UNIVERSITY OF KENTUCKY

Purchasing Division

Request for Proposal
UK-2340-23
Proposal Due Date - 04/18/2023

Project # 2592.0
JACOBS SCIENCE BUILDING FIT-UP CONTROLS

UNIVERSITY OF KENTUCKY
Purchasing Division

REQUEST FOR PROPOSAL (RFP)

ATTENTION: This is not an order. Read all instructions, terms and conditions carefully.

PROPOSAL NO.:	**UK-2340-23**	**RETURN ORIGINAL COPY OF PROPOSAL TO:**
Issue Date:	**03/29/2023**	**UNIVERSITY OF KENTUCKY**
	JACOBS SCIENCE BUILDING FIT-UP	**PURCHASING DIVISION**
Title:	**CONTROLS**	**411 S LIMESTONE**
Purchasing Officer:	**Corey W. Leslie**	**ROOM 322 PETERSON SERVICE BLDG.**
Email:	**cckbidquestions@uky.edu**	**LEXINGTON, KY 40506-0005**

IMPORTANT: PROPOSALS MUST BE RECEIVED BY: 04/18/2023 3 P.M. LEXINGTON, KY TIME.

NOTICE OF REQUIREMENTS

1. The University's General Terms and Conditions and Instructions to Bidders, viewable at https://purchasing.uky.edu/bid-and-proposal-opportunities, apply to this RFP. When the RFP includes construction services, the University's General Conditions and Special Conditions for Construction and Instructions to Bidders, viewable at https://purchasing.uky.edu/bid-and-proposal-opportunities, apply to the RFP.
2. Contracts resulting from this RFP must be governed by and in accordance with the laws of the Commonwealth of Kentucky.
3. Any agreement or collusion among offerors or prospective offerors, which restrains, tends to restrain, or is reasonably calculated to restrain competition by agreement to bid at a fixed price or to refrain from offering, or otherwise, is prohibited.
4. Any person who violates any provisions of KRS 45A.325 shall be guilty of a felony and shall be punished by a fine of not less than five thousand dollars nor more than ten thousand dollars, or be imprisoned not less than one year nor more than five years, or both such fine and imprisonment. Any firm, corporation, or association who violates any of the provisions of KRS 45A.325 shall, upon conviction, be fined not less than ten thousand dollars or more than twenty thousand dollars.

AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST

I hereby swear (or affirm) under the penalty for false swearing as provided by KRS 523.040:

1. That I am the offeror (if the offeror is an individual), a partner, (if the offeror is a partnership), or an officer or employee of the bidding corporation having authority to sign on its behalf (if the offeror is a corporation);
2. That the attached proposal has been arrived at by the offeror independently and has been submitted without collusion with, and without any agreement, understanding or planned common course of action with, any other Contractor of materials, supplies, equipment or services described in the RFP, designed to limit independent bidding or competition;
3. That the contents of the proposal have not been communicated by the offeror or its employees or agents to any person not an employee or agent of the offeror or its surety on any bond furnished with the proposal and will not be communicated to any such person prior to the official closing of the RFP:
4. That the offeror is legally entitled to enter into contracts with the University of Kentucky and is not in violation of any prohibited conflict of interest, including, but not limited to, those prohibited by the provisions of KRS 45A.330 to .340, and164.390;
5. That the offeror, and its affiliates, are duly registered with the Kentucky Department of Revenue to collect and remit the sale and use tax imposed by Chapter 139 to the extent required by Kentucky law and will remain registered for the duration of any contract award;
6. That I have fully informed myself regarding the accuracy of the statement made above.

SWORN STATEMENT OF COMPLIANCE WITH CAMPAIGN FINANCE LAWS

In accordance with KRS45A.110 (2), the undersigned hereby swears under penalty of perjury that he/she has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky and that the award of a contract to a bidder will not violate any provision of the campaign finance laws of the Commonwealth of Kentucky.

CONTRACTOR REPORT OF PRIOR VIOLATIONS OF KRS CHAPTERS 136, 139, 141, 337, 338, 341 & 342

The contractor by signing and submitting a proposal agrees as required by 45A.485 to submit final determinations of any violations of the provisions of KRS Chapters 136, 139, 141, 337, 338, 341 and 342 that have occurred in the previous five (5) years prior to the award of a contract and agrees to remain in continuous compliance with the provisions of the statutes during the duration of any contract that may be established. Final determinations of violations of these statutes must be provided to the University by the successful contractor prior to the award of a contract.

CERTIFICATION OF NON-SEGREGATED FACILITIES

The contractor, by submitting a proposal, certifies that he/she is in compliance with the Code of Federal Regulations, No. 41 CFR 60-1.8(b) that prohibits the maintaining of segregated facilities.

SIGNATURE REQUIRED: This proposal cannot be considered valid unless signed and dated by an authorized agent of the offeror. Type or print the signatory's name, title, address, phone number and fax number in the spaces provided. Offers signed by an agent are to be accompanied by evidence of his/her authority unless such evidence has been previously furnished to the issuing office.

DELIVERY TIME:	**NAME OF COMPANY:**	**DUNS #**
PROPOSAL FIRM THROUGH:	**ADDRESS:**	**Phone/Fax:**
PAYMENT TERMS:	**CITY, STATE & ZIP CODE:**	**E-MAIL:**
SHIPPING TERMS: F. O. B. DESTINATION PREPAID AND ALLOWED	**TYPED OR PRINTED NAME:**	**WEB ADDRESS:**
FEDERAL EMPLOYER ID NO.:	**SIGNATURE:**	**DATE:**

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Attachment A – General Conditions
Attachment B – 2590.0 JSB IC-M-E Sheets
Attachment C – Specification sections:

200100
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1.0 DEFINITIONS

The term "addenda" means written or graphic instructions issued by the University of Kentucky prior to the receipt of proposals that modify or interpret the RFP documents by additions, deletions, clarifications and/or corrections.

The term "competitive negotiations" means the method authorized in the Kentucky Revised Statutes, Chapter 45A.085.

The terms "offer" or “proposal” mean the offeror’s/offerors’ response to this RFP.

The term "offeror" means the entity or contractor group submitting the proposal.

The term "contractor" means the entity receiving a contract award.

The term "purchasing agency" means the University of Kentucky, Purchasing Division, Room 322 Peterson Service Building, Lexington, KY 40506-0005.

The term "purchasing official" means the University of Kentucky’s appointed contracting representative.

The term "responsible offeror" means a person, company or corporation that has the capability in all respects to perform fully the contract requirements and the integrity and reliability that will assure good faith performance. In determining whether an offeror is responsible, the University may evaluate various factors including (but not limited to): financial resources; experience; organization; technical qualifications; available resources; record of performance; integrity; judgment; ability to perform successfully under the terms and conditions of the contract; adversarial relationship between the offeror and the University that is so serious and compelling that it may negatively impact the work performed under this RFP; or any other cause determined to be so serious and compelling as to affect the responsibility of the offeror.

