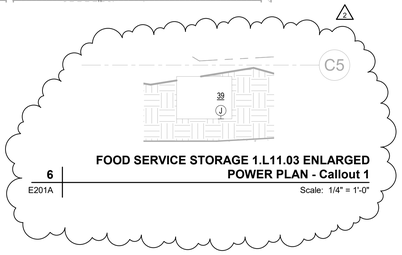
ITEM NO.	EQUITMENT DESCRIPTION	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT NUMBER	Comments
34	WORK TABLE W/ SINK	120 V	1	1920 VA	1HLF	1	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	1HLF	2	
49	WALK-IN COOLER	120 V	1	1920 VA	E0LLF	4	LIGHTS, DOOR HEATER, ALARM
49	WALK-IN COOLER	120 V	1	1920 VA	E0LLF	8	LIGHTS, DOOR HEATER, ALARM
49.1	EVAPORATOR - COOLER SECTION	120 V	1	1200 VA	E0LLF	6	
49.2	COMPRESSOR - COOLER	208 V	3	2810 VA	E0LLF	7,9,11	LOCATED ON ROOF
101	ICE/SODA STATION	120 V	1	1440 VA	1HLF	4	
101	ICE/SODA STATION	120 V	1	1440 VA	1HLF	6	
103	PIZZA PREP REFRIGERATOR	120 V	1	1440 VA	1HLF	8	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1HLF	3	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1HLF	10	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1HLF	5	
105.1	WARMER, DRAWER TYPE	120 V	1	900 VA	1HLF	12	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1HLF	7	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1HLF	14	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1HLF	9	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1HLF	16	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1HLF	18	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	1HLF	11	
114	PRETZEL CABINET	120 V	1	1440 VA	1HLF	13	
115.1	POPCORN POPPER	120 V	1	1920 VA	1HLF	20	
116	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	1920 VA	1HLF	15	
116.1	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	864 VA	1HLF	22	
116.1	BOTTLED BEVERAGE REFRIGERATOR - ONE DOOR	120 V	1	864 VA	1HLF	17	
117	NACHO CHEESE DISPENSER	120 V	1	600 VA	1HLF	24	
117	NACHO CHEESE DISPENSER	120 V	1	600 VA	1HLF	19	
130	HEATED DISPLAY CASE	208 V	1	2120 VA	1HLF	37,39	
135.1	CONVEYOR OVEN	208 V	3	18700 VA	1HLF	26,28,30	
153	MOBILE WORK TABLE	120 V	1	1920 VA	1HLF	21	
170	PIZZA PREP REFRIGERATOR	120 V	1	804 VA	1HLF	23	
636	COUNTERTOP STEAMER	208 V	3	11889 VA	1HLF	25,27,29	



4 | FOOD SERVICE STORAGE 1.L11.03 ENLARGED POWER PLAN
E201A | Scale: 1/4" = 1'-0"

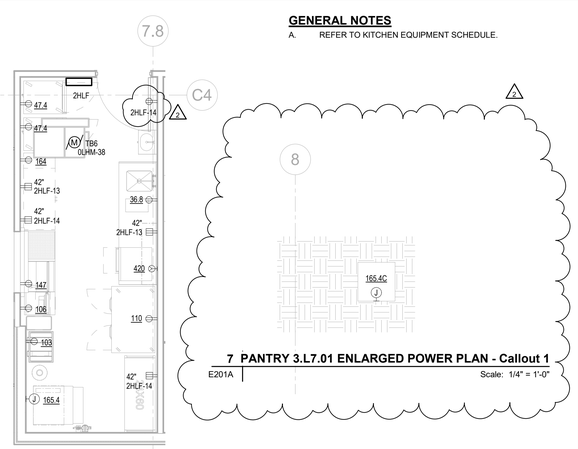
FOOD SERVICE STORAGE 1.L11.03 EQUIPMENT CONNECTION SCHEDULE

ITEM NO.	EQUITMENT DESCRIPTION	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT NUMBER	Comments
08	MOBILE WORK TABLE	120 V	1	1920 VA	0LLF	1	
08	MOBILE WORK TABLE	120 V	1	1920 VA	0LLF	2	
08	MOBILE WORK TABLE	120 V	1	1920 VA	0LLF	3	
24	WALK-IN COOLER/FREEZER	120 V	1	1920 VA	E0LLF	1	LIGHTS, DOOR HEATER, ALARM
24	WALK-IN COOLER/FREEZER	120 V	1	1920 VA	E0LLF	10	LIGHTS, DOOR HEATER, ALARM
24.1	EVAPORATOR - COOLER SECTION	120 V	1	1920 VA	E0LLF	2	
24.3	EVAPORATOR - FREEZER SECTION	208 V	1	2434 VA	E0LLF	3,5	
24.5	FREEZER DRAIN LINE HEAT TRACE	120 V	1	1800 VA	E0LLF	12	
39	REFRIGERATION COMPRESSOR RACK	208 V	3	10376 VA	E0LLF	13,15,17	VERIFY EXACT LOCATION WITH THE ARCHITECT.
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	0LLF	10	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	0LLF	12	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	0LLF	5	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	0LLF	9	
667	BAGGED ICE CABINET	120 V	1	972 VA	0LLF	7	



6 | FOOD SERVICE STORAGE 1.L11.03 ENLARGED POWER PLAN - Callout 1
E201A | Scale: 1/4" = 1'-0"

GENERAL NOTES
A. REFER TO KITCHEN EQUIPMENT SCHEDULE.



5 | PANTRY 3.L7.01 ENLARGED POWER PLAN
E203A | Scale: 1/4" = 1'-0"

7 | PANTRY 3.L7.01 ENLARGED POWER PLAN - Callout 1
E201A | Scale: 1/4" = 1'-0"

PANTRY 3.L7.01 EQUIPMENT CONNECTION SCHEDULE

ITEM NO.	EQUITMENT DESCRIPTION	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT NUMBER	Comments
36.8	COFFEE BREWER	120 V	1	1800 VA	2HLF	8	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	2HLF	1	
47.4	MOBILE HOLDING CABINET	120 V	1	1920 VA	2HLF	2	
103	SODA SYSTEM	120 V	1	1440 VA	2HLF	6	
106	CASH REGISTER/POS SYSTEM	120 V	1	600 VA	2HLF	5	
110	REACH-IN REFRIGERATOR - TWO DOOR	120 V	1	780 VA	2HLF	11	
147	BAR GUN	120 V	1	600 VA	2HLF	4	
164	BACK BAR COOLER - TWO DOOR	120 V	1	300 VA	2HLF	3	
165.4	ICE MAKER, REMOTE	208 V	1	2246 VA	2HLF	7,9	
165.4C	ICE MACHINE CONDENSER	208 V	1	1920 VA	2HLF	15,17	LOCATED ON GROUND LEVEL
420	MICROWAVE CONVECTION/IMPINGEMENT OVEN	208 V	1	4992 VA	2HLF	10,12	

AECOM

PROJECT
Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION
DAVID SNOOK REGISTERED 23702 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11/15/19
INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
ENLARGED POWER PLANS

SHEET NUMBER 1
E301

Project Management Initials:
Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"
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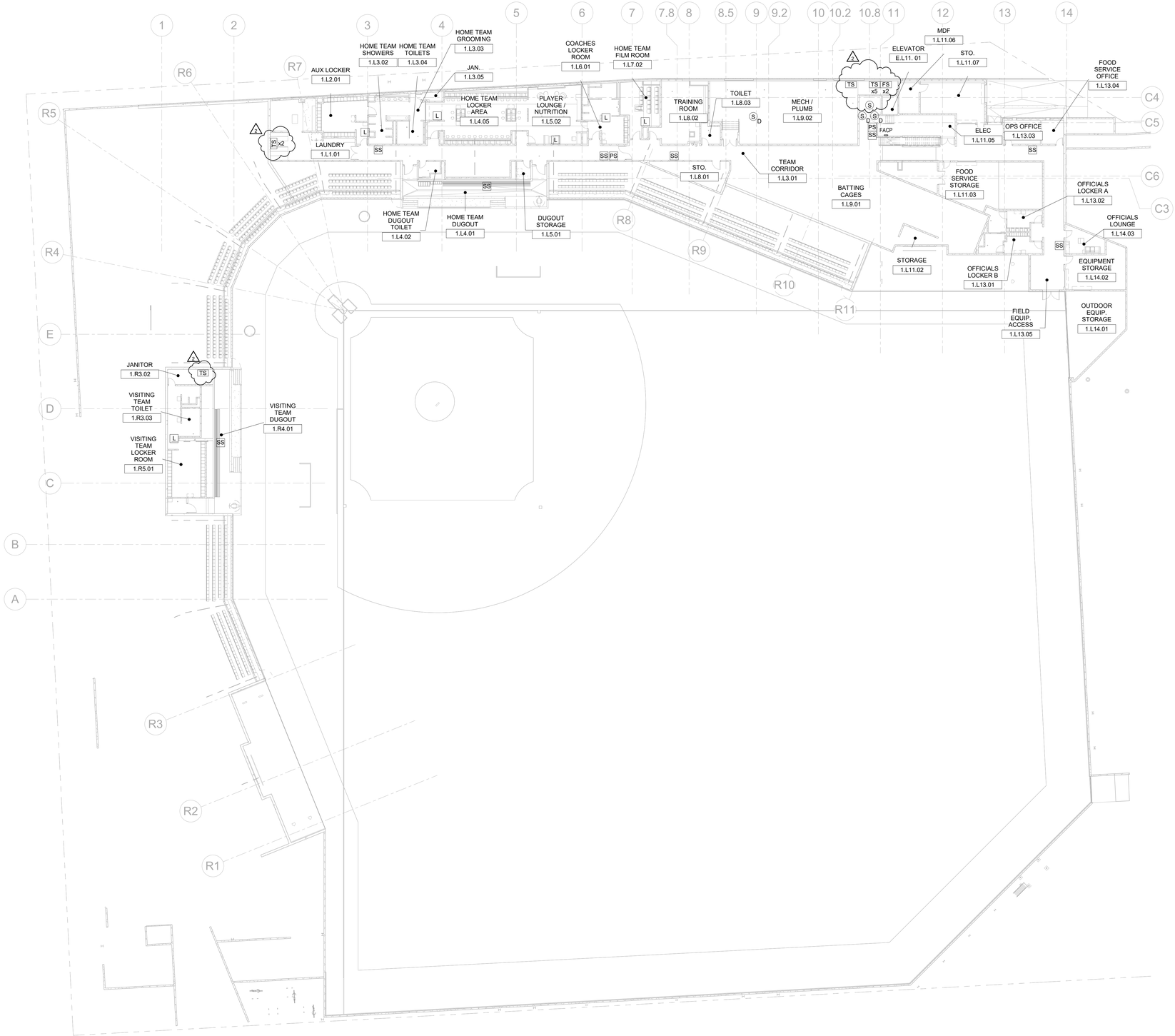

1A DUGOUT LEVEL FIRE ALARM PLAN - OVERALL
1" = 20'-0"

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

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AECOM
125 Broad Street, 15th Floor
New York, NY 10004
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MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
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REGISTRATION

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11/15/19

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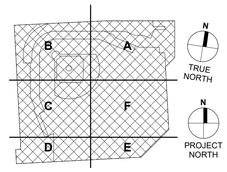
11/15/19

KEY PLAN



ISSUE/REVISION

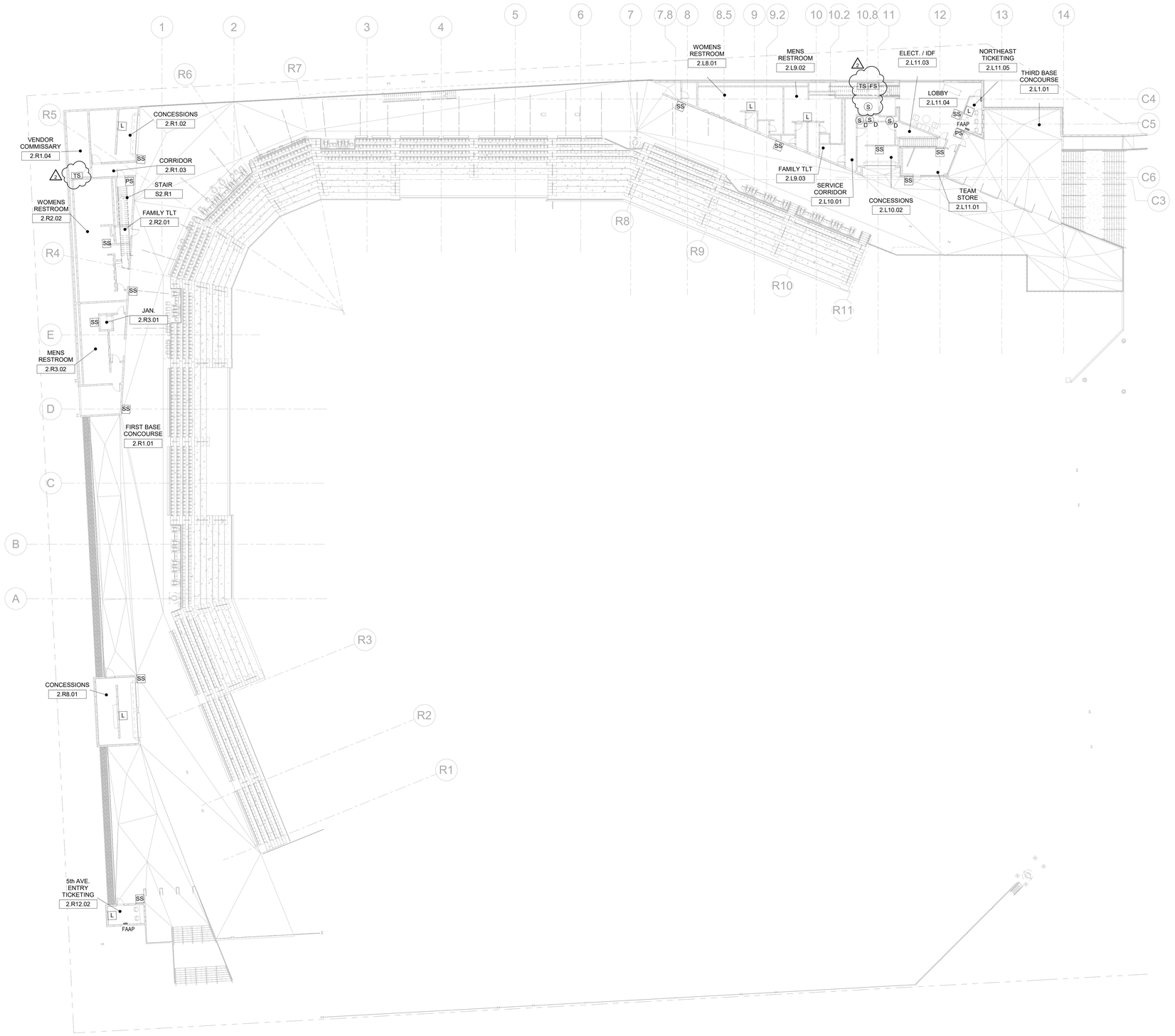
I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
DUGOUT LEVEL FIRE ALARM PLAN - OVERALL

SHEET NUMBER 1

E401



1A CONCOURSE LEVEL FIRE ALARM PLAN - OVERALL
1" = 20'-0"

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

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AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

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AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

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D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

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530 N. Wood St. Unit C
Chicago, IL 60622
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11/15/19

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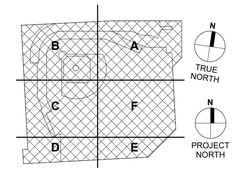
CONSTRUCTION DOCUMENTS - BID SET

11/15/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
CONCOURSE LEVEL FIRE ALARM PLAN - OVERALL

SHEET NUMBER 1
E402

Project Management Initials:
Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"
DOCUMENT SET: E402 -CONCOURSE LEVEL FIRE ALARM PLAN - OVERALL
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Printed on ___% Post-Consumer Recycled Content Paper

1A PRESS LEVEL FIRE ALARM PLAN - OVERALL
1" = 20'-0"

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
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STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
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AECOM
277 West Nationwide Blvd.
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Henderson Engineers, Inc.
8345 Lenexa Drive, #300
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FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S., #110
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S2O Consultants, Inc
530 N. Wood St. Unit C
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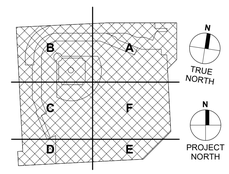
11/15/19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

KEY PLAN



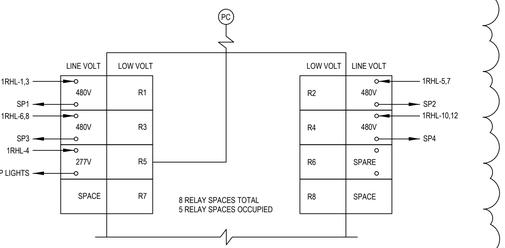
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
PRESS LEVEL FIRE ALARM PLAN - OVERALL

SHEET NUMBER 1
E403

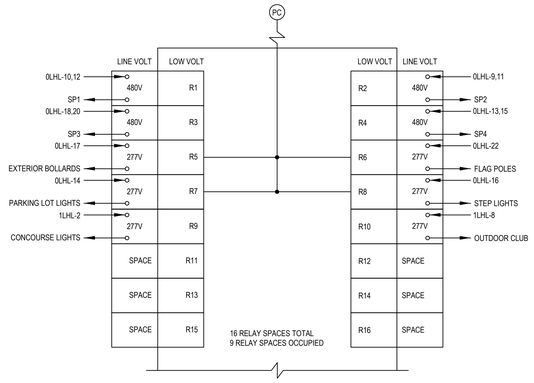


LOW VOLTAGE RELAY PANEL "RPR"

GENERAL NOTES:

A. RELAY PANEL EATON OR EQUAL.
B. PROVIDE SMART RELAY PANEL WITH MICROPROCESSOR THAT CAN INTERFACE WITH MASTER PANEL FOR SCHEDULE OR "ON / AUTO / OFF" CONTROL.
C. PHOTOCELL TO ONLY CONTROL RELAYS SHOWN WHEN IN "AUTO" MODE.