The term "solicitation" means RFP.

The term "University" means University of Kentucky.

2.0 GENERAL OVERVIEW

2.1 Intent and Scope

This Request for Proposal (RFP) is issued to solicit proposals from qualified, experienced, financially sound, and responsible firms PROVIDE the **Labor and Material for the Controls package** for the updates in Improve Jacobs Science Building project in Lexington, Kentucky. The selected **contractor for this RFP will be assigned to the successful mechanical contractor, prior to the bid date of the mechanical scope of work.** The scope of work of this Project consists of the supply and warranting of all materials and products including transportation, as herein specified in this RFP and Attachments.

Also required will be full submittal documentation prior to releasing the order.

- The Offeror who is chosen must provide a single point of contact during the warranty period for all repairs. This single point of contact will have full responsibility for ensuring repairs are completed. After the warranty period has expired the Offeror must offer a maintenance contract on the system with a single point-of-contact for all repairs.

- The design shall comply with all applicable codes, Owner's standards http://www.uky.edu/Services/CPMD/ukstandards/Divisions/Master.html, rules, and regulations.

2.2 Background Information

The Jacobs Science Building was first occupied in 2017 and is the primary undergraduate classroom building for Chemistry and Biology. When originally constructed the building included shell space on 3 floors of the south wing. The University is now designing the fit-up of those spaces to offer additional science labs, classrooms, and office space to act as temporary space as other University modernization projects are in progress and building tenants need to be relocated for the duration of the project.

2.3 University Information

Since his arrival, President Eli Capilouto has set forth an ambitious agenda to extend and enhance our role as Kentucky's land-grant and flagship research university. By focusing on infrastructure growth and improvement; creating opportunities for innovative teaching, learning, and academic excellence; fostering a robust research and creative scholarship enterprise; providing life-saving subspecialty care; empowering communities through service and outreach; and encouraging a transparent and shared dialogue about institutional priorities; the University of Kentucky will ensure a new century of promise for the people we impact.

Founded in 1865 as a land-grant institution adjacent to downtown Lexington, UK is nestled in the scenic heart of the beautiful Bluegrass Region of Kentucky. From its early beginnings, with only 190 students and 10 professors, UK's campus now covers more than 918 acres and is home to more than 30,000 students and approximately 14,500 employees, including more than 2,300 full-time faculty. UK is one of a small number of universities in the United States that has programs in agriculture, engineering, a full complement of health colleges including medicine and pharmacy, law and fine arts on a single campus, leading to groundbreaking discoveries and unique

interdisciplinary collaboration. The state's flagship university consists of 17 academic and professional colleges where students can choose from more than 200 majors and degree programs at the undergraduate and graduate levels. The colleges are Agriculture, Food and Environment; Arts and Sciences; Business and Economics; Communication and Information; Dentistry; Design; Education; Engineering; Fine Arts; Graduate School; Health Sciences; Law; Medicine; Nursing; Pharmacy; Public Health; and Social Work. These colleges are supported by a modern research library system.

Research at the University of Kentucky is a dynamic enterprise encompassing both traditional scholarship and emerging technologies, and UK's research faculty, staff and students are establishing UK as one of the nation's most prolific public research universities. UK's research enterprise attracted $285 million in research grants and contracts from out-of-state sources, which generated a $580 million impact on the Kentucky economy. Included in this portfolio is $153 million in federal awards from the National Institutes of Health, non-NIH grants from the Department Health and Human Services, the National Science Foundation, Department of Energy, Department of Agriculture and NASA, among others. The National Science Foundation ranks UK's research enterprise 44th among public institutions.

With more than 50 research centers and institutes, UK researchers are discovering new knowledge, providing a rich training ground for current students and the next generation of researchers, and advancing the economic growth of the Commonwealth of Kentucky. Several centers excel in the services offered to the public. The Gluck Equine Research Center is one of only three facilities of its kind in the world, conducting research in equine diseases.

The Center for Applied Energy Research is pursuing groundbreaking discovery across the energy disciplines. CAER staff are pioneering new ways to sustainably utilize Kentucky natural resources through carbon-capture algae technology, biomass/coal to liquid products and the opening of UK's first LEED-certified research lab to support the development of Kentucky's growing alternative energy industry. Among the brightest examples of UK's investment in transformative research is the Markey Cancer Center. As a center of excellence and distinction at UK, Markey's robust research and clinical enterprise is the cornerstone of our commitment to Kentucky – fundamental to our success in uplifting lives through our endeavors and improving the general health and welfare of our state – burdened by the nation's highest rate of cancer deaths per 100,000 people. In 2013, Markey earned the prestigious National Cancer Institute-designation (NCI) – one of 68 nationally and the only one in Kentucky.

The University of Kentucky was awarded a $20 million Clinical Translational Sciences Award (CTSA) from the National Institutes of Health (NIH). As one of only 60 institutions with this research distinction, UK was awarded the CTSA for its potential in moving research and discovery in the lab into practical field and community applications. The CTSA and NCI are part of a trifecta of federal research grants that includes an Alzheimer's Disease Center. UK is one of only 22 universities in the country to hold all three premier grants from NIH.

Established in 1957, the medical center at UK is one of the nation's finest academic medical centers and includes the University's clinical enterprise, UK HealthCare. The 569-bed UK Albert B. Chandler Hospital and Kentucky Children's Hospital, along with 256 beds at UK Good Samaritan Hospital, are supported by a growing faculty and staff providing the most advanced subspecialty care for the most critically injured and ill patients throughout the Commonwealth and beyond. Over the last several years, the number of patients served by the medical enterprise has increased from roughly 19,000 discharges to more than 36,000 discharges in 2014.

UK Chandler Hospital includes the only Level 1 Trauma Center for both adult and pediatric patients in Central and Eastern Kentucky. In addition, UK HealthCare recently opened one of the country's largest robotic hybrid operating rooms and the first of its kind in the region. While our new patient care pavilion is the leading healthcare facility for advanced medical procedures in the region, our talented physicians consult with and travel to our network of affiliate hospitals so Kentucky citizens can receive the best health care available close to their home and never need to leave the Bluegrass for complex subspecialty care.

King's Daughters Medical Center based in Ashland Kentucky officially became part of the University of Kentucky. King's Daughters Medical Center serves a 16-county region across Kentucky, Ohio, and West Virginia. Its health system is comprised of two acute-care hospitals totaling 465 licensed beds, more than 50 ambulatory centers and practice locations, a long-term care facility, medical transport company, and six urgent care centers.