1 Lighting Relay Panel - RPR
NTS

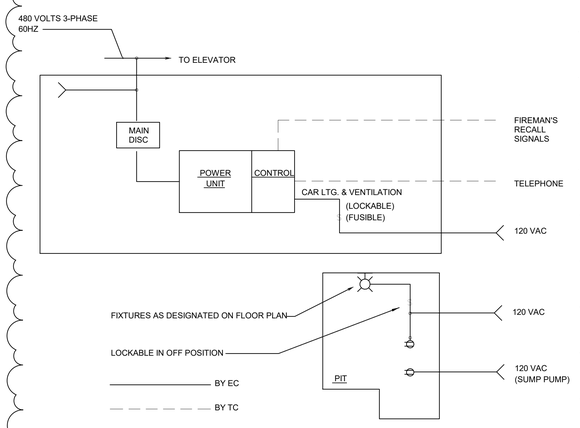


LOW VOLTAGE RELAY PANEL "RPL"

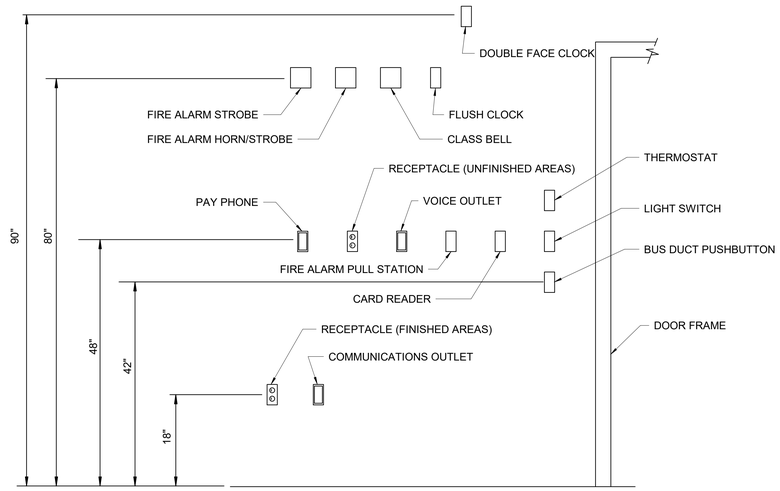
GENERAL NOTES:

A. RELAY PANEL EATON OR EQUAL.
B. PROVIDE SMART RELAY PANEL WITH MICROPROCESSOR THAT CAN INTERFACE WITH MASTER PANEL FOR SCHEDULE OR "ON / AUTO / OFF" CONTROL.
C. PHOTOCELL TO ONLY CONTROL RELAYS SHOWN WHEN IN "AUTO" MODE.

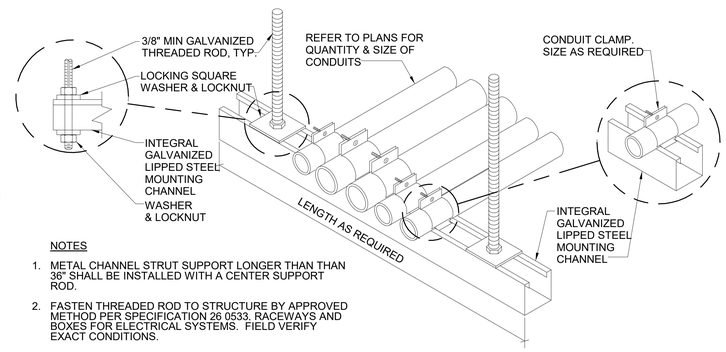
2 Lighting Relay Panel - RPL
NTS



3 ELEVATOR POWER CONNECTION SCHEMATIC
NTS



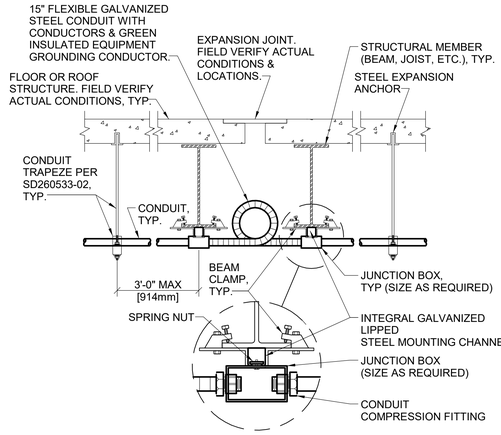
5C TYPICAL DEVICE MOUNTING HEIGHT DETAIL
NTS



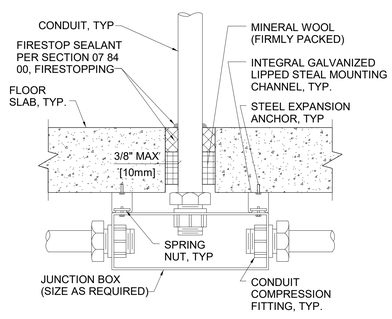
NOTES

1. METAL CHANNEL STRUT SUPPORT LONGER THAN THAN 36" SHALL BE INSTALLED WITH A CENTER SUPPORT ROD.
2. FASTEN THREADED ROD TO STRUCTURE BY APPROVED METHOD PER SPECIFICATION 26 0533. RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS. FIELD VERIFY EXACT CONDITIONS.

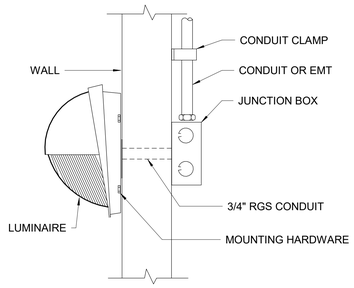
2C CONDUIT TRAPEZE MOUNTING DETAIL
NTS



4B CONDUIT JOINT CROSSING DETAIL
NTS



5A FLOOR SLAB PENETRATION DETAIL
NTS



4A LUMINAIRE MOUNTED ON EXTERIOR WALL
NTS

POWER FEED ASSEMBLY NON-FEED ASSEMBLY

GENERAL NOTES:

A. WHERE THE REQUIRED LOCATION OF AN ANCHOR DOES NOT OCCUR ON A HORIZONTAL CONCRETE FACE PROVIDE SEISMICALLY ENGINEERED STEEL C-CHANNEL SPANNING AROUND THE VOID OR OBSTRUCTION AND SECURE THE FIXTURES SUPPORT ROD TO THE STEEL CHANNEL.

B. AIRCRAFT CABLE, CABLE FITTINGS, CANOPIES, CORD STRAIN RELIEF FITTING AND SEISMIC RESTRAINT BRACKET SHALL BE FURNISHED BY THE FIXTURE MANUFACTURER.

C. FIXTURE SUPPORTS SHALL BE DESIGNED FOR A MINIMUM ULTIMATE LOAD OF 300 POUNDS EACH OR TWICE THE FIXTURE WEIGHT, WHICHEVER IS GREATER.

2A SUSPENDED LIGHTING FIXTURES MOUNTING DETAIL
NTS

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PROJECT

Marshall Baseball Electrical

THE HERD

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

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New York, NY 10004
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277 West Nationwide Blvd.
Columbus, OH 43215
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Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

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D A Hogan & Associates
119 1st Ave S., #110
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FOODSERVICE
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530 N. Wood St. Unit C
Chicago, IL 60622
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11/15/19

ISSUE/REVISION

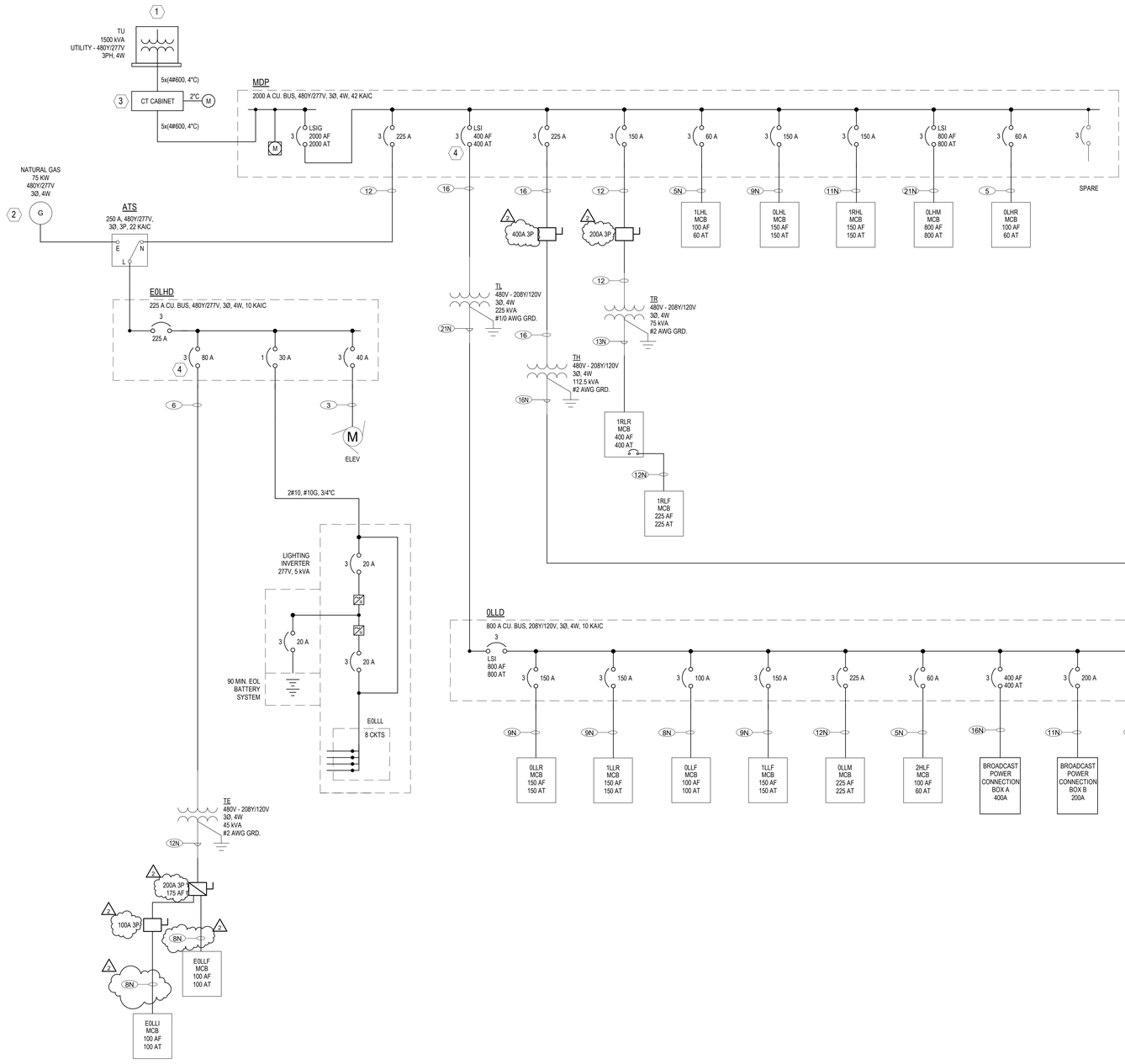
2	12/12/2019	ADDENDUM 2
I/R	DATE	DESCRIPTION

PROJECT NUMBER
60590790

SHEET TITLE
ELECTRICAL DETAILS

SHEET NUMBER 1
E502

Project Management Initials:
Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"
DOCUMENT SET: E502-ELECTRICAL DETAILS
Last Plotted: 12/11/2019 12:11:06 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt
Printed on ___% Post-Consumer Recycled Content Paper



MDP

ATS	27985 VA
TRANSFORMER TL	414600 VA
TRANSFORMER TH	163118 VA
TRANSFORMER TR	89448 VA
1LHL	8398 VA
0LHL	63358 VA
1RHL	54059 VA
0LHM	710027 VA
0LHR	36332 VA
TOTAL CONNECTED VOLT AMPERES	1567325 VA
TOTAL DEMAND VOLT AMPERES	1094447 VA

ELECTRICAL LOAD ESTIMATE

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND LOAD
Lighting	128800 VA	100.00%	128800 VA
Motor	718598 VA	80.00%	574879 VA
KTCH	172037 VA	65.00%	111824 VA
REC	547890 VA	50.91%	278945 VA
TOTAL VOLT AMPERES	1567325 VA		1094447 VA
CALCULATED AMPERES	1885 A		1316 A

DEMAND FACTOR DETERMINATION:
GENERAL LIGHTING (Lighting): 100% OF CONNECTED LOADS.
RECEPTACLES (REC): FIRST 10 kVA AT 100%, REMAINDER AT 50%.
MOTOR LOADS (Motor): 80% OF CONNECTED LOADS.
KITCHEN (KTCH): 65% OF CONNECTED LOADS.

GENERAL NOTES

A. REFER TO SHEET E902 FOR CORRESPONDING FEEDER SCHEDULE.
B. LARGER LUGS OR TAP BOXES TO BE USED IF WIRE IS SIGNIFICANTLY UPSIZED DUE TO VOLTAGE DROP.

KEYNOTES

1 PAD MOUNTED UTILITY TRANSFORMER PROVIDED BY AEP. COORDINATE PAD REQUIREMENTS, OPENINGS, ETC. WITH UTILITY. PROVIDE CABLE TERMINATIONS AT SECONDARY SIDE OF TRANSFORMER.
2 DO NOT BOND NEUTRAL AT GENERATOR. NOT A SEPARATELY DERIVED SOURCE.
3 CT CABINET PROVIDED BY CONTRACTOR IN ACCORDANCE WITH AEP REQUIREMENTS.
4 PROVIDE LOCKABLE CIRCUIT BREAKER.