UK's agenda remains committed to accelerating the University's movement toward academic excellence in all areas and gain worldwide recognition for its outstanding academic programs, its commitment to students, its investment in pioneering research and discovery, its success in building a diverse community and its engagement with the larger society. It is all part of the University's fulfillment of our promise to Kentucky to position our state as a leader in American prosperity.

SUSTAINABILITY

Sustainability is an institution-wide priority for the University of Kentucky. We strive to ensure that all activities are ecologically sound, socially just, and economically viable, and that they will continue to be so for future generations. This commitment also prioritizes the integration of these principles in curricula, research, athletics, health care, creative works, and outreach. This principled approach to operational practices and intellectual pursuits is intended to prepare students and empower the campus community to support sustainable development in the Commonwealth and beyond. The UK Sustainability Strategic Plan guides these efforts (https://www.uky.edu/sustainability/sustainability-strategic-plan).

2.4 Supplier Diversity and Procurement

The University of Kentucky is committed to serve as an advocate for diverse businesses in their efforts to conduct business. Diverse Business Enterprises (DBE) consist of minority, women, disabled, veteran and disabled veteran owned business firms that are at least fifty-one percent owned and operated by an individual(s) of the aforementioned categories. Also included in this category are disabled business enterprises and non-profit work centers for the blind and severely disabled.

The University is committed to increasing the amount of goods and services acquired from businesses owned and controlled by diverse persons to 10% of all procurement expenditures. The University expects its suppliers to support and assist in this effort.

Among the University's goals for DBE participation in procurement are:

- To ensure the absence of barriers that reduce the participation of diverse suppliers
- Educate vendors on "how to" do business with the University
- Support diverse vendors seeking to do business with the University in the areas of goods, services, construction, and other areas of procurement
- Encourage participation of qualified diverse vendors by directing them to agencies that can benefit from their product or service
- Provide resources for diverse vendors
- Sponsor events to assist diverse vendors in becoming active, responsible, and responsive participants in the University's purchasing opportunities

For additional information regarding how diverse suppliers may participate in this Request for Proposal, submit any questions to the Purchasing Officer as indicated in Section 3.2 by the Deadline for Written Questions date.

3.0 PROPOSAL REQUIREMENTS

3.1 Key Event Dates

Release of RFP	03/29/2023
Pre-Proposal Conference (Optional)	04/04//2023 at 11 AM via Zoom
Deadline for Written Questions	3:00 p.m. Lexington, KY Time on 04/07/2023
RFP Proposals Due	3:00 p.m. Lexington, KY Time on 04/18/2023

3.2 Offeror Communication

To ensure that RFP documentation and subsequent information (modifications, clarifications, addenda, Written Questions and Answers, etc.) are directed to the appropriate persons within the offeror's firm, each offeror who intends to participate in this RFP is to provide the following information to the purchasing officer. Prompt, thorough compliance is in the best interest of the offeror. Failure to comply may result in incomplete or delayed communication of addenda or other vital information. Contact information is the responsibility of the offeror. Without the prompt information, any communication shortfall shall reside with the offeror.

- Name of primary contact
- Mailing address of primary contact
- Telephone number of primary contact
- Fax number of primary contact
- E-mail address of primary contact
- Additional contact persons with same information provided as primary contact

This information shall be transmitted via fax or e-mail to:

Mr. Corey Leslie
Purchasing Division
University of Kentucky
322 Peterson Service Building
Lexington, KY 40506-0005
Phone: (859) 257-9102
Fax: (859) 257-1951
E-mail: Corey.Leslie@uky.edu

All communication with the University regarding this RFP shall only be directed to the purchasing officer listed above.

3.3 Pre-Proposal Conference

A pre-proposal conference will be held via Zoom on April 4th at 11:00 AM to allow prospective contractors an opportunity to ask questions and clarify the University's expectations. This conference provides offerors an opportunity for oral questions. Meeting Link: https://uky.zoom.us/j/82189512405

The following items should be noted in reference to the pre-proposal conference:

- Attendance at the pre-proposal conference is optional**.** At this conference, the scope of services will be discussed in detail.
- Offerors are encouraged to submit written questions after the conference by the date listed in Section 3.1.

The University will prepare written responses to all questions submitted and make them available to all offerors. The questions and answers will be made part of the RFP and may become part of the contract with the successful contractor. Answers given orally at the conference are not binding.

3.4 Offeror Presentations

All offerors whose proposals are judged acceptable for award may be required to make a presentation to the evaluation committee.

3.5 Preparation of Offers

The offeror is expected to follow all specifications, terms, conditions, and instructions in this RFP.

The offeror will furnish all information required by this solicitation.

Proposals should be prepared simply and economically, providing a description of the offeror's capabilities to satisfy the requirements of the solicitation. Emphasis should be on completeness and clarity of content. All documentation submitted with the proposal should be bound in the single volume except as otherwise specified.

Include in your proposal all relevant and important information which will help the selection committee evaluate your firm for this project. UK reserves the right to make a selection from proposals without conducting interviews.

An electronic version of the RFP, in .PDF format only, is available through the University of Kentucky Purchasing Division website at: https://purchasing.uky.edu/bid-and-proposal-opportunities.

3.6 Proposed Deviations from the RFP

The stated requirements appearing elsewhere in this RFP shall become a part of the terms and conditions of any resulting contract. Any deviations therefrom must be specifically defined in accordance with the transmittal letter, Section 4.3 (d). If accepted by the University, the deviations shall become part of the contract, but such deviations must not be in conflict with the basic nature of this RFP.

Note: Offerors shall not submit their standard terms and conditions as exceptions to the University's General Terms and Conditions. Each exception to the University's General Terms and Conditions shall be individually addressed.

3.7 Proposal Submission and Deadline

Offeror must provide the following materials prior to 3:00 p.m Lexington KY, time on the date specified in Section 3.1 and addressed to the purchasing officer listed in Section 3.2:

- **Technical Proposal:** One (1) copy on electronic storage device (USB) clearly marked with the proposal number and name, firm name and what is included (Technical Proposal) and One (1) printed original.

- **Financial Proposal:** One (1) copy on electronic storage device (USB) clearly marked with the proposal number and name, firm name and what is included (Financial Proposal) and One (1) printed original.

Note: Proposals received after the closing date and time will not be considered. In addition, proposals received via fax or e-mail are not acceptable.

The University of Kentucky accepts deliveries of RFPs Monday through Friday from 8 a.m. to 5 p.m. Lexington, KY time. However, RFPs must be received by 3 p.m. Lexington, KY time on the date specified on the RFP in order to be considered.

Proposals shall be enclosed in sealed envelopes to the above referenced address and shall show on the face of the envelope: the closing time and date specified, the solicitation number and the name and address of the offeror. The technical proposal shall be submitted in a sealed envelope and the financial proposal shall be submitted in a sealed envelope under separate cover. Both sealed envelopes shall have identical information on the cover, with the addition that one will state "Technical Information," and the other, "Financial Proposal."

Note: In accordance with the Kentucky Revised Statute 45A.085, there will be no public opening.

3.8 Modification or Withdrawal of Offer

An offer and/or modification of offer received at the office designated in the solicitation after the exact hour and date specified for receipt will not be considered.

An offer may be modified or withdrawn by written notice before the exact hour and date specified for receipt of offers. An offer also may be withdrawn in person by an offeror or an authorized representative, provided the identity of the person is made known and the person signs a receipt for the offer, but only if the withdrawal is made prior to the exact hour and date set for receipt of offers.

3.9 Acceptance or Rejection and Award of Proposal

The University reserves the right to accept or reject any or all proposals (or parts of proposals), to waive any informalities or technicalities, to clarify any ambiguities in proposals and (unless otherwise specified) to accept any item in the proposal. In case of error in extension or prices or other errors in calculation, the unit price shall govern. Further, the University reserves the right to make a single award, split awards, multiple awards or no award, whichever is in the best interest of the University.

3.10 Rejection

Grounds for the rejection of proposals include (but shall not be limited to):

- Failure of a proposal to conform to the essential requirements of the RFP.
- Imposition of conditions that would significantly modify the terms and conditions of the solicitation or limit the offeror's liability to the University on the contract awarded on the basis of such solicitation.
- Failure of the offeror to sign the University RFP. This includes the Authentication of Proposal and Statement of Non-Collusion and Non-Conflict of Interest statements.
- Receipt of proposal after the closing date and time specified in the RFP.

3.11 Addenda

Any addenda or instructions issued by the purchasing agency prior to the time for receiving proposals shall become a part of this RFP. Such addenda shall be acknowledged in the proposal. No instructions or changes shall be binding unless documented by a proper and duly issued addendum.

3.12 Disclosure of Offeror's Response

The RFP specifies the format, required information and general content of proposals submitted in response to this RFP. The purchasing agency will not disclose any portions of the proposals prior to contract award to anyone outside the Purchasing Division, the University's administrative staff, representatives of the state or federal government (if required) and the members of the committee evaluating the proposals. After a contract is awarded in whole or in part, the University shall have the right to duplicate, use or disclose all proposal data submitted by offerors in response to this RFP as a matter of public record.

Any submitted proposal shall remain valid six (6) months after the proposal due date.

The University shall have the right to use all system ideas, or adaptations of those ideas, contained in any proposal received in response to this RFP. Selection or rejection of the proposal will not affect this right.

3.13 Restrictions on Communications with University Staff

From the issue date of this RFP until a contractor is selected and a contract award is made, offerors are not allowed to communicate about the subject of the RFP with any University administrator, faculty, staff or members of the board of trustees except: the purchasing office representative, any University purchasing official representing the University administration, others authorized in writing by the purchasing office and University representatives during offeror presentations. If violation of this provision occurs, the University reserves the right to reject the offeror's proposal.

3.14 Cost of Preparing Proposal

Costs for developing the proposals and any subsequent activities prior to contract award are solely the responsibility of the offerors. The University will provide no reimbursement for such costs.

3.15 Disposition of Proposals

All proposals become the property of the University. The successful proposal will be incorporated into the resulting contract by reference.

3.16 Alternate Proposals

Offerors may submit alternate proposals. If more than one proposal is submitted, all must be complete (separate) and comply with the instructions set forth within this document. Each proposal will be evaluated on its own merits.

3.17 Questions

All questions should be submitted by either fax or e-mail to the purchasing officer listed in Section 3.2 no later than the date listed in Section 3.1.

3.18 Section Titles in the RFP

Section titles used herein are for the purpose of facilitating ease of reference only and shall not be construed to infer the construction of contractual language.

3.19 No Contingent Fees

No person or selling agency shall be employed or retained or given anything of monetary value to solicit or secure this contract, except bona fide employees of the offeror or bona fide established commercial or selling agencies maintained by the offeror for the purpose of securing business. For breach or violation of this provision, the University shall have the right to reject the proposal, annul the contract without liability, or, at its discretion, deduct from the contract price or otherwise recover the full amount of such commission, percentage, brokerage or contingent fee or other benefit.

3.20 Proposal Addenda and Rules for Withdrawal

Prior to the date specified for receipt of offers, a submitted proposal may be withdrawn by submitting a written request for its withdrawal to the University purchasing office, signed by the offeror. Unless requested by the University, the University will not accept revisions or alterations to proposals after the proposal due date.

3.21 Requirement To Perform Vendor Onboarding and Registration

As a condition of award, and for any renewals performed during the life of the contract, successful Contractor agrees to register their company with PaymentWorks, Inc., the University's vendor onboarding application. Registration information will be provided by the Purchasing Division as part of the award process. During the vendor registration process, successful Contractor agrees to provide any applicable information pertaining to diversity demographics for their company. Further, should any company or diversity information change during the life of the contract, successful Contractor agrees to update this information in PaymentWorks as applicable.

4.0 PROPOSAL FORMAT AND CONTENT

4.1 Proposal Information and Criteria

The following list specifies the items to be addressed in the proposal. Offerors should read it carefully and address it completely and in the order listed to facilitate the University's review of the proposal.

Proposals shall be organized into the sections identified below. The content of each section is detailed in the following pages. It is strongly suggested that offerors use the same numbers for the following content that are used in the RFP.

- Signed Authentication of Proposal and Statement of Non-Collusion and Non-Conflict of Interest Form
- Transmittal Letter
- Executive Summary and Proposal Overview
- Criteria 1 - Offeror Qualifications
- Criteria 2 - Services Defined
- Criteria 3 - Financial Proposal
- Criteria 4 - Evidence of Successful Performance and Implementation Schedule
- Criteria 5 - Other Additional Information

4.2 Signed Authentication of Proposal and Statements of Non-Collusion and Non-Conflict of Interest Form

The Offeror will sign and return the proposal cover sheet and print or type their name, firm, address, telephone number and date. The person signing the offer must initial erasures or other changes. An offer signed by an agent is to be accompanied by evidence of their authority unless such evidence has been previously furnished to the purchasing agency. The signer shall further certify that the proposal is made without collusion with any other person, persons, company or parties submitting a proposal; that it is in all respects fair and in good faith without collusion or fraud; and that the signer is authorized to bind the principal offeror.

4.3 Transmittal Letter

The Transmittal Letter accompanying the RFP shall be in the form of a standard business letter and shall be signed by an individual authorized to legally bind the offeror. It shall include:

- A statement referencing all addenda and written questions, the answers and any clarifications to this RFP issued by the University and received by the offeror (If no addenda have been received, a statement to that effect should be included.).
- A statement that the offeror's proposal shall remain valid for six (6) months after the closing date of the receipt of the proposals.
- A statement that the offeror will accept financial responsibility for all travel expenses incurred for oral presentations (if required) and candidate interviews.
- A statement that summarizes any deviations or exceptions to the RFP requirements and includes a detailed justification for the deviation or exception.
- A statement that identifies the confidential information as described in Section 6.23.