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

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125 Broad Street, 15th Floor
New York, NY 10004
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Columbus, OH 43215
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8345 Lenexa Drive, #300
Lenexa, KS 66214
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D A Hogan & Associates
119 1st Ave S., #110
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530 N. Wood St. Unit C
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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
ELECTRICAL ONE-LINE DIAGRAM

SHEET NUMBER 1

E601

Project Management Initials:
Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"
DOCUMENT SET: E601 ELECTRICAL ONE-LINE DIAGRAM
Last Plotted: 12/11/2019 12:11:09 PM
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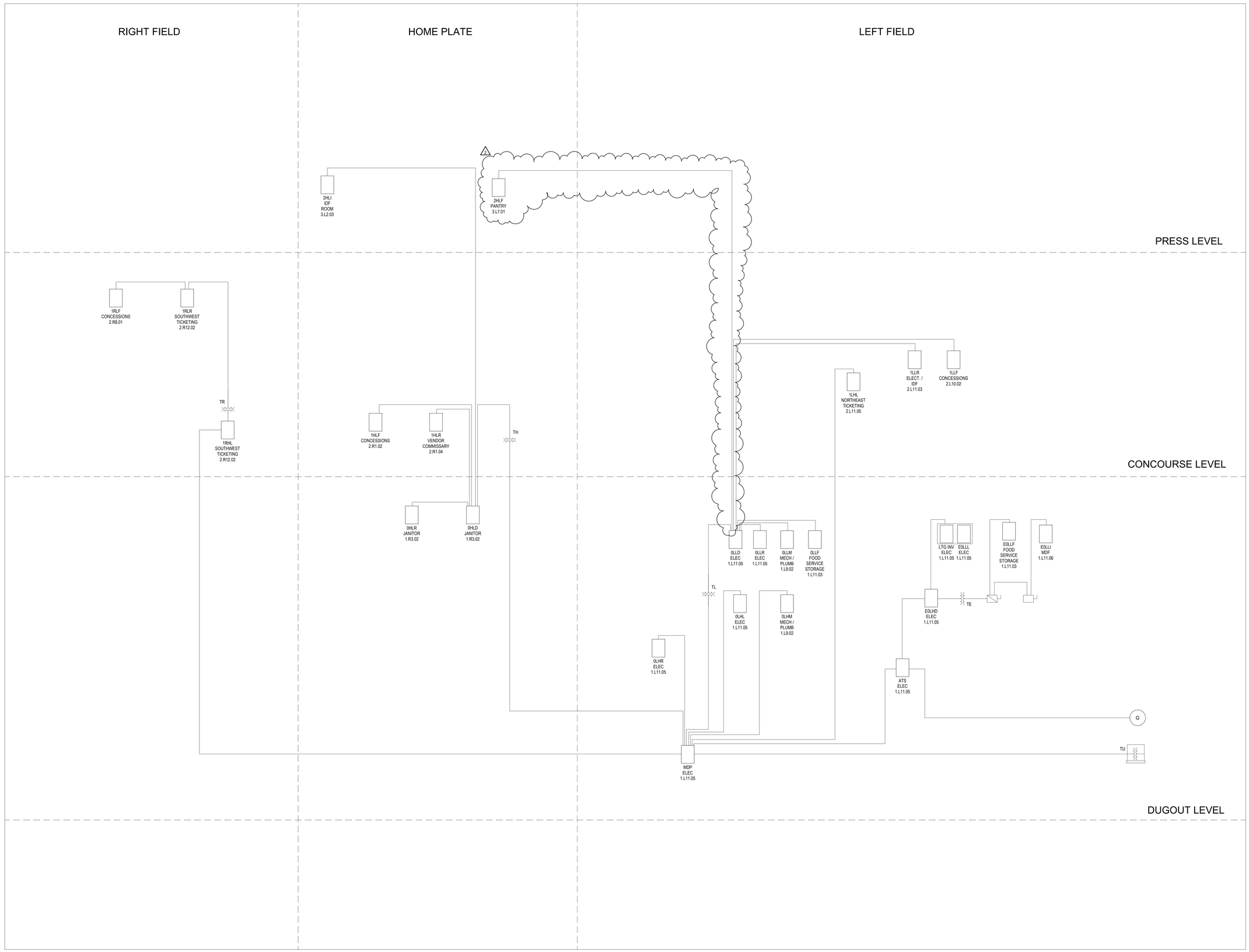

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CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

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Kansas City, MO 64108
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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

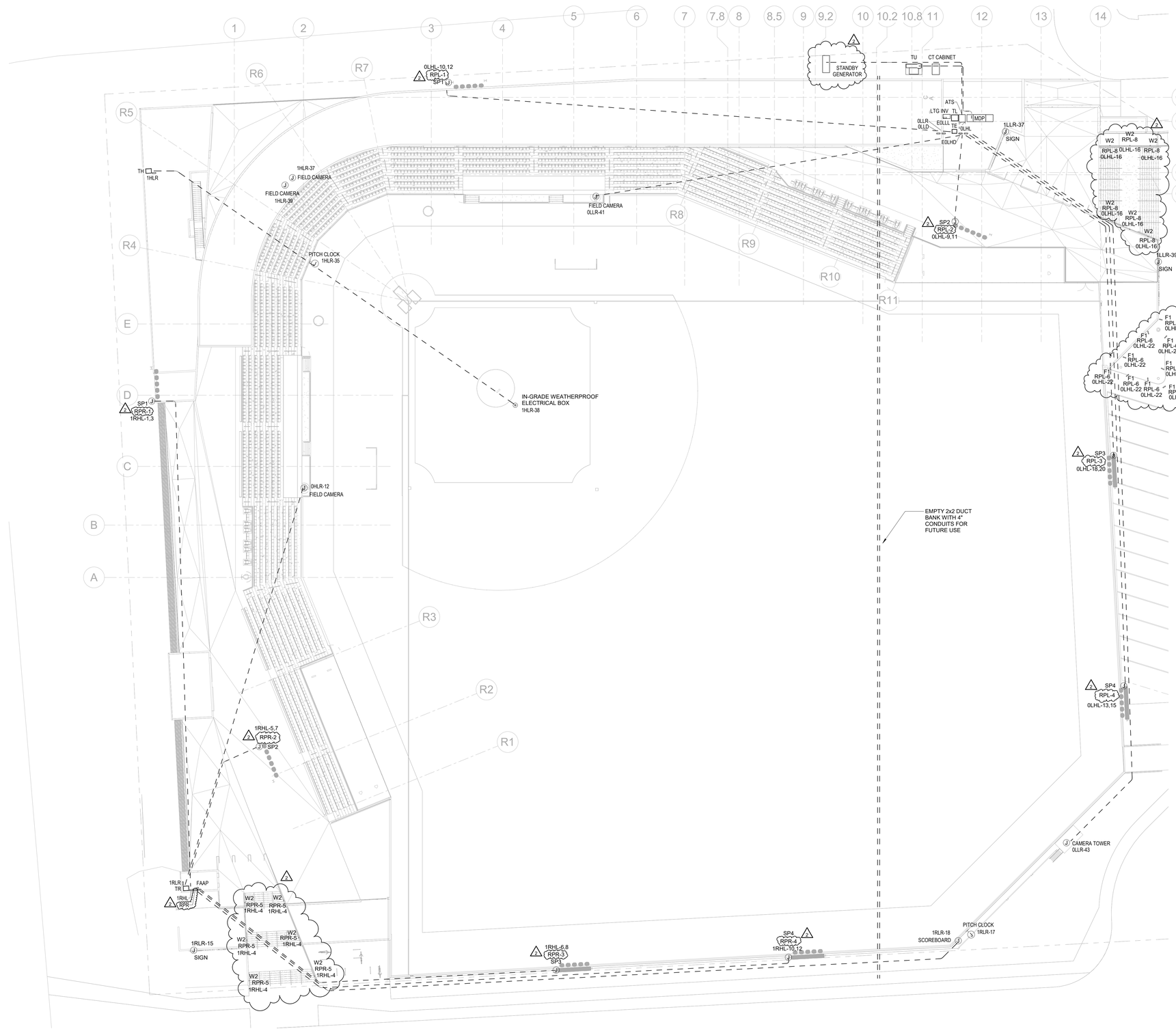
ELECTRICAL RISER DIAGRAM

SHEET NUMBER 1

E602

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E502.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.



1A ELECTRICAL SITE PLAN - STADIUM
1" = 20'-0"

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PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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150 Clay St., Suite 410
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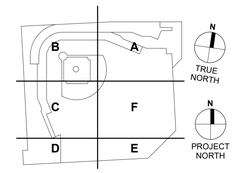


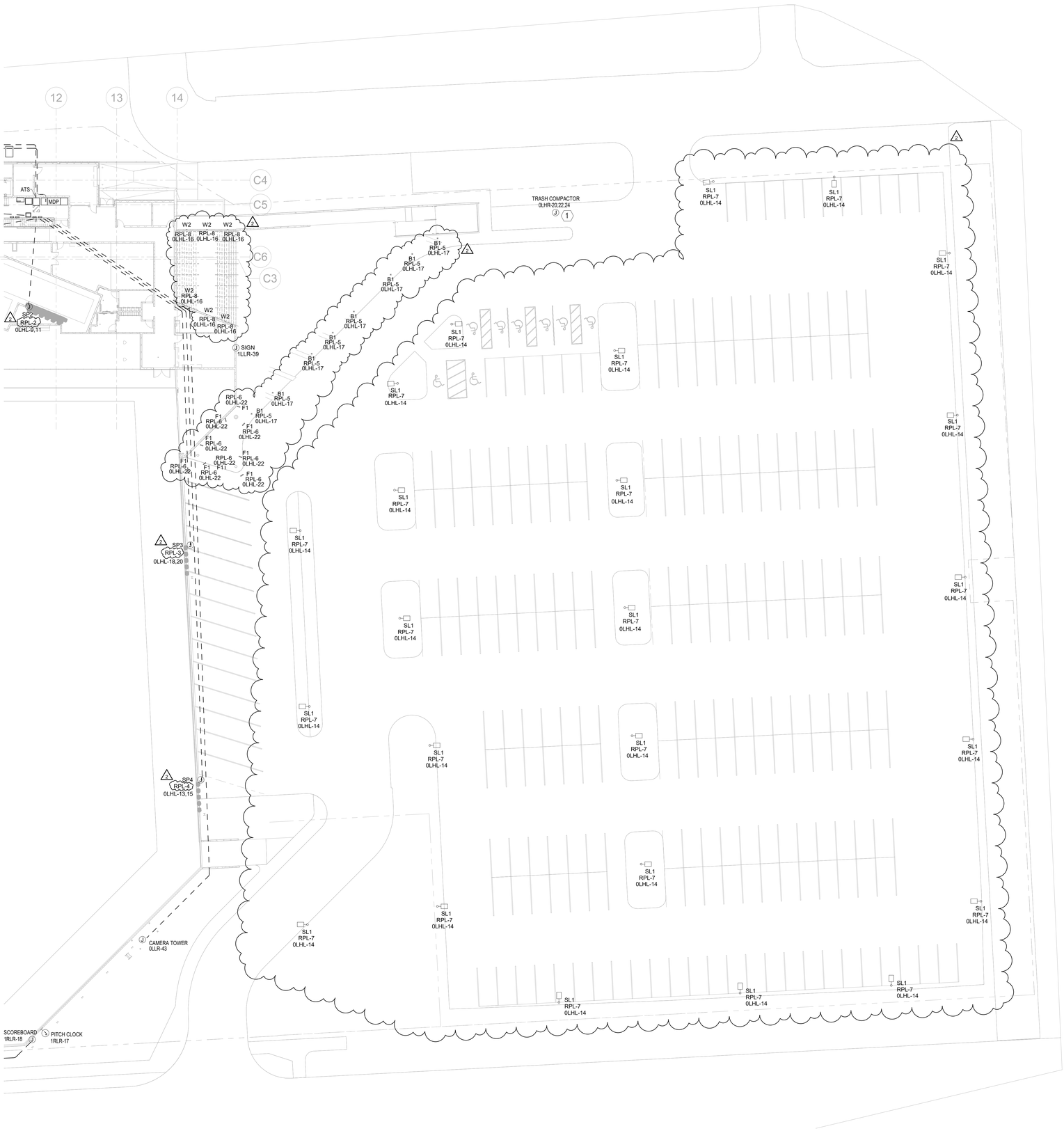
ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
ELECTRICAL SITE PLAN - STADIUM

SHEET NUMBER 1
E831



1A ELECTRICAL SITE PLAN - PARKING
1" = 20'-0"

GENERAL NOTES

A. REFER TO E-902 FOR LIGHT FIXTURE SCHEDULE.
B. ALL EMERGENCY LIGHTS TO RECEIVE EMERGENCY POWER FROM THE LIGHTING INVERTER PANEL. LIGHTING MUST COME ON AUTOMATICALLY IN THE EVENT OF PRIMARY POWER LOSS AND STAY ILLUMINATED FOR 90 MINUTES.
C. EXTERIOR LUMINAIRES AND SPORTS LIGHTING TO BE CONTROLLED VIA LIGHTING RELAY PANELS. SEE RELAY PANEL DETAILS ON SHEET E502.
D. PROVIDE OCCUPANCY SENSORS AS REQUIRED TO PROVIDE COMPLETE AND FUNCTIONAL LIGHTING SYSTEM.
E. PROVIDE 10 ADDITIONAL EXIT SIGNS FOR LOCATIONS TO BE DETERMINED DURING ELECTRICAL INSPECTION.

KEYNOTES

1 PROVIDE NEMA 3R 30/3 NON-FUSED DISCONNECT SWITCH. COORDINATE WITH OWNER'S REPRESENTATIVE FOR FINAL LOCATION PRIOR TO ROUGH-IN.

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PROJECT

Marshall Baseball Electrical

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

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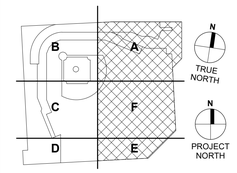
KEY PLAN



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I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER
60590790

SHEET TITLE
ELECTRICAL SITE PLAN - PARKING

SHEET NUMBER 1
E832

ANSI D 22"x34"
Designer: Designer Checked: Checker Approved: Approver
Project Management Initials:

Panel Designation: 0HLR

Location: JANITOR 1.R3.02 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0HLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1				6.25									2
3	EIH1 RELAY PANEL VISITING TEAM DUGOUT 1.R4.01	55 A	3		6.25			0.18		1	20 A	EIH1 CONROL POWER	4
5						6.25			3.33				6
7	REC IT 1 JANITOR 1.R3.02	20 A	1	0.15			3.33			3	35 A	EWH1 JANITOR 1.R3.02	8
9	REC ROOM 1.R3.02	20 A	1		0.90			3.33					10
11	RCP1	20 A	1			0.53			0.80	1	20 A	VISITING DUGOUT FIELD CAMERA	12
13	REC EXTERIOR DUGOUT	20 A	1	0.36			0.18			1	20 A	TMV2 REC JANITOR 1.R3.02	14
15	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	16
17	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	18
19	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	20
21	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	10.3 kVA		10.7 kVA		10.9 kVA					
			Total Amps:	85.6 A		89.4 A		91.4 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	10528 VA	80.00%	8422 VA		
REC	21320 VA	73.45%	15660 VA	Total Conn. Load:	31848 VA
				Total Est. Demand:	24082 VA
				Total Conn.:	88 A
				Total Est. Demand:	67 A

Panel Designation: 0LLF

Location: FOOD SERVICE STORAGE 1.L11.03 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0LLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 100 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 100 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	REC MOBILE WORK TABLE FOOD SERVICE...	20 A	1	0.18			0.18			1	20 A	REC MOBILE WORK TABLE FOOD SERVICE...	2
3	REC MOBILE WORK TABLE FOOD SERVICE...	20 A	1		0.18			0.54		1	20 A	REC ROOM 1.L11.03	4
5	MOBILE HOLDING CABINET FOOD SERVICE...	20 A	1			0.18			0.36	1	20 A	REC FOOD SERVICE STORAGE 1.L11.03	6
7	BAGGED ICE CABINET	20 A	1	0.97			0.05			1	20 A	OVERHEAD COILING DOOR FOOD SERVICE...	8
9	MOBILE HOLDING CABINET FOOD SERVICE...	20 A	1		0.18			0.18		1	20 A	MOBILE HOLDING CABINET FOOD SERVICE...	10
11	REC FOOD SERVICE STORAGE 1.L11.03	20 A	1			0.54			0.18	1	20 A	MOBILE HOLDING CABINET FOOD SERVICE...	12
13	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	14
15	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	16
17	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	18
19	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	20
21	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	1.4 kVA		1.1 kVA		1.3 kVA					
			Total Amps:	11.7 A		9.0 A		10.7 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	50 VA	80.00%	40 VA		
REC	1440 VA	100.00%	1440 VA	Total Conn. Load:	3722 VA
KTCH	2232 VA	65.00%	1451 VA	Total Est. Demand:	2931 VA
				Total Conn.:	10 A
				Total Est. Demand:	8 A

Panel Designation: 0LHL

Location: ELEC 1.L11.05 **Volts:** 480/277 Wye **A.I.C. Rating:** 10 KAIC
Supply From: MDP **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	LIGHTING ROOM 1.L11.05, 1.L9.02, 1.L11.06,...	20 A	1	0.62			0.90			1	20 A	LIGHTING BATTING CAGES	2
3	LIGHTING FOOD SERVICE STORAGE 1.L11.03	20 A	1		0.75			1.11		1	20 A	LIGHTING CORRIDOR 1.L11.04	4
5	LIGHTING ROOM 1.L7.02, 1.L8.02, 1.L8.03	20 A	1			0.58			0.99	1	20 A	LIGHTING TEAM CORRIDOR 1.L3.01	6
7	LIGHTING ROOM 1.L6.01	20 A	1	1.26			0.54			1	20 A	LIGHTING VISITING TEAM DUGOUT 1.R4.01	8
9	LIGHTING SP2	40 A	2		7.31			8.53		2	45 A	LIGHTING SP1	10
11						7.31			8.53				12
13	LIGHTING SP4	30 A	2	5.28			1.73			1	20 A	EXTERIOR PARKING LOT LIGHTING	14
15					5.28			0.02		1	20 A	LIGHTING EXTERIOR STAIRS	16
17	EXTERIOR BOLLARDS	20 A	1			0.10			5.68	2	30 A	LIGHTING SP3	18
19	SPARE	20 A	1	0.00			5.68						20
21	SPARE	20 A	1		0.00			1.17		1	20 A	LIGHTING EXTERIOR FLAG POLES	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	16.0 kVA		24.2 kVA		23.2 kVA					
			Total Amps:	57.8 A		91.2 A		87.7 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	63358 VA	100.00%	63358 VA		
				Total Conn. Load:	63358 VA
				Total Est. Demand:	63358 VA
				Total Conn.:	76 A
				Total Est. Demand:	76 A