4.4 Executive Summary and Proposal Overview

The Executive Summary and Proposal Overview shall condense and highlight the contents of the technical proposal in such a way as to provide the evaluation committee with a broad understanding of the entire proposal.

As part of the Executive Summary and Proposal Overview, Offeror shall submit with their response a summarized profile describing the demographic nature of their company or organization:

1. When was your organization established and/or incorporated?
2. Indicate whether your organization is classified as local, regional, national, or international.
3. Describe the size of your company in terms of number of employees, gross sales, etc.
4. Is your company certified as small business, minority-owned, women-owned, veteran-owned, disabled-owned, or similar classification?
5. Include other demographic information that you feel may be applicable to the Request for Proposal submission.
6. Offeror shall describe in detail their company's commitment to diversity, equity, and inclusion. Information shall be provided as to the number of diverse individuals that the vendor employees as well as a description of vendors efforts to do business with Diverse Business Enterprises as they conduct their own business. In additional, please indicate the diversity nature of your company as well as ownership race/ethnicity.

Check One Only	Diverse Business Description (If Diverse Business, determine the classification that is the best description)	Internal Code
	Minority Owned (only)	10
	Veteran Owned and Small Business	100
	Minority and Woman and Small Business	110
	Minority and Woman and Veteran-Owned Business	120
	Minority and Veteran and Small Business	130
	Woman and Veteran and Small Business	140
	Minority and Woman and Veteran-Owned Small Business	150
	Woman Owned (only)	20
	Small Business (only)	30
	Veteran Owned (only)	40
	Minority and Woman Owned	50
	Minority and Small Business	60
	Minority and Veteran-Owned	70
	Woman Owned and Small Business	80
	Woman and Veteran-Owned	90
	Diversity not indicated	999

Race/Ethnicity	Check One
Asian	
Black/African American	
Hispanic or Latino	
Native American	
Native Hawaiian/Pacific Islander	
White	
Other	

4.5 Criteria 1 - Offeror Qualifications

The purpose of the Offeror Qualifications section is to determine the ability of the offeror to respond to this RFP. Offerors must describe and offer evidence of their ability to meet each of the qualifications listed below.

Our supply chains and business partnerships are an important aspect of this work. In your proposal, please (A) provide your company's mission and vision relative to sustainability, and (B) how your company, through services, products, and partnerships, will help the University of Kentucky advance specific elements of the Sustainability Strategic Plan.

4.6 Criteria 2 – Services Defined

1. The Offeror's ability to provide each of the services required listed in Section 7.1 as well as the project Drawings and Specifications.
2. The Offeror's ability to provide Warranty repair information and services in a timely manner.

4.7 Criteria 3 – Financial Proposal

The Financial Summary Form shall contain the complete financial offer made to the University using the format contained in Section 8.0. All financial information must be submitted in a sealed envelope under separate cover.

4.8 Criteria 4 – Evidence of Successful Performance and Implementation Schedule

1. Provide production and delivery schedule to the Site for controls equipment including Tier I and Tier II controllers, control valves, thermostats, and sensors. The selection for this project will be heavily influenced by the ability to deliver the equipment in a manner that can assist the Construction Manager in delivering the project on schedule.
2. Provide evidence of successful experience performing the work requested on previous projects at the University or with similar Institutions.

4.9 Criteria 5 – Other Additional Information

The offeror may present any creative approaches that might be appropriate. This applies to the equipment delivery and how the manufacturer will deal with supply chain logistics that may prevent certain components from being delivered to the factory on time. The offeror may also provide supporting documentation that would be pertinent to this RFP.

Offeror shall describe in detail their company's commitment to diversity, equity and inclusion. Information shall be provided as to the number of diverse individuals that the vendor employees as well as a description of vendors efforts to do business with Diverse Business Enterprises as they conduct their own business.

5.0 EVALUATION CRITERIA PROCESS

A committee of University officials appointed by the Chief Procurement Officer will evaluate proposals and make a recommendation to the Chief Procurement Officer. The evaluation will be based upon the information provided in the proposal, additional information requested by the University for clarification, information obtained from references and independent sources and oral presentations (if requested).

The evaluation of responsive proposals shall then be completed by an evaluation team, which will determine the ranking of proposals. Proposals will be evaluated strictly in accordance with the requirements set forth in this solicitation, including any addenda that are issued. The University will award the contract to the responsible offeror whose proposal is determined to be the most advantageous to the University, taking into consideration the evaluation factors set forth in this RFP.

The evaluation of proposals will include consideration of responses to the list of criteria in Section 4.0. Offerors must specifically address all criteria in their response. Any deviations or exceptions to the specifications or requirements must be described and justified in a transmittal letter. Failure to list such exceptions or deviations in the transmittal letter may be considered sufficient reason to reject the proposal.

The relative importance of the criteria is defined below:

Primary Criteria

- Offeror Qualifications
- Services Defined
- Financial Proposal
- Evidence of Successful Performance and Implementation including Delivery Date

Secondary Criteria

- Other Additional Services

The University will evaluate proposals as submitted and may not notify offerors of deficiencies in their responses.

Proposals must contain responses to each of the criteria, listed in Section 4 even if the offeror’s response cannot satisfy those criteria. A proposal may be rejected if it is conditional or incomplete in the judgment of the University.

6.0 ADDITIONAL TERMS

6.1 Project General and Special Conditions

Refer to and incorporate within the Offer the attached General Conditions and Special Conditions for these services. If there are conflicting information, between the documents and the sections listed below, the more stringent shall apply to this RFP.

6.2 Effective Date

The effective date of the contract shall be the date upon which the parties execute it and all appropriate approvals, including that of the Commonwealth of Kentucky Government Contracts Review Committee, have been received.

6.3 Competitive Negotiation

It is the intent of the RFP to enter into competitive negotiation as authorized by KRS 45A.085.

The University will review all proposals properly submitted. However, the University reserves the right to request necessary modifications, reject all proposals, reject any proposal that does not meet mandatory requirement(s) or cancel this RFP, according to the best interests of the University.

Offeror(s) selected to participate in negotiations may be given an opportunity to submit a Best and Final Offer to the purchasing agency. All information-received prior to the cut-off time will be considered part of the offeror's Best and Final Offer.

The University also reserves the right to waive minor technicalities or irregularities in proposals providing such action is in the best interest of the University. Such waiver shall in no way modify the RFP requirements or excuse the offeror from full compliance with the RFP specifications and other contract requirements if the offeror is awarded the contract.