Panel Designation: 0LLM

Location: MECH / PLUMB 1.L9.02 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0LLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 225 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 225 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1				6.35			0.06			2	15 A	COB1 CORRIDOR 3.L2.05	2
3	AHU2	70 A	3		6.35			0.06					4
5						6.35			0.06	2	15 A	COB2 CORRIDOR 3.L9.04	6
7	EF2 CONCESSIONS 2.R1.02	20 A	2	1.37			0.06						8
9					1.37			0.66		1	20 A	WS1 MECH / PLUMB 1.L9.02	10
11	AHU1 LIGHTS MECH / PLUMB 1.L9.02	20 A	1			1.80			0.10	2	15 A	FC04 CORRIDOR 3.L9.04	12
13	EF6 MECH / PLUMB 1.L9.02	20 A	2	1.37			0.10						14
15					1.37			0.47		2	20 A	FC10 3.L2.05	16
17	FC3 ELEC 1.L11.05	15 A	2			0.45			0.47				18
19				0.45			0.25			2	20 A	FC14, FC15, FC16 ROOM 3.L1.01, 3.R1.01, 3.R1.02	20
21	FC05, FC06, FC07, FC08 3.L5.02, 3.L5.01, 3.L4.02, 3.L4.01	20 A	2		0.42			0.25					22
23						0.42			0.21	2	20 A	FC20, FC21 WRITING PRESS 3.R3.01	24
25	FC11, FC12, FC13 ROOM 3.L1.04, 3.L1.03, 3.L1.02	20 A	2	0.29			0.21						26
27					0.29			0.94					28
29	FC17, FC18, FC19 ROOM 3.R1.03, 3.R1.04, 3.R2.01	20 A	2			0.25			0.94	3	20 A	MAU2 MECH / PLUMB 1.L9.02	30
31				0.25			0.94						32
33	GWH1 MECH / PLUMB 1.L9.02	20 A	1		0.60			0.60		1	20 A	GWH2 MECH / PLUMB 1.L9.02	34
35	RCP1 MECH / PLUMB 1.L9.02	20 A	1			0.53			0.60	1	20 A	TMV1 MECH / PLUMB 1.L9.02	36
37				6.25			0.18			1	20 A	EIH1 CONTROL POWER	38
39	EIH1 RELAY PANEL HOME TEAM DUGOUT 1.L4.01	55 A	3		6.25			1.37		2	20 A	EF5 WOMENS RESTROOM 2.R2.02	40
41						6.25			1.37				42
43	FC02 STO. 1.L11.07	15 A	2	0.45			0.04			2	20 A	FC03 ELECT. / IDF 2.L11.03	44
45					0.45			0.04					46
47	COB3 STO. 1.L11.07	15 A	2			0.06			0.79	2	20 A	EF1 CONCESSIONS 2.L10.02	48
49				0.06			0.79						50
51	EF4 TLT 3.L2.02	20 A	2		0.33			1.44		1	20 A	AHU1 BURNER CONNECTION MECH / PLUMB...	52
53						0.33			0.18	1	20 A	REC MECH / PLUMB 1.L9.02	54
55	REC MECH / PLUMB 1.L9.02	20 A	1	0.18			0.00			1	20 A	SPARE	56
57	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	58
59	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	60
			Total Load:	19.7 kVA		23.3 kVA		21.2 kVA					
			Total Amps:	163.8 A		195.8 A		178.3 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	41558 VA	80.00%	33246 VA		
REC	22530 VA	72.19%	16265 VA	Total Conn. Load:	64088 VA
				Total Est. Demand:	49511 VA
				Total Conn.:	178 A
				Total Est. Demand:	137 A

Panel Designation: 0LLR

Location: ELEC 1.L11.05 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0LLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A	B	C	A	B	C	Poles	Trip	Circuit Description	CKT
1	REC SWITCHED OPS & FOOD SERVICE...	20 A	1	1.08			1.32			1	20 A	REC OPS & FOOD SERVICE OFFICE	2
3	REC UC REF OFFICIALS LOUNGE	20 A	1		1.00			0.78		1	20 A	REC OFFICIALS LOUNGE 1.L14.03	4
5	REC OFFICIALS TLT B 1.L12.01	20 A	1			1.32			1.32	1	20 A	REC OFFICIALS TLT A 1.L12.02	6
7	REC ROOM 1.L14.01	20 A	1	0.72			0.54			1	20 A	REC PITCHING MACHINES	8
9	EWC	20 A	1		0.48			0.18		1	20 A	REC ICE TRAINING ROOM 1.L8.02	10
11	REC TRAINING ROOM 1.L8.02	20 A	1			0.96			0.96	1	20 A	REC ROOM 1.L8.03, 1.L8.02	12
13	REC HOME TEAM FILM ROOM 1.L7.02	20 A	1	0.96			0.72			1	20 A	REC COACHES LOCKER ROOM 1.L6.01	14
15	REC COACHES LOCKER ROOM 1.L6.01	20 A	1		0.78			1.80		1	20 A	REF PLAYER LOUNGE	16
17	REC REF PLAYER LOUNGE	20 A	1			1.80			0.90	1	20 A	REC PLAYER LOUNGE	18
19	REC PLAYER LOUNGE	20 A	1	1.08			1.08			1	20 A	REC HOME TEAM LOCKERS	20
21	REC HOME TEAM LOCKERS	20 A	1		1.08			0.90		1	20 A	REC HOME TEAM LOCKERS	22
23	REC HOME TEAM LOCKERS	20 A	1			1.20			1.08	1	20 A	REC HOME TEAM LOCKERS	24
25	REC HOME TEAM LOCKERS	20 A	1	0.90			1.20			1	20 A	REC HOME TEAM LOCKERS	26
27	REC LAUNDRY 1.L1.01	20 A	1		1.32			0.72		1	20 A	REC AUX LOCKER 1.L2.01	28
29	REC MECH / PLUMB 1.L9.02	20 A	1			0.90			0.54	1	20 A	REC ELEC 1.L11.05	30
31	REC ROOM CORRIDOR 1.L11.04	20 A	1	0.72			0.54			1	20 A	REC EXTERIOR	32
33	REC HOME TEAM BULLPEN 1.L11.01	20 A	1		0.72			0.54		1	20 A	REC HOME TEAM DUGOUT TOILET 1.L4.02	34
35	OVERHEAD COILING DOORS EQUIPMENT...	20 A	1			1.20			0.36	1	20 A	REC BROADCAST POWER	36
37	REC STO. 1.L11.07	20 A	1	0.54			0.36			1	20 A	REC BROADCAST POWER	38
39	OVERHEAD COILING DOORS STORAGE...	20 A	1		1.20			0.18		1	20 A	REC ELEVATOR E.L11. 01	40
41	HOME DUGOUT FIELD CAMERA	20 A	1			0.80			1.80	1	20 A	REC PLAYER LOUNGE / NUTRITION 1.L5.02	42
43	OUTFIELD CAMERA TOWER	20 A	1	0.80			0.12			1	20 A	LIT CABINET TEAM CORRIDOR 1.L3.01	44
45	LIT SIGN HOME TEAM LOCKER ROOM	20 A	1		0.12			0.80		1	20 A	OH DOOR ROOM 1.L3.05	46
47	PLAYER LOUNGE / NUTRITION 1.L5.02	20 A	1			0.80			0.18	1	20 A	EIH2 CTRL CLUB / TEAM MEETING ROOM...	48
49	REC HOME TEAM FILM ROOM 1.L7.02	20 A	1	0.48			1.50			1	20 A	GEN JACKET HEATER	50
51	GEN BATT CHARGER	20 A	1		1.50			0.66		1	20 A	REC TVS PLAYER LOUNGE 1.L5.02	52
53	LIGHTING RELAY PANEL 1.L11.05	20 A	1			1.20			0.36	1	20 A	BROADCAST REC	54
55	SPARE	20 A	1	0.00			0.36			1	20 A	REC PITCHING MACHINES	56
57	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	58
59	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	60
61	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	62
63	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	64
65	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	66
67	SPACE	--	--	0.00			0.00			--	--	SPACE	68
69	SPACE	--	--		0.00			0.00		--	--	SPACE	70
71	SPACE	--	--			0.00			0.00	--	--	SPACE	72
			Total Load:	15.0 kVA		14.8 kVA		17.7 kVA					
			Total Amps:	125.5 A		123.0 A		147.7 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	3440 VA	80.00%	2752 VA		
REC	44020 VA	61.36%	27010 VA	Total Conn. Load:	47460 VA
				Total Est. Demand:	29762 VA
				Total Conn.:	132 A
				Total Est. Demand:	83 A

Panel Designation: 0LHM

Location: MECH / PLUMB 1.L9.02 **Volts:** 480/277 Wye **A.I.C. Rating:** 22 KAIC
Supply From: MDP **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 800 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 800 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1				53.21			16.30						2
3	ACCU1	225 A	3		53.21			16.30		3	70 A	AHU1 SUPPLY FAN	4
5						53.21			16.30				6
7				12.75			12.75						8
9	HP2	60 A	3		12.75			12.75		3	60 A	HP3	10
11						12.75			12.75				12
13	TB2 CONCESSIONS 2.L10.02	20 A	1	4.00			8.00			1	40 A	TB3 TEAM STORE 2.L11.01	14
15	TB3 TEAM STORE	40 A	1		8.00			8.00		1	40 A	TB3 NORTHEAST TICKETING 2.L11.05	16
17	GIH1 HOME TEAM BULLPEN 1.L11.01	20 A	1			0.02			12.75				18
19	TB1 CORRIDOR 1.L11.04	15 A	1	2.50			12.75			3	60 A	HP4	20
21	TB2 CORRIDOR 1.L11.04	20 A	1		4.00			12.75					22
23	TB3 CORRIDOR 1.L11.04	40 A	1			8.00			4.00	1	20 A	TB2 TRAINING ROOM 1.L8.02	24
25	TB3 TRAINING ROOM 1.L8.02	40 A	1	8.00			4.00			1	20 A	TB2 COACHES LOCKER ROOM 1.L6.01	26
27	TB2 HEAD COACH'S OFFICE 3.L10.02	20 A	1		4.00			13.00		1	60 A	TB4 HEAD COACH'S OFFICE 3.L10.02	28
29	TB5 ASSISTANT COACH'S OFFICE 3.L10.01	100 A	1			22.00			4.00	1	20 A	TB2 WORK / BREAK AREA 3.L8.04	30
31	TB3 OFFICIALS LOCKER	40 A	1	8.00			8.00			1	40 A	TB3 CORRIDOR 1.L11.04	32
33	TB3 AUX LOCKER 1.L2.01	40 A	1		8.00			8.00		1	40 A	TB3 PLAYER LOUNGE / NUTRITION 1.L5.02	34
35	TB3 PLAYER LOUNGE / NUTRITION 1.L5.02	40 A	1			8.00			13.00	1	60 A	TB4 MENS TLT. 3.L8.01	36
37	TB4 PLAYER LOUNGE / NUTRITION 1.L5.02	60 A	1	13.00			26.00			1	120 A	TB6 PANTRY 3.L7.01	38
39	TB6 TEAM CORRIDOR 1.L3.01	120 A	1		26.00			15.00					40
41	TB4 LAUNDRY 1.L1.01	60 A	1			13.00			15.00	3	70 A	EIH2 RELAY OUTDOOR CLUB 3.L3.01	42
43				10.00			15.00						44
45	EIH2 RELAY SUITE 1 3.L4.01	45 A	3		10.00			7.51					46
47						10.00			7.51	3	35 A	EIH2 RELAY CLUB / TEA MEETING ROOM 3.L6.01	48
49				1.33			7.51						50
51	SE1 MECH / PLUMB 1.L9.02	20 A	3		1.33			1.67					52
53						1.33			1.67	3	20 A	UH1 1.L9.02	54
55				1.33			1.67						56
57	SE2 MECH / PLUMB 1.L9.02	20 A	3		1.33			1.67					58
59						1.33			1.67	3	20 A	UH1 1.L9.02	60
61				5.85			1.67						62
63	AHU1 EXHAUST FAN	25 A	3		5.85			0.50					64
65						5.85			0.50	3	20 A	AHU1 HEAT WHEEL MOTOR	66
67				6.57			0.50						68
69	AHU1 RETURN FAN	30 A	3		6.57			0.00		1	20 A	SPARE	70
71						6.57			0.00	1	20 A	SPARE	72
73	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	74
75	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	76
77	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	78
79	SPACE	--	--	0.00			0.00			--	--	SPACE	80
81	SPACE	--	--		0.00			0.00		--	--	SPACE	82
83	SPACE	--	--			0.00			0.00	--	--	SPACE	84
			Total Load:	240.7 kVA		238.2 kVA		231.2 kVA					
			Total Amps:	872.7 A		863.7 A		834.6 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	612527 VA	80.00%	490021 VA		
REC	97500 VA	55.13%	53750 VA	Total Conn. Load:	710027 VA
				Total Est. Demand:	543771 VA
				Total Conn.:	854 A
				Total Est. Demand:	654 A

Panel Designation: 0LHR

Location: ELEC 1.L11.05 **Volts:** 480/277 Wye **A.I.C. Rating:** 10 KAIC
Supply From: MDP **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 100 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 60 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1				1.08			1.08						2
3	REC DRYER LAUNDRY 1.L1.01	15 A	3		1.08			1.08		3	15 A	REC DRYER LAUNDRY 1.L1.01	4
5						1.08			1.08				6
7				1.08			1.66						8
9	REC DRYER LAUNDRY 1.L1.01	15 A	3		1.08			1.66		3	15 A	REC WASHER LAUNDRY 1.L1.01	10
11						1.08			1.66				12
13				1.66			1.66						14
15	REC WASHER LAUNDRY 1.L1.01	15 A	3		1.66			1.66		3	15 A	REC WASHER LAUNDRY 1.L1.01	16
17						1.66			1.66				18
19	SPARE	20 A	1	0.00			3.88						20
21	SPARE	20 A	1		0.00			3.88		3	25 A	TRASH COMPACTOR	22
23	SPARE	20 A	1			0.00			3.88				24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	12.1 kVA		12.1 kVA		12.1 kVA					
			Total Amps:	43.7 A		43.7 A		43.7 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	11640 VA	80.00%	9312 VA		
REC	24692 VA	70.25%	17346 VA	Total Conn. Load:	36332 VA
				Total Est. Demand:	26658 VA
				Total Conn.:	44 A
				Total Est. Demand:	32 A

Panel Designation: 0HLD

Location: JANITOR 1.R3.02 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: TH **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 400 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 400 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1				10.27			12.60						2
3	0HLR	100 A	3		10.66			12.61		3	100 A	1HLR	4
5						10.91			21.24				6
7				25.36			6.49						8
9	1HLF	225 A	3		24.31			2.60		3	150 A	2HLI	10
11						22.43			3.63				12
13	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	14
15	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	16
17	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	18
19	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	20
21	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	54.7 kVA		50.2 kVA		58.2 kVA					
			Total Amps:	461.9 A		418.2 A		490.9 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	16953 VA	80.00%	13562 VA		
REC	87164 VA	55.74%	48582 VA	Total Conn. Load:	163118 VA
KTCH	59001 VA	65.00%	38351 VA	Total Est. Demand:	100495 VA
				Total Conn.:	453 A
				Total Est. Demand:	279 A

Panel Designation: 0LLD

Location: ELEC 1.L11.05 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: TL **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 800 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 800 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1				15.02			11.46						2
3	0LLR	125 A	3		14.76			12.48		3	150 A	1LLR	4
5						17.68			12.42				6
7				1.38			17.57						8
9	0LLF	100 A	3		1.08			13.09		3	100 A	1LLF	10
11						1.26			11.15				12
13				19.66			7.66						14
15	0LLM	225 A	3		23.27			5.48		3	60 A	2HLF	16
17						21.16			6.28				18
19				38.43			19.21						20
21	BROADCAST POWER CONNECTION A STO. 1.L11.07	400 A	3		38.43			19.21		3	200 A	BROADCAST POWER CONNECTION B STO. 1.L11.07	22
23						38.43			19.21				24
25				9.61			0.00			1	20 A	SPARE	26
27	BROADCAST POWER CONNECTION SATELLITE UPLINK STO. 1.L11.07	100 A	3		9.61			0.00		1	20 A	SPARE	28
29						9.61			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	140.0 kVA		137.4 kVA		137.2 kVA					
			Total Amps:	1167.0 A		1145.3 A		1143.3 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	45968 VA	80.00%	36774 VA		
REC	313889 VA	51.59%	161944 VA	Total Conn. Load:	414600 VA
KTCH	54743 VA	65.00%	35583 VA	Total Est. Demand:	234302 VA
				Total Conn.:	1151 A
				Total Est. Demand:	650 A

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL

AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL

AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION

AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL

Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT

D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE

S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

DAVID SHOOK REGISTERED 23702 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER 11/15/19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

ELECTRICAL PANEL SCHEDULES - SHEET 1

SHEET NUMBER 1

E901

DOCUMENT SET-E901-ELECTRICAL PANEL SCHEDULES - SHEET 1
Last Plotted: 12/11/2019 12:11:32 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt

Printed on ___% Post-Consumer Recycled Content Paper

Designer: Designer Checked: Checker Approved: Approver ANSI D 22"x34"

Project Management Initials:

Panel Designation: 1HLR

Location: VENDOR COMMISSARY 2.R1.04 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0HLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	REC EXTERIOR	20 A	1	0.54			0.72			1	20 A	REC WOMENS RESTROOM	2
3	REC MENS RESTROOM	20 A	1		1.26			1.08		1	20 A	REC WRITING PRESS 3.R3.01	4
5	REC WRITING PRESS 3.R3.01	20 A	1			1.44			0.90	1	20 A	REC WRITING PRESS 3.R3.01	6
7	REC ROOM 3.R2.01, 3.R3.01	20 A	1	1.08			0.36			1	20 A	REC SWITCHED WORKROOM 3.R2.01	8
9	REC COPIER CORRIDOR 3.L2.05	20 A	1		1.80			0.90		1	20 A	REC STUDENT RADIO 3.R1.03	10
11	REC REF CORRIDOR 3.L2.05	20 A	1			1.80			0.90	1	20 A	REC VISITING RADIO 3.R1.02	12
13	REC EMERITUS / VIS. AD SUITE 3.R1.04	20 A	1	1.32			0.90			1	20 A	REC HOME RADIO 3.R1.01	14
15	REC STUDENT RADIO 3.R1.03	20 A	1		0.78			0.72		1	20 A	REC ROOM 3.L1.01, 3.L2.05	16
17	REC VISITING RADIO 3.R1.02	20 A	1			0.78			0.78	1	20 A	REC TV BOOTH 3.L1.02	18
19	REC HOME RADIO 3.R1.01	20 A	1	0.78			0.90			1	20 A	REC PA ANNOUNCER/ OFFICIAL SCORER...	20
21	REC TV BOOTH 3.L1.02	20 A	1		0.90			1.08		1	20 A	REC ROOM 3.L1.04, 3.L2.05	22
23	REC PA ANNOUNCER/ OFFICIAL SCORER...	20 A	1			0.72			1.00	1	20 A	REC UC REF SUITE 1 3.L4.01	24
25	REC SCOREBOARD / SOUND / REPLAY 3.L1.04	20 A	1	0.96			1.00			1	20 A	REC UC REF SUITE 2 3.L4.02	26
27	REC ROOM 3.L2.01, 3.L2.02, 3.L3.01	20 A	1		0.36			0.42		1	20 A	REC OUTDOOR CLUB 3.L3.01	28
29	REC SUITE 1 3.L4.01	20 A	1			0.96			0.18	1	20 A	EIH2 CONTROLS OUTDOOR CLUB 3.L3.01	30
31	REC SUITE 2 3.L4.02	20 A	1	0.96			2.10						32
33	ACCESS CONTROL 3.L2.05	20 A	1		0.05			2.10		3	35 A	MAU1	34
35	HOME PLATE PITCH CLOCK	20 A	1			0.18			2.10				36
37	FIELD CAMERA 3.L1.01	20 A	1	0.80			0.18			1	20 A	REC HOME PLATE BOX	38
39	FIELD CAMERA 3.L1.01	20 A	1		0.80			0.36		1	20 A	REC OUTDOOR CLUB 3.L3.01	40
41	REC VENDOR COMMISSARY 2.R1.04	20 A	1			9.38			0.12	1	20 A	LIT SIGN OUTDOOR CLUB 3.L3.01	42
43	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	44
45	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	46
47	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	48
49	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	50
51	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	52
53	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	54
55	SPACE	--	--	0.00			0.00			--	--	SPACE	56
57	SPACE	--	--		0.00			0.00		--	--	SPACE	58
59	SPACE	--	--			0.00			0.00	--	--	SPACE	60
			Total Load:	12.6 kVA		12.6 kVA		21.2 kVA					
			Total Amps:	105.0 A		105.1 A		177.0 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	6425 VA	80.00%	5140 VA		
REC	40025 VA	62.49%	25013 VA	Total Conn. Load:	46450 VA
				Total Est. Demand:	30153 VA
				Total Conn.:	129 A
				Total Est. Demand:	84 A

Panel Designation: 1LLF

Location: CONCESSIONS 2.L10.02 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0LLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	MOBILE HOLDING CABINET	20 A	1	1.92			1.44			1	20 A	ICE/SODA STATION	2
3	ICE/SODA STATION	20 A	1		1.44			1.44		1	20 A	SODA SYSTEM	4
5	WARMER, DRAWER TYPE	20 A	1			0.90			0.90	1	20 A	WARMER, DRAWER TYPE	6
7	WARMER, DRAWER TYPE	20 A	1	0.90			0.60			1	20 A	CASH REGISTER/POS SYSTEM	8
9	CASH REGISTER/POS SYSTEM	20 A	1		0.60			0.60		1	20 A	CASH REGISTER/POS SYSTEM	10
11	REACH-IN REFRIGERATOR - TWO DOOR	20 A	1			0.78			1.44	1	20 A	PRETZEL CABINET	12
13	PRETZEL WARMER	20 A	1	1.92			1.92			1	20 A	POPCORN POPPER	14
15	BOTTLED BEVERAGE REFRIGERATOR - ONE...	20 A	1		1.92			0.86		1	20 A	BOTTLED BEVERAGE REFRIGERATOR - ONE...	16
17	NACHO CHEESE DISPENSER	20 A	1			0.60			3.96				18
19	KTCH CONCESSIONS 2.L10.02	20 A	1	1.92			3.96			3	50 A	COUNTERTOP STEAMER	20
21	REC CONCESSIONS 2.L10.02	20 A	1		0.18			3.96					22
23	EXTERIOR TV CONCESSIONS 2.L10.02	20 A	1			0.24			0.24	1	20 A	INTERIOR TV CONCESSIONS 2.L10.02	24
25	REC CONCESSIONS 2.L10.02	20 A	1	0.54			0.36			1	20 A	EIH1 CTRL CONCESSIONS 2.L10.02	26
27					2.08			0.00		1	20 A	SPARE	28
29	EIH1 RELAY CONCESSIONS 2.L10.02	25 A	3			2.08			0.00	1	20 A	SPARE	30
31				2.08			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	17.6 kVA		13.1 kVA		11.1 kVA					
			Total Amps:	148.9 A		111.6 A		92.9 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	0 VA	0.00%	0 VA		
REC	7810 VA	100.00%	7810 VA	Total Conn. Load:	41803 VA
KTCH	33993 VA	65.00%	22095 VA	Total Est. Demand:	29905 VA
				Total Conn.:	116 A
				Total Est. Demand:	83 A

Panel Designation: 1LLR

Location: ELECT. / IDF 2.L11.03 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0LLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	REC LOBBY	20 A	1	0.96			0.72			1	20 A	REC NORTHEAST TICKETING 2.L11.05	2
3	REC NORTHEAST TICKETING 2.L11.05	20 A	1		1.08			0.60		1	20 A	REC TEAM STORE	4
5	REC ROOM 2.L9.03, 2.L9.02, 2.L8.01	20 A	1			0.90			0.36	1	20 A	REC TEAM STORE 2.L11.01	6
7	REC SWITCHED HEAD COACH'S OFFICE...	20 A	1	0.72			0.36			1	20 A	REC FLOOR BOXES HEAD COACH'S OFFICE...	8
9	REC HEAD COACH'S OFFICE 3.L10.02	20 A	1		1.14			1.08		1	20 A	REC SWITCHED ROOM 3.L10.01, 3.L9.02	10
11	REC SWITCHED ASSISTANT COACH'S OFFIC...	20 A	1			0.72			0.90	1	20 A	REC SWITCHED ROOM 3.L8.04, 3.L8.03	12
13	EWC CLUB / TEAM MEETING ROOM 3.L6.01	20 A	1	0.48			1.38			1	20 A	REC ROOM 3.L10.01, 3.L9.02	14
15	REC ROOM 3.L8.03, 3.L9.01	20 A	1		0.96			0.36		1	20 A	REC COUNTERTOP WORK / BREAK AREA...	16
17	REC ROOM 3.L9.01, 3.L9.02	20 A	1			1.14			0.72	1	20 A	REC ROOM 3.L8.04, 3.L8.05	18
19	REC REF WORK / BREAK AREA 3.L8.04	20 A	1	1.80			0.36			1	20 A	REC ROOM 3.L8.01, 3.L8.02	20
21	REC ROOM 3.L9.03, 3.L9.04, 3.L6.01	20 A	1		0.72			1.80		1	20 A	DISHWASHER WORK/BREAK AREA 3.L8.04	22
23	DISPOSER WORK/BREAK AREA 3.L8.04	20 A	1			0.80			1.02	1	20 A	REC CLUB / TEAM MEETING ROOM 3.L6.01	24
25	REC FLOOR BOX CLUB / TEAM MEETING...	20 A	1	0.54			1.80			1	20 A	MICROWAVE WORK/BREAK AREA 3.L8.04	26
27	REC UC REF SUITE 4 3.L5.02	20 A	1		1.00			0.36		1	20 A	REC FLOOR BOX CLUB / TEAM MEETING...	28
29	REC UC REF SUITE 3 3.L5.01	20 A	1			1.00			0.96	1	20 A	REC SUITE 4 3.L5.02	30
31	EIH2 CTRL POWER SUITE 2 3.L4.02	20 A	1	0.18			0.96			1	20 A	REC SUITE 3 3.L5.01	32
33	REC THIRD BASE CONCOURSE FOOD CART	20 A	1		1.80			0.80		1	20 A	OVERHEAD COILING DOOR CONCESSIONS...	34
35	EIH2 CTRL POWER SUITE 1 3.L4.01	20 A	1			0.18			1.80	1	20 A	REC WORK / BREAK AREA 3.L8.04	36
37	ILLUMINATED SIGNAGE CONCOURSE 2.L1.01	20 A	1	0.60			0.18			1	20 A	EIH2 CTRL POWER SUITE 3 3.L5.01	38
39	ILLUMINATED SIGNAGE	20 A	1		0.60			0.18		1	20 A	EIH2 CRTL POWER SUITE 4 3.L5.02	40
41	REC IT 1 ELECT. / IDF 2.L11.03	20 A	1			1.80			0.12	1	20 A	LIT SIGN RECEPTION AREA	42
43	REC WALL ELECT. / IDF 2.L11.03	20 A	1	0.24			0.18			1	20 A	RPL CONTROL POWER NORTHEAST...	44
45	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	46
47	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	48
49	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	50
51	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	52
53	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	54
55	SPACE	--	--	0.00			0.00			--	--	SPACE	56
57	SPACE	--	--		0.00			0.00		--	--	SPACE	58
59	SPACE	--	--			0.00			0.00	--	--	SPACE	60
			Total Load:	11.5 kVA		12.5 kVA		12.4 kVA					
			Total Amps:	95.5 A		105.2 A		104.7 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	920 VA	80.00%	736 VA		
REC	35440 VA	64.11%	22720 VA	Total Conn. Load:	36360 VA
				Total Est. Demand:	23456 VA
				Total Conn.:	101 A
				Total Est. Demand:	65 A

Panel Designation: 1RLF

Location: CONCESSIONS 2.R8.01 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 1RLR **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 225 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 225 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	MOBILE HOLDING CABINET	20 A	1	1.92			1.92			1	20 A	MOBILE HOLDING CABINET	2
3	WORK TABLE W/ SINK	20 A	1		1.92			1.44		1	20 A	ICE/SODA STATION	4
5	ICE/SODA STATION	20 A	1			1.44			1.44	1	20 A	ICE/SODA STATION	6
7	SODA SYSTEM	20 A	1	1.44			0.90			1	20 A	WARMER, DRAWER TYPE	8
9	WARMER, DRAWER TYPE	20 A	1		0.90			0.90		1	20 A	WARMER, DRAWER TYPE	10
11	WARMER, DRAWER TYPE	20 A	1			0.90			0.60	1	20 A	CASH REGISTER/POS SYSTEM	12
13	CASH REGISTER/POS SYSTEM	20 A	1	0.60			0.60			1	20 A	CASH REGISTER/POS SYSTEM	14
15	CASH REGISTER/POS SYSTEM	20 A	1		0.60			0.60		1	20 A	CASH REGISTER/POS SYSTEM	16
17	CASH REGISTER/POS SYSTEM	20 A	1			0.60			1.92	1	20 A	MENU BOARD	18
19	MENU BOARD	20 A	1	1.92			0.78			1	20 A	REACH-IN REFRIGERATOR - TWO DOOR	20
21	PRETZEL CABINET	20 A	1		1.44			1.44		1	20 A	PRETZEL CABINET	22
23	PRETZEL WARMER	20 A	1			1.92			1.92	1	20 A	POPCORN POPPER	24
25	POPCORN POPPER	20 A	1	1.92			1.92			1	20 A	BOTTLED BEVERAGE REFRIGERATOR - ONE...	26
27	BOTTLED BEVERAGE REFRIGERATOR - ONE...	20 A	1		0.86			0.86		1	20 A	BOTTLED BEVERAGE REFRIGERATOR - ONE...	28
29	NACHO CHEESE DISPENSER	20 A	1			0.60			0.60	1	20 A	NACHO CHEESE DISPENSER	30
31	PIZZA PREP REFRIGERATOR	20 A	1	0.80			0.80			1	20 A	PIZZA PREP REFRIGERATOR	32
33	POPCORN POPPER	20 A	1		1.92			1.48		1	20 A	WORKTOP REFRIGERATOR	34
35	BAGGED ICE CABINET	20 A	1			0.97			1.80	1	20 A	REC THIRD PLATE FOOD CART	36
37				3.96			0.60						38
39	COUNTERTOP STEAMER	50 A	3		3.96			0.60		3	20 A	REC PORTABLE GRILL	40
41						3.96			0.60				42
43	EF3 CONCESSIONS 2.R8.01	20 A	2	1.37			0.60						44
45					1.37			0.60		3	20 A	REC PORTABLE GRILL	46
47	EIH1 CTRL CONCESSIONS 2.R8.01	20 A	1			9.38			0.60				48
49	REC EXTERIOR	20 A	1	0.18			2.08						50
51	SPARE	20 A	1		0.00			2.08		3	35 A	EIH1 RELAY CONCESSIONS 2.R8.01	52
53	SPARE	20 A	1			0.00			2.08				54
55	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	56
57	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	58
59	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	60
			Total Load:	24.3 kVA		23.0 kVA		31.3 kVA					
			Total Amps:	204.4 A		191.5 A		262.8 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	2746 VA	80.00%	2196 VA		
REC	17605 VA	78.40%	13803 VA	Total Conn. Load:	78643 VA
KTCH	58293 VA	65.00%	37890 VA	Total Est. Demand:	53889 VA
				Total Conn.:	218 A
				Total Est. Demand:	150 A

Panel Designation: 1HLF

Location: CONCESSIONS 2.R1.02 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: 0HLD **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 225 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 225 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	WORK TABLE W/ SINK	20 A	1	1.92			1.92			1	20 A	MOBILE HOLDING CABINET	2
3	WARMER, DRAWER TYPE	20 A	1		0.90			1.44		1	20 A	ICE/SODA STATION	4
5	WARMER, DRAWER TYPE	20 A	1			0.90			1.44	1	20 A	ICE/SODA STATION	6
7	CASH REGISTER/POS SYSTEM	20 A	1	0.60			1.44			1	20 A	PIZZA PREP REFRIGERATOR	8
9	CASH REGISTER/POS SYSTEM	20 A	1		0.60			0.90		1	20 A	WARMER, DRAWER TYPE	10
11	KTCH VENDOR COMMISSARY 2.R1.04	20 A	1			0.60			0.90	1	20 A	WARMER, DRAWER TYPE	12
13	PRETZEL CABINET	20 A	1	1.44			0.60			1	20 A	CASH REGISTER/POS SYSTEM	14
15	BOTTLED BEVERAGE REFRIGERATOR - ONE...	20 A	1		1.92			0.60		1	20 A	CASH REGISTER/POS SYSTEM	16
17	BOTTLED BEVERAGE REFRIGERATOR - ONE...	20 A	1			0.86			0.60	1	20 A	CASH REGISTER/POS SYSTEM VENDOR	18
19	NACHO CHEESE DISPENSER	20 A	1	0.60			1.92			1	20 A	POPCORN POPPER	20
21	MOBILE WORK TABLE	20 A	1		1.92			0.86		1	20 A	BOTTLED BEVERAGE REFRIGERATOR - ONE...	22
23	PIZZA PREP REFRIGERATOR	20 A	1			0.80			0.60	1	20 A	NACHO CHEESE DISPENSER	24
25				3.96			6.23						26
27	COUNTERTOP STEAMER	50 A	3		3.96			6.23		3	50 A	CONVEYOR OVEN	28
29						3.96			6.23				30
31							0.54			1	20 A	REC CONCESSIONS 2.R1.02	32
33	REC CONCESSIONS 2.R1.02	20 A	1		0.54			0.24		1	20 A	EXTERIOR TV CONCESSIONS 2.R1.02	34
35	INTERIOR TV CONCESSIONS 2.R1.02	20 A	1			0.48			1.80	1	20 A	REC THIRD BASE CONCOURSE FOOD CART	36
37	HEATED DISPLAY CASE	20 A	2	1.06			3.13						38
39					1.06			3.13		3	40 A	EIH1 RELAY CONCESSIONS 2.R1.02	40
41	EIH1 CTRL CONCESSIONS 2.R1.02	20 A	1			0.12			3.13				42
43	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	44
45	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	46
47	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	48
49	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	50
51	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	52
53	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	54
55	SPACE	--	--	0.00			0.00			--	--	SPACE	56
57	SPACE	--	--		0.00			0.00		--	--	SPACE	58
59	SPACE	--	--			0.00			0.00	--	--	SPACE	60
			Total Load:	25.4 kVA		24.3 kVA		22.4 kVA					
			Total Amps:	213.7 A		204.9 A		186.9 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	0 VA	0.00%	0 VA		
REC	13095 VA	88.18%	11548 VA	Total Conn. Load:	72096 VA
KTCH	59001 VA	65.00%	38351 VA	Total Est. Demand:	49898 VA
				Total Conn.:	200 A
				Total Est. Demand:	139 A

Panel Designation: 1RLR

Location: SOUTHWEST TICKETING 2.R12.02 **Volts:** 208/120 Wye **A.I.C. Rating:** 10 KAIC
Supply From: TR **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 400 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 400 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	REC 5TH AVE ENTRY TICKETING	20 A	1	0.72			24.33						2
3	REC IT RACK 5TH AVE ENTRY TICKETING	20 A	1		0.15			22.98		3	225 A	1RLF	4
5	HP1	25 A	2			1.77			31.33				6
7				1.77			0.90			1	20 A	REC 5TH AVE ENTRY TICKETING	8
9	ACCESS CONTROL 5TH AVE ENTRY...	20 A	1		0.15			0.11		2	15 A	FC22 5TH AVE ENTRY TICKETING	10
11	REC EXTERIOR TV CONCESSIONS 2.R8.01	20 A	1			0.48			0.11				12
13	REC CONCESSIONS 2.R8.01	20 A	1	0.54			0.54			1	20 A	REC CONCESSIONS 2.R8.01	14
15	ILLUMINATED SIGNAGE	20 A	1		0.60			1.80		1	20 A	REC RIGHT FIELD PARTY DECK FOOD CART	16
17	OUTFIELD PITCH CLOCK	20 A	1			0.18			0.80	1	20 A	SCOREBOARD	18
19	RPR CONTROL POWER	20 A	1	0.18			0.00			1	20 A	SPARE	20
21	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	29.0 kVA		25.8 kVA		34.7 kVA					
			Total Amps:	245.5 A		215.0 A		293.0 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	6510 VA	80.00%	5208 VA		
REC	24645 VA	70.29%	17323 VA	Total Conn. Load:	89448 VA
KTCH	58293 VA	65.00%	37890 VA	Total Est. Demand:	60421 VA
				Total Conn.:	248 A
				Total Est. Demand:	168 A

Panel Designation: 1LHL

Location: NORTHEAST TICKETING 2.L11.05 **Volts:** 480/277 Wye **A.I.C. Rating:** 10 KAIC
Supply From: MDP **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 100 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 60 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	LIGHTING ROOM 2.L11.05	20 A	1	1.10			1.48			1	20 A	LIGHTING CONCOURSE	2
3	LIGHTING ROOM 2.R1.04	20 A	1		0.96			0.00		1	20 A	SPARE	4
5	LIGHTING ROOM 3.L9.03	20 A	1			0.73			1.17	1	20 A	LIGHTING ROOM 3.L7.01, 3.L8.05	6
7	LIGHTING ROOM 3.L4.03, 3.L4.02, 3.L4.01,...	20 A	1	1.06			0.23			1	20 A	LIGHTING OUTDOOR CLUB 3.L3.01	8
9	LIGHTING ROOM 3.L2.01, 3.L1.04	20 A	1		0.98			0.69		1	20 A	LIGHTING ROOM 3.R2.01, 3.L2.05, 3.R1.02	10
11	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	12
13	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	14
15	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	16
17	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	18
19	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	20
21	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	3.9 kVA		2.6 kVA		1.9 kVA					
			Total Amps:	14.4 A		9.9 A		6.9 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	8398 VA	100.00%	8398 VA		
				Total Conn. Load:	8398 VA
				Total Est. Demand:	8398 VA
				Total Conn.:	10 A
				Total Est. Demand:	10 A

Panel Designation: 1RHL

Location: SOUTHWEST TICKETING 2.R12.02 **Volts:** 480/277 Wye **A.I.C. Rating:** 10 KAIC
Supply From: MDP **Phases:** 3 **Mains Type:** MCB
Mounting: SURFACE **Wires:** 4 **Mains Rating:** 150 A
Enclosure: PER SPECIFICATIONS **MCB Rating:** 150 A

Notes:

CKT	Circuit Description	Trip	Poles	A (kVA)	B (kVA)	C (kVA)	A (kVA)	B (kVA)	C (kVA)	Poles	Trip	Circuit Description	CKT
1	LIGHTING SP1	45 A	2	8.53			0.07			1	20 A	LIGHTING ENTRY TICKETING	2
3					8.53			0.02		1	20 A	LIGHTING EXTERIOR STAIRS	4
5	LIGHTING SP2	40 A	2			7.31			5.68	2	30 A	LIGHTING SP3	6
7				7.31			5.68						8
9	LIGHTING 2.R8.01	20 A	1		0.38			5.28		2	30 A	LIGHTING SP4	10
11	SPARE	20 A	1			0.00			5.28				12
13	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	14
15	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	16
17	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	18
19	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	20
21	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	22
23	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	24
25	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	26
27	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	28
29	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	30
31	SPARE	20 A	1	0.00			0.00			1	20 A	SPARE	32
33	SPARE	20 A	1		0.00			0.00		1	20 A	SPARE	34
35	SPARE	20 A	1			0.00			0.00	1	20 A	SPARE	36
37	SPACE	--	--	0.00			0.00			--	--	SPACE	38
39	SPACE	--	--		0.00			0.00		--	--	SPACE	40
41	SPACE	--	--			0.00			0.00	--	--	SPACE	42
			Total Load:	21.6 kVA		14.2 kVA		18.3 kVA					
			Total Amps:	80.2 A		51.3 A		68.2 A					

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	54059 VA	100.00%	54059 VA		
				Total Conn. Load:	54059 VA
				Total Est. Demand:	54059 VA
				Total Conn.:	65 A
				Total Est. Demand:	65 A

AECOM

PROJECT

Marshall Baseball Electrical

THE HERD

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL

AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL

AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION

AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL

Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT

D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE

S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

DAVID SHOOK REGISTERED 23702 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11/15/19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

I/R	DATE	DESCRIPTION
2	12/12/2019	ADDENDUM 2

PROJECT NUMBER

60590790

SHEET TITLE

ELECTRICAL PANEL SCHECULES - SHEET 2

SHEET NUMBER 1

E901B

DOCUMENT SET-E901B-ELECTRICAL PANEL SCHECULES - SHEET 2
Last Plotted: 12/11/2019 12:11:35 PM
Filename: BIM 360://60590790 - Marshall University Baseball/60590790_Marshall_Baseball_R18_ELEC.rvt

FEEDER SCHEDULE - COPPER

MAXIMUM OCPD	FEEDER NUMBER	NUMBER OF SETS	CONDUCTOR SIZE			CONDUIT SIZE
			PHASE(3/C)	NEUTRAL	EQUIPMENT GROUND	
15 / 20	1	1	12	--	12	3/4"
	1N			12		
25 / 30	2	1	10	--	10	3/4"
	2N			10		
35 / 40	3	1	8	--	10	3/4"
	3N			8		1"
45 / 50	4	1	6	--	10	1"
	4N			6		
60 / 70	5	1	4	--	8	1-1/4"
	5N			4		
80	6	1	3	--	8	1-1/4"
	6N			3		
90	7	1	2	--	8	1-1/4"
	7N			2		1-1/2"
100 / 110 / 125	8	1	1	--	6	1-1/2"
	8N			1		
150	9	1	1/0	--	6	1-1/2"
	9N			1/0		2"
175	10	1	2/0	--	6	2"
	10N			2/0		
200	11	1	3/0	--	6	2"
	11N			3/0		
225	12	1	4/0	--	4	2"
	12N			4/0		2-1/2"
250	13	1	250	--	4	2-1/2"
	13N			250		
300	14	1	350	--	3	2-1/2"
	14N			350		3"
350	15	1	500	--	3	3"
	15N			500		3-1/2"
400	16	2	3/0	--	3	2"
	16N			3/0		2-1/2"
450	17	2	4/0	--	2	2"
	17N			4/0		2-1/2"

MAXIMUM OCPD	FEEDER NUMBER	NUMBER OF SETS	CONDUCTOR SIZE			CONDUIT SIZE
			PHASE(3/C)	NEUTRAL	EQUIPMENT GROUND	
500	18	2	250	--	1	2-1/2"
	18N			250		3"
600	19	2	350	--	1/0	3"
	19N			350		
700	20	2	500	--	1/0	3"
	20N			500		3-1/2"
800	21	3	300	--	1/0	2-1/2"
	21N			300		3"
1000	22	3	400	--	2/0	3"
	22N			400		
1200	23	3	600	--	3/0	3-1/2"
	23N			600		4"
1600	24	4	600	--	4/0	3-1/2"
	24N			600		4"
2000	25	5	600	--	250	3-1/2"
	25N			600		4"
2500	26	6	600	--	350	3-1/2"
	26N			600		4"
3000	27	8	500	--	400	3-1/2"
	27N			500		
4000	28	10	600	--	500	3-1/2"
	28N			600		4"
5000	29	12	600	--	700	4"
	29N			600		5"

LIGHTING FIXTURE SCHEDULE GENERAL NOTES

A. ALL RECESSED LIGHT FIXTURES SHALL BE SUPPORTED INDEPENDENTLY OF THE SUSPENDED CEILING USING A MINIMUM OF (2) SUPPORT WIRES PER FIXTURE AT OPPOSITE CORNERS. UTILIZING THE SAME SIZE WIRE BEING USED TO SUPPORT THE CEILING GRID.

B. THE ELECTRICAL CONTRACTOR SHALL FURNISH ALL REQUIRED OPTIONS AND ACCESSORIES TO INSTALL FIXTURES IN DRYWALL CEILINGS OR ON WALLS/CEILINGS.

C. PROVIDE FIXTURE WITH FACTORY FURNISHED PENDANTS AS REQUIRED. CONTRACTOR SHALL DETERMINE PENDANT LENGTHS REQUIRED BY REFERENCING THE MOUNTING HEIGHTS NOTED ON THE LIGHTING PLANS AND COORDINATED WITH ARCHITECTURAL PLANS.

D. ALL LED'S SHALL BE A MINIMUM 80 CRI UNLESS NOTED OTHERWISE.

E. CONTRACTOR SHAL COORDINATE EXACT CEILING TYPES PRIOR TO ORDERING. PROVIDE REQUIRED FLANGE KITS FOR FIXTURES INSTALLED IN HARD CEILINGS.

F. ALL DRIVERS SHALL BE 10% DIMMING CAPABLE UNLESS NOTED OTHERWISE.

G. ALL FINISHES SHALL BE COORDINATED WITH THE ARCHITECTURAL DESIGN LEAD PRIOR TO ORDERING.

LIGHTING FIXTURE SCHEDULE

FIXTURE TYPE	BASIS OF DESIGN OR EQUAL*		LAMP	WATTS	FIXTURE VOLTAGE	LUMINAIRE LUMENS	DESCRIPTION
	MANUFACTURER	MODEL					
B1	EATON	ASPEN	LED	15.7 W	UNV	235 lm	OPEN APERTURE BOLLARD
F1	LIGMAN LIGHTING USA	UKI-60785	LED	33 W	UNV	3320 lm	IN-GROUND LED FLAG POLE FLOOD LIGHT. IP67 WET LOCATION AND IK10 IMPACT RESISTANT LISTED. 3500K. 80 CRI.
P1	EATON	HVSL2 LD4 LED	LED	33.5 W	UNV	4587 lm	2'(W) X 4'(L). PENDANT MOUNTED LED STRIP LIGHT. OPAL POLYCARBONATE LENS. 3500K.
P2	EATON	METALUX SNLED REFLECTOR	LED	30.6 W	UNV	4214 lm	4'(L) LED FIXTURE WITH REFLECTOR. 3500 KELVIN. 80 CRI.
P3	EATON	METALUX SNLED LENSED	LED	18 W	UNV	2289 lm	2' (L) PENDANT MOUNTED LED STRIP LIGHT. SEMI-FROST LENS NARROW. 3500K. 80 CRI. 0-10V DIMMING DRIVER.
P4	ARKTURA	SOUNDBAR DUO	LED	120 W	UNV	12800 lm	4"(W) X 6"(D) X 5'(L) PENDANT MOUNTED LED STRIP LIGHT WITH UP AND DOWN LIGHT. 3500K. 95+ CRI.
R1	EATON	22ALN	LED	20.2 W	UNV	2522 lm	2'(W) X 2'(L). RECESSED LED. SMOOTH FROSTED ACRYLIC CURVED LENS. 3500K. 0-10V DIMMING DRIVER.
R2	GOTHAM	EVO 8 DOWNLIGHT	LED	31.6 W	UNV	2004 lm	8" LED ROUND DOWNLIGHT. 3500K. CLEAR APERTURE. MEDIUM DISTRIBUTION.
R3	GOTHAM	EVO 8 NON-CONDUCTIVE SHOWER LIGHT	LED	31.6 W	UNV	2004 lm	IP65 RATED, WET-LISTED LED ROUND DOWNLIGHT. NON-CONDUCTIVE FRONT DROP. 3500K. 0-10V DRIVER DIMS TO 10%.
R4	AXIS	SCULPT	LED	34 W	UNV	1200 lm	4'(L) RECESSED LIGHTING FIXTURE WITH FLUSH LENS. 3500K. 80 CRI. 0-10V DRIVER DIMS TO 1%.
R5	AXIS	BEAM 2 LED	LED	13.8 W	UNV	1525 lm	2'(L) DIRECT RECESSED SLOT. 3500K. 80 CRI. 0-10V DRIVER DIMS TO 1%.
R6	PINNACLE	EDGE EV1	LED	45 W	UNV	3570 lm	1.5"(W) X 3 1/2"(D). DAMP LOCATION LISTED LED FIXTURE WITH EXTRUDED ALUMINUM TRIM WITH COLD ROLLED STEEL BACK BOX, SATINE LENS, 80 CRI, 3500K COLOR TEMPERATURE. 0-10V DIMMING TO 10%.
R7	CONTECH	CTR324	LED	31.6 W	UNV	2004 lm	3" FULLY ADJUSTABLE WALLWASH LED. 3500K. WIDE SPREAD LENS. CLEAR SPECULAR REFLECTOR. BRUSHED NICKEL TRIM.
R8	KENALL	CSEFL22	LED	46 W	UNV	5461 lm	2'(W) X 2'(L) RECESSED LED. IP65 WET LOCATION LISTED. DIFFUSED ACRYLIC LENS. 3500K. 82+ CRI. 0-10V DIMMING DRIVER TO 1%.
S1	EATON	HVSL4 LD4 LED	LED	33.5 W	UNV	3484 lm	SURFACE MOUNTED VANDAL RESISTANT LINEAR LED. 3500K. OPAL POLYCARBONATE LENS. SINGLE CIRCUIT, NON-DIMMING DRIVER.
SL1	WE-EF	661-5460 VFL530-SE	LED	81 W	UNV	9323 lm	POLE MOUNTED FIXTURE 16' MOUNTING HEIGHT. TYPE 4 DISTRIBUTION.
SP1	CAROLINA HIGH MAST	ULTRASPOT R800	LED	17052 W	480V	1789074 lm	MOUNTING HEIGHT 100'. 21 LUMINAIRES PER POLE. WATTAGE AND LUMENS LISTED ARE PER POLE.
SP2	CAROLINA HIGH MAST	ULTRASPOT R800	LED	14616 W	480V	1533492 lm	MOUNTING HEIGHT 100'. 18 LUMINAIRES PER POLE. WATTAGE AND LUMENS LISTED ARE PER POLE.
SP3	CAROLINA HIGH MAST	ULTRASPOT R800	LED	11368 W	480V	1192716 lm	MOUNTING HEIGHT 90'. 14 LUMINAIRES PER POLE. WATTAGE AND LUMENS LISTED ARE PER POLE.
SP4	CAROLINA HIGH MAST	ULTRASPOT R800	LED	10556 W	480V	1107522 lm	MOUNTING HEIGHT 90'. 13 LUMINAIRES PER POLE. WATTAGE AND LUMENS LISTED ARE PER POLE.
V1	EATON	SHAPER 605-WP	LED	21.6 W	UNV	1681 lm	25"(W) BATHROOM VANITY. DAMP LOCATION LISTED. 3500K. 83+ CRI. 0-10 VOLT DIMMING.
W1	EATON	TR15 LED	LED	38.1 W	UNV	3300 lm	HARMONY TERRAPIN VANDAL RESISTANT LED
W2	EATON	RIO 1235-RD	LED	5 W	UNV	16 lm	15" DIAMETER STEP LIGHT. ROUND. POLYCARBONATE EYELID STYLE WITH TAMPER RESISTANT SCREWS. 3500K.
X2	COOPER	LPX	LED	1 W	UNV	0 lm	SURFACE MTD, A/C POWERED, POLYCARBONATE LED EXIT SIGN WITH RED LETTERS, SINGLE FACE, FIXTURE SHALL BE FURNISHED WITH DIRECTIONAL CHEVRONS PER PLANS

* EQUAL AS NOTED IN THE SPECIFICATIONS

ELEC AUTOMATIC TRANSFER SWITCH SCHEDULE

AUTOMATIC TRANSFER SWITCH (ATS) SCHEDULE

IDENTIFICATION	LOCATION	VOLTS	RATING	WITHSTAND RATING (KA)	# OF POLES	TRANSITION TYPE	LOAD SERVED	NOTES
ATS	ELEC 1.L11.05	480Y/277V	250 A	42	3	OPEN	OPTIONAL STANDBY	SOLID NEUTRAL

ELEC DOOR HARDWARE CONNECTIONS

DESIGNATOR	DESCRIPTION OF WORK REQUIRED
AC	ACCESS CONTROL - PROVIDE ELECTRICAL CONNECTION, ABOVE CEILING, TO LOW VOLTAGE TRANSFORMER SERVING CARD READERS/SENSOR REQUIRED BACKBOXES, CONDUIT (MIN. 3/4"), WIRING, AND MOUNTING APPURTENANCES BETWEEN THE LOW VOLTAGE TRANSFORMER AND ASSOCIATED CARD READER/SENSORS. REFER TO ARCHITECTURAL DRAWINGS AND COORDINATE WITH DOOR HARDWARE VENDOR FOR CARD READERS/SENSOR LOCATION REQUIREMENTS PRIOR TO START OF WORK. CIRCUIT AS INDICATED.
OC	PROVIDE ELECTRICAL CONNECTION TO ELECTRICALLY OPERATED COILING DOOR WITH ALL REQUIRED BACKBOXES, CONDUIT (MIN. 3/4"), WIRING, AND MOUNTING APPURTENANCES. PROVIDE LOCAL DISCONNECT SWITCH. MOUNT MANUAL CONTROLLER ADJACENT TO DOOR UNLESS NOTED OTHERWISE. PROVIDE ALL CONTROL WIRING BETWEEN DOOR CONTROLLER AND MANUAL CONTROLLER. REFER TO ARCHITECTURAL DRAWINGS AND COORDINATE WITH DOOR HARDWARE VENDOR FOR OPERATING CONTROL LOCATION REQUIREMENTS PRIOR TO START OF WORK. CIRCUIT AS INDICATED.