6.4 Appearance Before Committee

Any, all or no offerors may be requested to appear before the evaluation committee to explain their proposal and/or to respond to questions from the committee concerning the proposal. Offerors are prohibited from electronically recording these meetings. The committee reserves the right to request additional information.

6.5 Additions, Deletions or Contract Changes

The University reserves the right to add, delete, or change related items or services to the contract established from this RFP. No modification or change of any provision in the resulting contract shall be made unless such modification is mutually agreed to in writing by the contractor and the Chief Procurement Officer and incorporated as a written modification to the contract. Memoranda of understanding and correspondence shall not be interpreted as a modification to the contract.

6.6 Contractor Cooperation in Related Efforts

The University reserves the right to undertake or award other contracts for additional or related work to other entities. The contractor shall fully cooperate with such other contractors and University employees and carefully fit its work to such additional work. The contractor shall not commit or permit any act which will interfere with the performance of work by any other contractor or by University employees. This clause shall be included in the contracts of all contractors with whom this contractor will be required to cooperate. The University shall equitably enforce this clause to all contractors to prevent the imposition of unreasonable burdens on any contractor.

6.7 Entire Agreement

The RFP shall be incorporated into any resulting contract. The resulting contract, including the RFP and those portions of the offeror's response accepted by the University, shall be the entire agreement between the parties.

6.8 Governing Law

The contractor shall conform to and observe all laws, ordinances, rules and regulations of the United States of America, Commonwealth of Kentucky and all other local governments, public authorities, boards or offices relating to the property or the improvements upon same (or the use thereof) and will not permit the same to be used for any illegal or immoral purposes, business or occupation. The resulting contract shall be governed by Kentucky law and any claim relating to this contract shall only be brought in the Franklin Circuit Court in accordance with KRS 45A.245.

6.9 Kentucky's Personal Information Security and Breach Investigation Procedures and Practices Act

To the extent Company receives Personal Information as defined by and in accordance with Kentucky's Personal Information Security and Breach Investigation Procedures and Practices Act, KRS 61.931, 61.932 and 61.933 (the "Act"), Company shall secure and protect the Personal Information by, without limitation: (i) complying with all requirements applicable to non-affiliated third parties set forth in the Act; (ii) utilizing security and breach investigation procedures that are appropriate to the nature of the Personal Information disclosed, at least as stringent as University's and reasonably designed to protect the Personal Information from unauthorized access, use, modification, disclosure, manipulation, or destruction; (iii) notifying University of a security breach relating to Personal Information in the possession of Company or its agents or subcontractors within seventy-two (72) hours of discovery of an actual or suspected breach unless the exception set forth in KRS 61.932(2)(b)2 applies and Company abides by the requirements set forth in that exception; (iv) cooperating with University in complying with the response, mitigation, correction, investigation, and notification requirements of the Act , (v) paying all costs of notification, investigation and mitigation in the event of a security breach of Personal Information suffered by Company; and (vi) at University's discretion and direction, handling all administrative functions associated with notification, investigation and mitigation.

6.10 Termination for Convenience

The University of Kentucky, Purchasing Division, reserves the right to terminate the resulting contract without cause with a thirty (30) day written notice. Upon receipt by the contractor of a "notice of termination," the contractor shall discontinue all services with respect to the applicable contract. The cost of any agreed upon services provided by the contractor will be calculated at the agreed upon rate prior to a "notice of termination" and a fixed fee contract will be pro-rated (as appropriate).

6.11 Termination for Non-Performance

Default

The University may terminate the resulting contract for non-performance, as determined by the University, for such causes as:

- Failing to provide satisfactory quality of service, including, failure to maintain adequate personnel, whether arising from labor disputes, or otherwise any substantial change in ownership or proprietorship of the Contractor, which in the opinion of the University is not in its best interest, or failure to comply with the terms of this contract;

- Failing to keep or perform, within the time period set forth herein, or violation of, any of the covenants, conditions, provisions or agreements herein contained;

- Adjudicating as a voluntarily bankrupt, making a transfer in fraud of its creditors, filing a petition under any section from time to time, or under any similar law or statute of the United States or any state thereof, or if an order for relief shall be entered against the Contractor in any proceeding filed by or against contractor thereunder. In the event of any such involuntary bankruptcy proceeding being instituted against the Contractor, the fact of such an involuntary petition being filed shall not be considered an event of default until sixty (60) days after filing of said petition in order that Contractor might during that sixty (60) day period have the opportunity to seek dismissal of the involuntary petition or otherwise cure said potential default; or

- Making a general assignment for the benefit of its creditors, or taking the benefit of any insolvency act, or if a permanent receiver or trustee in bankruptcy shall be appointed for the Contractor.

Demand for Assurances

In the event the University has reason to believe Contractor will be unable to perform under the Contract, it may make a demand for reasonable assurances that Contractor will be able to timely perform all obligations under the Contract. If Contractor is unable to provide such adequate assurances, then such failure shall be an event of default and grounds for termination of the Contract.

Notification

The University will provide ten (10) calendar days written notice of default. Unless arrangements are made to correct the non-performance issues to the University's satisfaction within ten (10)

calendar days, the University may terminate the contract by giving forty-five (45) days notice, by registered or certified mail, of its intent to cancel this contract.

6.12 Funding Out

The University may terminate this contract if funds are not appropriated or are not otherwise available for the purpose of making payments without incurring any obligation for payment after the date of termination, regardless of the terms of the contract. The University shall provide the contractor thirty (30) calendar days' written notice of termination under this provision.

6.13 Prime Contractor Responsibility

Any contracts that may result from the RFP shall specify that the contractor(s) is/are solely responsible for fulfillment of the contract with the University.

6.14 Assignment and Subcontracting

The Contractor(s) may not assign or delegate its rights and obligations under any contract in whole or in part without the prior written consent of the University. Any attempted assignment or subcontracting shall be void.

6.15 Permits, Licenses, Taxes

The contractor shall procure all necessary permits and licenses and abide by all applicable laws, regulations and ordinances of all federal, state and local governments in which work under this contract is performed.

The contractor must furnish certification of authority to conduct business in the Commonwealth of Kentucky as a condition of contract award. Such registration is obtained from the Secretary of State, who will also provide the certification thereof. However, the contractor need not be registered as a prerequisite for responding to the RFP.

The contractor shall pay any sales, use, personal property and other tax arising out of this contract and the transaction contemplated hereby. Any other taxes levied upon this contract, the transaction or the equipment or services delivered pursuant hereto shall be the responsibility of the contractor.

The contractor will be required to accept liability for payment of all payroll taxes or deductions required by local and federal law including (but not limited to) old age pension, social security or annuities.

6.16 Attorneys' Fees

In the event that either party deems it necessary to take legal action to enforce any provision of the contract and in the event that the University prevails, the contractor agrees to pay all expenses of such action including attorneys' fees and costs at all stages of litigation.