PLUMBING EQUIPMENT ELECTRICAL SCHEDULE

MARK	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT	DISCONNECTING MEANS / RECEPTACLE TYPE	NOTES
EWH1	208 V	3	10000 VA	0HLR	6,8,10		
GWH1	120 V	1	600 VA	0LLM	33		
GWH2	120 V	1	600 VA	0LLM	34		
RCP1	120 V	1	528 VA	0LLM	35		
RCP1	120 V	1	528 VA	0HLR	11		
SE1	480 V	3	3991 VA	0LHM	49,51,53		
SE2	480 V	3	3991 VA	0LHM	55,57,59		
TMV1	120 V	1	600 VA	0LLM	36		
WS1	120 V	1	660 VA	0LLM	10		

MECHANICAL EQUIPMENT ELECTRICAL SCHEDULE

MARK	VOLTAGE	PHASE	LOAD	PANEL	CIRCUIT	DISCONNECTING MEANS / CONNECTION TYPE	NOTES
ACCU1	480 V	3	159626 VA	0LHM	1,3,5	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
AHU1B	120 V	1	1440 VA	0LLM	52		AHU1 BURNER CONNECTION
AHU1E	480 V	3	17542 VA	0LHM	61,63,65	VFD PROVIDED BY DIVISION 23	AHU1 EXHAUST FAN
AHU1H	480 V	3	1497 VA	0LHM	64,66,68	VFD PROVIDED BY DIVISION 23	AHU1 HEAT WHEEL MOTOR
AHU1L	120 V	1	1800 VA	0LLM	11		AHU1 LIGHT CONNECTION
AHU1R	480 V	3	19704 VA	0LHM	67,69,71	VFD PROVIDED BY DIVISION 23	AHU1 RETURN FAN
AHU1S	480 V	3	48885 VA	0LHM	2,4,6	VFD PROVIDED BY DIVISION 23	AHU1 SUPPLY FAN
AHU2	208 V	3	19058 VA	0LLM	1,3,5	VFD PROVIDED BY DIVISION 23	RTU SHALL BE EQUIPPED WITH A UNIT DISCONNECT SWITCH
COB1	208 V	1	125 VA	0LLM	2,4		
COB2	208 V	1	125 VA	0LLM	6,8		
COB3	208 V	1	125 VA	0LLM	47,49		
EF1	208 V	1	1581 VA	0LLM	48,50	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
EF2	208 V	1	2746 VA	0LLM	7,9	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
EF3	208 V	1	2746 VA	1RLF	43,45	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
EF4	208 V	1	666 VA	0LLM	51,53	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
EF5	208 V	1	2746 VA	0LLM	40,42	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
EF6	208 V	1	2746 VA	0LLM	13,15	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
ELEV	480 V	3	25000 VA	E0LHD	7,9,11		
FC01	208 V	1	894 VA	0LLM	17,19		
FC02	208 V	1	894 VA	0LLM	43,45	VFD PROVIDED BY DIVISION 23	
FC03	208 V	1	83 VA	0LLM	44,46	VFD PROVIDED BY DIVISION 23	
FC04	208 V	1	208 VA	0LLM	12,14	VFD PROVIDED BY DIVISION 23	
FC05	208 V	1	208 VA	0LLM	21,23		
FC06	208 V	1	208 VA	0LLM	21,23		
FC07	208 V	1	208 VA	0LLM	21,23		
FC08	208 V	1	208 VA	0LLM	21,23		
FC09	208 V	1	146 VA	0LLM	16,18		
FC10	208 V	1	790 VA	0LLM	16,18		
FC11	208 V	1	208 VA	0LLM	25,27		
FC12	208 V	1	208 VA	0LLM	25,27		
FC13	208 V	1	166 VA	0LLM	25,27		
FC14	208 V	1	166 VA	0LLM	20,22		
FC15	208 V	1	166 VA	0LLM	20,22		
FC16	208 V	1	166 VA	0LLM	20,22		
FC17	208 V	1	166 VA	0LLM	29,31		
FC18	208 V	1	166 VA	0LLM	29,31		
FC19	208 V	1	166 VA	0LLM	29,31		
FC20	208 V	1	208 VA	0LLM	24,26		
FC21	208 V	1	208 VA	0LLM	24,26		
FC22	208 V	1	229 VA	1RLR	10,12		
HP1	208 V	1	3536 VA	1RLR	5,7		
HP2	480 V	3	38244 VA	0LHM	7,9,11	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
HP3	480 V	3	38244 VA	0LHM	8,10,12	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
HP4	480 V	3	38244 VA	0LHM	18,20,22	DISCONNECT SWITCH PROVIDED BY DIVISION 23	
MAU1	208 V	3	6305 VA	1HLR	32,34,36	VFD PROVIDED BY DIVISION 23	
MAU2	208 V	3	2810 VA	0LLM	28,30,32	VFD PROVIDED BY DIVISION 23	
TB1	277 V	1	2500 VA	0LHM	19		
TB2	277 V	1	4000 VA	0LHM	13		
TB2	277 V	1	4000 VA	0LHM	21		
TB2	277 V	1	4000 VA	0LHM	24		
TB2	277 V	1	4000 VA	0LHM	26		
TB2	277 V	1	4000 VA	0LHM	30		
TB2	277 V	1	4000 VA	0LHM	27		
TB3	277 V	1	8000 VA	0LHM	15		
TB3	277 V	1	8000 VA	0LHM	14		
TB3	277 V	1	8000 VA	0LHM	16		
TB3	277 V	1	8000 VA	0LHM	23		
TB3	277 V	1	8000 VA	0LHM	31		
TB3	277 V	1	8000 VA	0LHM	32		
TB3	277 V	1	8000 VA	0LHM	25		
TB3	277 V	1	8000 VA	0LHM	33		
TB3	277 V	1	8000 VA	0LHM	35		
TB3	277 V	1	8000 VA	0LHM	34		
TB4	277 V	1	13000 VA	0LHM	41		
TB4	277 V	1	13000 VA	0LHM	37		
TB4	277 V	1	13000 VA	0LHM	36		
TB4	277 V	1	13000 VA	0LHM	28		
TB5	277 V	1	22000 VA	0LHM	29		
TB6	277 V	1	26000 VA	0LHM	39		
TB6	277 V	1	26000 VA	0LHM	38		
UH1	480 V	3	5000 VA	0LHM	52,54,56	VFD PROVIDED BY DIVISION 23	
UH1	480 V	3	5000 VA	0LHM	58,60,62	VFD PROVIDED BY DIVISION 23	

AECOM

PROJECT

Marshall Baseball Electrical

CLIENT

Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT

AECOM
2380 McGee St., #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL

AECOM
150 Clay St., Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL

AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION

AECOM
277 West Nationwide Blvd.
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL

Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

FIELD CONSULTANT

D A Hogan & Associates
119 1st Ave S., #110
Seattle, WA 98104
HTTP://DAHOGAN.COM

FOODSERVICE

S2O Consultants, Inc
530 N. Wood St. Unit C
Chicago, IL 60622
HTTP://S2OCONSULTANTS.NET

REGISTRATION

DAVID SHOOK REGISTERED 23702 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER
11/15/19

INTERIM

CONSTRUCTION DOCUMENTS - BID SET

11/15/19

ISSUE/REVISION

2	12/12/2019	ADDENDUM 2
I/R	DATE	DESCRIPTION

PROJECT NUMBER

60590790

SHEET TITLE

ELECTRICAL SCHEDULES

SHEET NUMBER 1

E902

FOR INFORMATION ONLY

ADDENDUM F&T - 02

Date of Issuance: December 6, 2019

Re: MARSHALL UNIVERSITY BASEBALL STADIUM
Field & Turf RFP
Requisition No. R2001202
Marshall University, Huntington WV.

AECOM Project Number: 60590790

Issued By: AECOM Technical Services, Inc.

Issued To: All bidders/plan holders of record

Acknowledge receipt of this addendum on the Form of Proposal, Section 00 02 00, Part 1, Item 4. Failure to acknowledge receipt of this addendum may render your Proposal non-responsive, and disqualify the Proposer.

The requirements of the original Proposal documents remain in effect except as modified by this Addendum. Changes made by addenda take precedence over information published at an earlier date.

Bidders are advised to call attention to all sub-bidders and suppliers of all information and changes that might affect their work.

GENERAL CLARIFICATIONS:

1. This Addendum includes a re-issued Form of Proposal, Section 00 02 00. This clarification emphasizes that Proposing Firms are to use the re-issued Form, which clearly identifies itself as having been revised in both Addendum F&T-01 and F&T-02 in the header.

2. Some of the technical questions received by the Project Team suggest that there may be individuals reviewing and/or pricing the work without the benefit of the complete Project Documents. Each pre-qualified firm received two files, “Marshall University Baseball Stadium Field & Turf RFP Drawings 11-11-19.pdf” (6.8MB) containing the complete 13-sheet drawing package, and “Marshall University Baseball Stadium Field & Turf RFP Project Manual 11-12-19.pdf.pdf” (1.3MB), containing the complete 93-page Project Manual & Specification. Item immediately following includes a link to the equally important General Conditions, Special Conditions, and all work of other Trades.

   Principals of the Proposing Firms are encouraged to verify that their Proposal is based on the comprehensive documentation.

3. The following is revised from Addendum FT-01, General Clarification Item 1:

   Section 01 11 00 Paragraph 1.1.B references Divisions 0 and 1 of the Stadium Contract, and several drawings of the Stadium Contract are referenced in the Field & Turf RFP drawings. The

following is the public link to the full bid documents as referenced;

http://www.cbblueprint.com/MU%20Baseball%20Stadium.htm

~~Proposing Firms shall register as Plan Holders.~~

By Submitting a Proposal, the Proposing Firm certifies that they (the Proposing Firm, collectively or individually) have accessed, reviewed, and familiarized themselves with the Stadium Construction Bid Documents sufficiently to understand the requirements and implications of working for the Stadium GC directly.

4. Due to the numerous questions regarding the extent of fencing work involved, we have attached a Not-to-Scale version sheet PF101 Layout Plan with the limit of fencing and gates highlighted.

INTERROGATIVES:

1. Q. Is the only fencing located in between the field and bullpens (4') and the gates in left field and center field?

   A. Yes.

2. Q. The only place I see requiring a concrete curb is where fencing is required (between bullpens and field and where the gates are in the outfield wall in left field and center field.)

   A. Correct. The only concrete curb included in the RFP is that associated with the fencing.

3. Q. Is the outfield wall being provided by the GC and the turf field contractor is just responsible for attaching the nailer?

   A. Correct.

4. Q. Is a pressure treated 2"x4" nailer acceptable in lieu of the plastic edging for turf attachment?

   A. Yes. Refer to Section 33 46 23 Paragraph 2.4.C.

5. Q. Please clarify the difference between the irrigation line and the washwater line. They appear to be the same line on the irrigation drawing.

   A. The washwater is supplied by an "existing" irrigation source. For the purposes of the physical work of this RFP, "irrigation" and "washwater" are interchangeable, except when referring to the Field & Turf Washwater Point-of-Connection, which is the Stadium Contract's irrigation system.

6. Q. Are the perimeter drainage collector line and the irrigation/washwater mainline to be installed in the same trench then backfilled? They appear to be in the same location.

   A. No. Although they may be shown in close proximity, they are not shown in the same trench. Note that Detail A4 Sheet PF204 indicates very specific requirements for bedding & backfill.

7. Q. Is the 2'x2' duct bank with 4" conduits to be provided and installed by the GC or by the turf field contractor? If by the turf contractor, does their 2'x2' duct bank duct and conduits terminate at the perimeter of the field (fence line/wall) where others will pick up remaining? Is there a detail available for this?

A. The duct bank in question will be installed by the Stadium GC before the Field & Turf Contract Site Notice to Proceed is issued. The conduits pass through the site uninterrupted by any hand hole, vault, or surface feature at a depth that will not interfere with the underground work of the Field & Turf Contract.

8. Q. As per detail C1, can we substitute a 90 for the angled connection on the side inlet connection as it will be extremely difficult to achieve desired compaction around that angled connection?

   A. Assuming this is referencing C1/PF202, please propose as per the drawings & details. This detail shows 2 of several connection methods that may be acceptable. Alternatives to the methods shown can be reviewed post-Award.

9. Q. Would it be an option to substitute a perforated collector (6”/8”) perimeter pipe in a stone trench in lieu of the solid collector pipe in a dirt backfilled trench?

   A. Please propose as per the drawings & details. Alternatives to the methods shown can be reviewed post-Award.

10. Q. Please clarify what drawing detail A4 from drawing page PF204 is applicable for.

    A. This detail covers irrigation sleeving conditions extensively, although there are admittedly few if any situations warranting sleeving. The detail does also illustrate trenching requirements for washwater/irrigation piping.

11. Q. Are we to include anything for netting, windscreen, fence padding, batter’s eyes or foul poles? These items are minimally referenced but full details and specs are missing on all.

    A. Netting, windscreens, and padding are not supplied by the Field & Turf Proposal. References, including those associated with 4’ bullpen fencing, should also indicate that this equipment is provided per the A-Series drawings (Stadium Contract).

12. Q. Can we get a more definitive breakdown on what fencing and curb needs to be provided by the field builder?

    A. Provide only fencing and gates called out on Sheet PF101.

13. Q. The layout legend on PF100 doesn’t give a clear picture of what fence/curb details are needed?

    A. PF100 is a color illustration, although it does describe the fencing work as well. PF101 very clearly indicates the limit of chain link fencing and gates, and the associated details can be found on sheets PF201, PF203, and PF205. A1/PF205 indicates that there is a curb associated with all chain link fence. B4/PF203 indicates that some fencing, specifically that adjacent to the bullpen mounds, includes additional curb height with specialized detailing to ensure that the fence fabric and curb face are co-planar. This detail also illustrates the continuing curb.

14. Q. Are we only providing curb and fence at the bullpens?

    A. Yes, plus gates in the outfield fence as shown.

15. Q. Are we to provide the outfield fence/curb?

A. No, just the gates as shown.

16. Q. Can the trenches be scaled from 12” wide to 8” wide?

A. No.

17. Q. Are there any specifications for stone and pipe?

A. Yes.

18. Q. Are we responsible for all fencing or just everything not incorporated in the concrete wall?

A. PF101 indicates the limit of chain link fencing and gates as being the full length of both bullpens, and all gates onto the field. The associated details can be found on sheets PF201, PF203, and PF205. A1/PF205 indicates that there is a curb associated with all chain link fence. B4/PF203 indicates that some fencing, specifically that adjacent to the bullpen mounds, includes additional curb height with specialized detailing to ensure that the fence fabric and curb face are co-planar. This detail also illustrates the continuing curb.

19. Q. Can we switch the collector line from solid to perforated?

A. Please propose as per the drawings & details. Alternatives to the methods shown can be reviewed post-Award.

20. Q. Switch drainage insert-a-tees to regular tees?

A. Please propose as per the drawings & details. Alternatives to the methods shown can be reviewed post-Award.

21. Q. Can you please confirm who is responsible for the wall and the fencing inside that wall?

A. This inquiry is not clear enough to respond to directly, but we are confident that several of the previous items cover this area.

22. Q. Can we get clarification on who is responsible for the spoils from the drainage ditches for the project?

A. Yes – the Firm executing the Field & Turf Contract will be responsible for the disposition of materials in excess of that required to execute the work as described. Options might include off-site disposal, incorporation into the subgrade, or on-site disposal coordinated with the Stadium GC.

23. Q. Confirm that the stadium contractor is responsible for excavation to subgrade.

A. The Stadium GC will provide a rough subgrade +0.05’/-0.05’ of the designed subgrade. See Sheet PF002 notes, Section 01 11 00 Summary of Work, and 00 02 00 Form of the Proposal (Unit Prices 1 & 2) for a comprehensive description.

SPECIFICATIONS:

General: Deleted portions of specifications are struck-through and underlined. Revised portions

of specifications are bolded and underlined.

1. Q. The Bid Form (Section 00 02 00) asks for a UBI#. I am not familiar with what this is. Can you clarify what that is, what the acronym stands for?

   A. A Universal Business Identifier # is not a requirement for this Process. This has been stricken from the re-issued 00 02 00 Form.

DRAWINGS:

General: Revisions to drawings are clouded and have a delta mark next to them.

1. Reserved
   a. Reserved.

ATTACHMENTS:

Section 00 02 00 Form of the Proposal.pdf
PF 101 Layout Plan 12-4-19 NTS FT-02.pdf

END OF ADDENDUM

FOR INFORMATION ONLY

Section 00 02 00

Form of Proposal – Part 1
Addendum F&T-01
Addendum F&T-02

Address all Proposal Documents to:

~~Stephanie Smith, MS~~
Angela White Negley
CPO, Director of Purchasing, Marshall University
One John Marshall Drive
Huntington, WV 25755-4100

Proposal Documents must be received via e-mail at the following;

Angela White Negley, Marshall University negely4@marshall.edu
Brian Pounds, AECOM Brian.Pounds@aecom.com
Eric Gold, D.A. Hogan & Associates ericg@dahogan.com

For: Marshall University Baseball Stadium
Field & Turf Request for Proposals

Proposing Company Name: _____

In response to your Invitation to Propose for the above referenced work, the undersigned offers to furnish all of the following required to perform the work in accordance with the Contract and any addenda thereto for the firm and fixed price set forth below: labor, materials, tools, supplies, equipment, storage, transportation, incidental field engineering, supervision, services, goods and other items.

The undersigned certifies that: it has examined and is fully familiar with all provisions of the Contract and any addenda thereto; it has carefully checked all of the words and figures which comprise this Proposal; and it has by careful examination of the Contract, any addenda thereto, the site and all other pertinent conditions and information, satisfied itself as to the nature, location, difficulty, character, quality, and quantity of the work, required by the Contract and as to the conditions and other matters that may be encountered at or in the vicinity of the site or that may affect performance of the work or the cost or difficulty thereof.

In submitting this Proposal, the undersigned agrees:

1. To hold its bid open for ninety (90) consecutive calendar days from the date designated for receipt of bids;

2. If awarded the Contract, to duly execute the Contract and deliver to Marshall University and it's Stadium General Contract Holder the Field & Turf Contract, together with all required surety bonds and certificates of insurance and all other post bid information required by the documents, within ten (10) days from the date of Notice of Intent to Award;

3. To perform the work in accordance with the Contract which consists of the AGREEMENT BETWEEN Marshall University and its Stadium General Contractor AND _____, GENERAL, SUPPLEMENTAL AND ANY OTHER CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, SPECIFICATIONS, DRAWINGS, and all addenda thereto; other documents listed in the Agreement and Modifications issued after execution of the Contract; and,

4. To commence work under the Contract upon receipt of a written Notice to Proceed and complete the work in accordance with Sections 00 08 00 Supplemental Conditions and 01 11 00 Summary of Work.

The undersigned acknowledges receipt of the Contract Documents, including Drawings and Project Manuals, for the Marshall University Baseball Field & Turf RFP, and referenced documents of the Marshall University Baseball Stadium Construction Documents.

The undersigned acknowledges receipt, understanding and full consideration of Addenda Nos. _____and have included their provisions in my bid.

As full compensation for satisfactory performance of all obligations under the Contract, the undersigned will construct this project for the following lump sum base bid and/or combination of Awarded Alternate Bid Items as defined in the accompanying specifications and drawings and the General Conditions of the Marshall University Baseball Stadium Construction Documents;

INDICATE DEDUCTIVE or NEGATIVE VALUES IN (BRACKETS).

BASE BID ITEM #1 (Field Base): Construction of the Field Base including all related utilities infrastructure (washwater, drainage, and incidental coordination with others), embedments, fencing, equipment, and accessories as shown and described;

(Words)_____Dollars

(Numbers) $_____

BASE BID ITEM #2 (Turf Surfacing): Manufacture, Supply, Installation, Service, and Warranty of the Specified Synthetic Turf system, as shown and described;

(Words)_____Dollars

(Numbers) $_____

ALTERNATE BID #1 (Vendors Choice Turf System): Substitute the Proposers Preferred Synthetic Turf System, including Manufacture, Supply, Installation, Service, and Warranty, as described on the accompanying Section 00 02 05 Turf Technical Product Data Form(s) for the Specified product(s);

(Words)_____Dollars

FOR INFORMATION ONLY

(Numbers) $_____

UNIT PRICE #1 (Soil Export): Grading and Excavation of soil materials found to be in excess of that required to establish the Designed Subgrade Condition as shown and described, including loading, export trucking, and offsite disposal, PER 10 BANK CUBIC YARDS (10BCY, as measured in place);

(Words)_____Dollars/10bcy

(Numbers) $_____/10bcy

UNIT PRICE #2 (Soil Import): Import of approved Structural Fill soil in the quantity required to establish the Designed Subgrade Condition as shown and described including supply, import trucking, unloading, and rough grading and compaction, PER 10 BANK CUBIC YARDS (10BCY, in place, at the compaction rate specified);

(Words)_____Dollars/10bcy

(Numbers) $_____/10bcy

Exclusions Statement (initial one)

_____ No Specific Exclusions. The undersigned has read and understands the terms and conditions of the Agreement and identifies no specific exclusions or exceptions to same.

_____ The Proposal is subject to Specific Exclusions as noted on a separately attached, notarized Memorandum of Specific Exclusions to the Agreement.

Bidder's West Virginia Contractor's License No. _____

License Expiration Date: _____

Legal Name of Bidder: _____

~~UBI#:~~ _____

Business Address: _____

Phone Number: _____

Signature of Corporation.

_____
(Corporate Name)

_____

FOR INFORMATION ONLY

(State of Incorporation)

Date Signed: _____ By: _____

Title: _____

Signature of Partnership or Joint Venture.

_____
(Name of Partnership or Joint Venture)

Date Signed: _____ By: _____

Date Signed: _____ By: _____

Date Signed: _____ By: _____

Date Signed: _____ By: _____

FOR INFORMATION ONLY

ATTACHMENT NO. 1

NON-COLLUSION AFFIDAVIT
TO BE EXECUTED BY BIDDER AND
SUBMITTED WITH BID

State of West Virginia)
) ss
County of)

I, _____, being first duly sworn, deposes and says that he or she is _____ of _____ the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company association, organization, or corporation, that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, or to restrain competition.

Bidder_____

By_____

Title_____

Address_____

_____

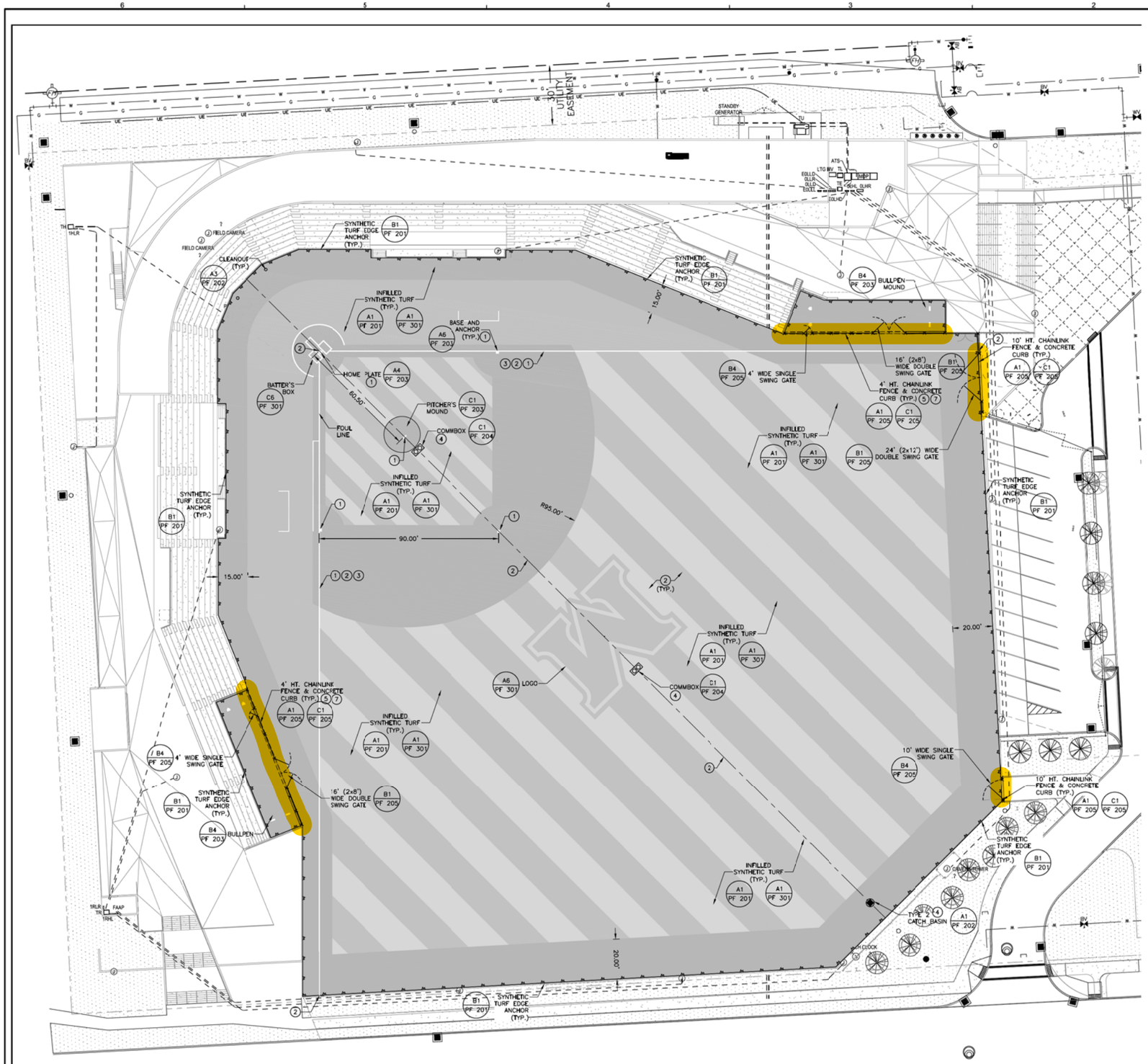
Subscribed and Sworn to before me this _____ day of _____, 20____.

_____
Printed Name

_____

Notary Public in and for the State of _____

Residing at _____



LAYOUT NOTES

1. CRITICAL LAYOUT POINTS INCLUDING GAME FIELD HOME PLATE AND PITCHERS MOUND/PLATE, BASES AND BASE ANCHORS, AND FOUL LINE SHALL BE ESTABLISHED BY A LICENSED SURVEYOR.
2. ESTABLISH AND MAINTAIN A LAYOU" BASELINE/CENTERLINE USING A POINT-OF-BEGINNING (P.O.B.) AT THE APEX OF HOME PLATE AND CENTERLINE INTERSECTION WITH THE OUTFIELD WALL. FOUL POLE SHALL BE LOCATED ENTIRELY IN-PLAY, WITH THE FOUL-SIDE (OUTSIDE) FACE EXACTLY TANGENT TO THE FOUL LINE.
3. FOUL LINES SHALL BE ESTABLISHED AS TWO LINES ORIGINATING AT THE APEX OF HOME PLATE, PRECISELY 90° TO EACH OTHER WITHOUT TOLERANCE, ORIENTED WITHIN THE STADIUM BOWL AS SHOWN AND DESCRIBED, TERMINATING IN TANGENCY TO THE FOUL SIDE OF THEIR RESPECTIVE FOUL POLE OR WALL MARKING. A 3" WIDE WHITE LINE SHALL BE INSTALLED IN THE SYNTHETIC TURF ON THE "FAIR" SIDE OF THIS LINE. FOUL POLE SHALL BE LOCATED ENTIRELY IN-PLAY, WITH THE FOUL-SIDE (OUTSIDE) FACE EXACTLY TANGENT TO THE FOUL LINE.
4. FIELD EMBEDMENTS AND UTILITY INFRASTRUCTURE ACCESS (HAND HOLES, CLEAN OUT COVERS, ETC.) ARE TO BE ON OR SYMMETRICALLY OFFSET TO THE FIELD CENTERLINE.
5. BULLPEN ENCLOSURE FENCE ALIGNMENT TO BE ESTABLISHED SUCH THAT THE FACE OF THE CHAIN LINK FABRIC IS IN PLANE WITH AND FLUSH TO THE FACE OF THE ADJACENT SEATING BOWL OR OUTFIELD WALL WITHOUT PROJECTION OF ANY KIND. ACCOUNT FOR THE FENCE POST OFFSET IN THE CONTAINMENT CURB AND CONTAINMENT CURB REVEAL TO RECEIVE SYNTHETIC TURF.
6. COORDINATE LAYOUT OF IMPROVEMENTS TO BE EMBEDDED IN THE FIELD BASE WITH THE APPROVED LAYOUT DRAWINGS INCLUDING BASES AND ANCHORS, HOME PLATE, BATTERS BOX REPLACEMENT PANELS AS APPROPRIATE, ETC.
7. ALL 4' HT FENCES IN FOUL TERRITORY SHALL USE A #2-5/8" TOP RAIL AND INCLUDE TOP RAIL PAD. INSTALL PAD PER A-SERIES DRAWINGS.

NOTE LEGEND

(1) (INDICATES GENERAL CONSTRUCTION NOTE)
(3) (INDICATES SPECIFIC CONSTRUCTION KEYNOTE)

LAYOUT LEGEND

- GREEN COLORED SYNTHETIC TURF AND PERMEABLE AGGREGATE
- BROWN COLORED SYNTHETIC TURF AND PERMEABLE AGGREGATE
- LIMIT OF SYNTHETIC TURF AND EDGE ANCHOR
- CATCH BASIN INLET (C.B.I.) TYPE 2 WITH TURF COVER
- CLEANOUT WITH TURF COVER
- COMMBOX
- CHAINLINK FENCE AND CONCRETE CURB
- CHAINLINK FENCE

FOR INFORMATION ONLY

AECOM

PROJECT
MARSHALL UNIVERSITY
BASEBALL STADIUM
FIELD & TURF RFP

CLIENT
Marshall University
1 John Marshall Drive
Huntington, WV 25755
HTTP://MARSHALL.EDU

ARCHITECT
AECOM
2390 McGee St, #200
Kansas City, MO 64108
HTTP://AECOM.COM

CIVIL
AECOM
150 Clay St, Suite 410
Morgantown, WV 26501
HTTP://AECOM.COM

STRUCTURAL
AECOM
125 Broad Street, 15th Floor
New York, NY 10004
HTTP://AECOM.COM

MEP/FIRE PROTECTION
AECOM
277 West Nationwide Blvd
Columbus, OH 43215
HTTP://AECOM.COM

AUDIO/VISUAL
Henderson Engineers, Inc.
8345 Lenexa Drive, #300
Lenexa, KS 66214
HTTP://HENDERSONENGINEERS.COM

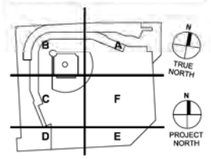
FIELD CONSULTANT
D A Hogan & Associates
119 1st Ave S, #110
Seattle, WA 98104
HTTPS://DAHOGAN.COM

FOODSERVICE
S2O Consultants, Inc
330 N. Wood St, Unit C
Chicago, IL 60622
HTTPS://S2OCONSULTANTS.NET

REGISTRATION

FIELD & TURF RFP PRICING DOCUMENTS
11/08/19

KEY PLAN



ISSUE/REVISION

I/R	DATE	DESCRIPTION

PROJECT NUMBER
60590790

SHEET TITLE
FIELD LAYOUT PLAN

SHEET NUMBER SHEET 04
PF101