6.17 Royalties, Patents, Copyrights and Trademarks

The Contractor shall pay all applicable royalties and license fees. If a particular process, products or device is specified in the contract documents and it is known to be subject to patent rights or copyrights, the existence of such rights shall be disclosed in the contract documents and the Contractor is responsible for payment of all associated royalties. To the fullest extent permitted by law the Contractor shall indemnify, hold the University harmless, and defend all suits, claims, losses, damages or liability resulting from any infringement of patent, copyright, and trademark rights resulting from the incorporation in the Work or device specified in the Contract Documents.

Unless provided otherwise in the contract, the Contractor shall not use the University's name nor any of its trademarks or copyrights, although it may state that it has a Contract with the University.

6.18 Indemnification

The contractor shall indemnify, hold and save harmless the University, its affiliates and subsidiaries and their officers, agents and employees from losses, claims, suits, actions, expenses, damages, costs (including court costs and attorneys' fees of the University's attorneys), all liability of any nature or kind arising out of or relating to the Contractor's response to this RFP or its performance or failure to perform under the contract awarded from this RFP. This clause shall survive termination for as long as necessary to protect the University.

6.19 Insurance

The successful Contractor shall procure and maintain, at its expense, the following minimum insurance coverages insuring all services, work activities and contractual obligations undertaken in this contract. These insurance policies must be with insurers acceptable to the University.

COVERAGES	**LIMITS**
Workers' Compensation	Statutory Requirements (Kentucky)
Employer's Liability	$500,000/$500,000/$500,000
Commercial General Liability including operations/completed operations, products and contractual liability (including defense and investigation costs), and this contract	$1,000,000 each occurrence (BI & PD combined) $2,000,000 Products and Completed Operations Aggregate
Business Automobile Liability covering owned, leased, or non-owned autos	$1,000,000 each occurrence (BI & PD combined)

The successful contractor agrees to furnish Certificates of Insurance for the above described coverages and limits to the University of Kentucky, Purchasing Division. The University, its trustees and employees must be added as additional insured on the Commercial General Liability policy with regard to the scope of this solicitation. Any deductibles or self-insured retention in the above-described policies must be paid and are the sole responsibility of the contractor. Coverage is to be primary and non-contributory with other coverage (if any) purchased by the University. All of these required policies must include a Waiver of Subrogation (except Workers' Compensation) in favor of the University, its trustees and employees.

6.20 Method of Award

It is the intent of the University to award a contract to the qualified offeror whose offer, conforming to the conditions and requirements of the RFP, is determined to be the most advantageous to the University, cost and other factors considered.

Notwithstanding the above, this RFP does not commit the University to award a contract from this solicitation. The University reserves the right to reject any or all offers and to waive formalities and minor irregularities in the proposal received.

6.21 Reciprocal Preference

In accordance with KRS 45A.494, a resident offeror of the Commonwealth of Kentucky shall be given a preference against a nonresident offeror. In evaluating proposals, the University will apply a reciprocal preference against an offeror submitting a proposal from a state that grants residency preference equal to the preference given by the state of the nonresident offeror. Residency and non-residency shall be defined in accordance with KRS 45A.494(2) and 45A.494(3), respectively. Any offeror claiming Kentucky residency status shall submit with its proposal a notarized affidavit affirming that it meets the criteria as set forth in the above reference statute.

6.22 NOT USED

6.23 Confidentiality

The University recognizes an offeror's possible interest in preserving selected information and data included in the proposal; however, the University must treat such information and data as required by the Kentucky Open Records Act, KRS 61.870, et seq.

Information areas which normally might be considered proprietary, and therefore confidential, shall be limited to individual personnel data, customer references, formulae and company financial audits which, if disclosed, would permit an unfair advantage to competitors. If a proposal contains information in these areas and the offeror declares them to be proprietary in nature and not available for public disclosure, the offeror shall declare in the Transmittal Letter the inclusion of proprietary information and shall noticeably label as confidential or proprietary each sheet containing such information. Proposals containing information declared by the offeror to be proprietary or confidential, either wholly or in part, outside the areas listed above may be deemed non-responsive and may be rejected.

The University's General Counsel shall review each offeror's information claimed to be confidential and, in consultation with the offeror (if needed), make a final determination as to whether or not the confidential or proprietary nature of the information or data complies with the Kentucky Open Records Act.

6.24 Conflict of Interest

This Request for Proposal and resulting Contract are subject to provisions of the Kentucky Revised Statutes regarding conflict of interest and the University of Kentucky's Ethical Principles and Code of Conduct (www.uky.edu/Legal/ethicscode.htm). When submitting and signing a proposal, an offeror is certifying that no actual, apparent or potential conflict of interest exists between the interests of the University and the interests of the offeror. A conflict of interest (whether contractual, financial, organizational or otherwise) exists when any individual, contractor or subcontractor has a direct or indirect interest because of a financial or pecuniary interest, gift or other activities or relationships with other persons (including business, familial or household relationships) and is thus unable to render or is impeded from rendering impartial assistance or advice, has impaired objectivity in performing the proposed work or has an unfair competitive advantage.

Questions concerning this section or interpretation of this section should be directed to the University purchasing officer identified in this RFP.

6.25 NOT USED

6.26 Copyright Ownership and Title to Designs and Copy

The contractor and University intend this RFP to result in a contract for services, and both consider the products and results of the services to be rendered by the contractor hereunder to be a work made for hire. The contractor acknowledges and agrees that the work and all rights therein, including (without limitation) copyright, belongs to and shall be the sole and exclusive property of the University. For any work that is not considered a work made for hire under applicable law, title and copyright ownership shall be assigned to the University.

Title to all dies, type, cuts, artwork, negatives, positives, color separations, progressive proofs, plates, copy and any other requirement not stated herein required for completion of the finished product for use in connection with any University job shall be the property of and owned by the University. Such items shall be returned to the appropriate department upon completion and/or delivery of work unless otherwise authorized by the University. In the event that time of return is not specified, the contractor shall return all such items to the appropriate University department within one week of delivery.

6.27 University Brand Standards

The contractor must adhere to all University of Kentucky Brand Standards. University Brand Standards are maintained by the University Public Relations Office (UKPR) and can be viewed at http://www.uky.edu/prmarketing/brand-standards. Non-adherence to the standards can have a penalty up to and including contract cancellation. Only the UKPR Director or designee can approve exceptions to the University standards.

Graphics standards for the UK HealthCare areas are governed by UK HealthCare Clinical Enterprise Graphic Standards, found at: https://ukhealthcare.uky.edu/staff/brand-strategy.

Contractor warrants that its products or services provided hereunder will be in compliance with all applicable Federal disabilities laws and regulations, including without limitation the accessibility requirements of Section 255 of the Federal Telecommunications Act of 1996 (47 U.S.C. § 255) and Section 508 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794d), and its implementing regulations set forth at Title 36, Code of Federal Regulations, Part 1194. For purposes of clarity, updated regulations under Section 508 standards now incorporate WCAG 2.0, and for purposes of this agreement WCAG 2.0 Level AA compliance is expressly included. Contractor agrees to promptly respond to, resolve and remediate any complaint regarding accessibility of products or services in a timely manner and provide an updated version to University at no cost. If deficiencies are identified, University reserves the right to request from Contractor, a timeline by which accessibility standards will be incorporated into the products or services provided by Contractor and shall provide such a timeline within a commercially reasonable duration of time. Failure to comply with these requirements shall constitute a material breach of this Agreement and shall be grounds for termination of this Agreement.

Where any customized web services are provided, Contractor represents that it has reviewed the University's Web Policy and all products or services will comply with its published standards.

Contractor will provide University with a current Voluntary Product Accessibility Template (VPAT) for any deliverable(s). If none is available, Vendor will provide sufficient information to reasonably assure the University that the products or services are fully compliant with current requirements.

6.28 NOT USED

6.29 NOT USED

6.30 Payment Terms

The University adheres to a strategic approach regarding payables management based on risk minimization, processing costs, and industry best practices. As such, suppliers and individuals doing business with the University will be paid based on the following protocol:

1. The University utilizes Payment Plus (e-payables) as its primary default form of payment. By enrolling in Payment Plus, suppliers can receive payments immediately (all invoices will be paid immediately upon confirmation of goods receipt and invoice). The process is electronic and the supplier receives real-time payment notices. Additional information regarding Payment Plus (and enrollment form) can be found at: https://www.uky.edu/ufs/payment-plus-supplier-enrollment-form.

2. Payments by check. Payment terms for check payments are Net-30.

3. Individuals receiving payments from the University that require ACH direct payments will only be processed under special circumstances as approved by the Controller's office. Payment terms for ACH are Net-40.

7.0 SCOPE OF SERVICES

7.1 Detailed Services Defined

The Scope of Work/Supply is identified in the following Specification Section(s) and further described below:

200100	General
200200	Scope
202400	Identification
230200	HVAC Equipment
250200	Controls- Direct Digital

This section defines in summary, without limitations by the descriptions, significant items of the scope of work to be performed by the Subcontractor and any special provision related to the Subcontractor's execution of the Work and the Project. The details of the scope of work are further defined in Drawings, Specifications and other provisions contained in the project documents. This scope shall include all labor, material, equipment, services, and supervision necessary to complete all work as indicated on the plans and specifications and as further defined below.

1. The Scope to be included in this Request for Proposal is a complete building management system installed in the Jacobs Science Building and integrated into the University's Delta Center. The primary scope of the Controls contractor is identified on the IC Drawings and Specification 250200. Reference the Mechanical, Electrical, and Plumbing drawings for locations of items that have control sequences associated with them.
2. This package shall include providing Phoenix Control Valves included on the Mechanical HVAC drawings and installed.
3. Once awarded, this package shall be assigned to the successful Mechanical Contractor to manage and coordinate.
4. The BIM 3-D coordination process shall be as follows:
    a) The architect will provide their Revit model and initial BIM model provided by Ayoroa Simmons. The architect provides no assurances or liability for accuracy of the Revit model they provide. This model should be coordinated for major equipment. The Controls contractor shall provide additional input regarding conduit paths and device locations.
    b) The steel, fire protection, electrical, Controls, plumbing and mechanical subcontractors will design coordination shop drawings in a BIM format which can be imported into Navisworks for final clash detection.
    c) The mechanical subcontractor will receive 3D models from the above mentioned subcontractors and the architect, and shall be responsible for running clash detection using Navisworks. Each week, a clash detection report will be issued, and a weekly onsite coordination meeting including the applicable subcontractors will be held, and necessary adjustments made by each subcontractor to their 3D model. Revised 3D models will then

be sent to the mechanical contractor, and clash detection will be run again. This will be an ongoing process throughout coordination.

d) It will be the responsibility of the mechanical contractor to have a computer that has Navisworks and the BIM model on it for use in the coordination meeting.

e) All subcontractors will be responsible for including 3D models of their fixtures and equipment on their coordination drawings.

f) Models shall be updated throughout construction, and at project completion shall be turned over as a record document to the CM in both an electronic model and printed drawings.

g) The Controls subcontractor shall participate in the 3-D coordination process as described.

8.0 FINANCIAL OFFER SUMMARY

Offerors are to provide a fixed price for the services offered.

8.1 Mandatory Services (Section 7.1)

The Bidder agrees to furnish all materials, supplies, and services required to complete the Work, for the above referenced Project for the Capital Construction Procurement Section, University of Kentucky, as described in the RFP including Attachments and as modified by the Addenda listed above.

For the LUMP SUM OF _____
(USE WORDS)
_____ DOLLARS and _____
(USE WORDS)
CENTS.

($_____) USE FIGURES

8.2 Equipment Delivery

Controls

Final Equipment Shop Drawings Submitted _____ Days after notice to proceed.

Shipment Date* after receipt of Approved Shop Drawings:_____

Transportation to the Site will take:_____ Days

Final Control Sequences Shop Drawing Submitted _____ Days after notice to proceed. Contractor may indicate that this will be submitted simultaneous with the Equipment Shop Drawings.

*This is the number of days or weeks after approved Shop Drawings are returned that the unit will ship from the factory.

8.3 Alternate Pricing

In addition to the above financial offer, the offeror may submit alternative financial proposals, however the information requested above must be supplied and will be used for proposal evaluation purposes.

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION BY A CONSTRUCTION MANAGER AT RISK
University of Kentucky
Capital Construction Division

These General Conditions are binding upon the Construction Manager and all Sub-contractors as each are subject to the provisions contained herein.

ARTICLE 1 - DEFINITIONS

1.1 Wherever used in these General Conditions or in other Contract Documents, the following terms have the meaning indicated which are applicable to both the singular and plural thereof:

1.1.1 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS (ASI) - The term "ASI" means a written order issued by the Consultant that clarifies or interprets the Contract Documents, that orders minor changes in the Work, that does not require an adjustment in either cost or time, and that does not require a Change Order.

1.1.2 BUSINESS DAY – The term "Business Day" means a Calendar Day that is not a Saturday, Sunday or legal holiday in Fayette County, Kentucky.

1.1.3 CALENDAR DAY - The term "Calendar Day" means a day of twenty-four hours measured from midnight to the next midnight

1.1.4 CHANGE ORDER - The term "Change Order" means a written order to the Construction Manager, signed by the Owner and issued after the execution of the Contract, directing a change in the Work or an adjustment in the Contract Amount or the Contract Time. A Change Order may be an agreed change by the Construction Manager and the Owner or it may be a unilateral change by the Owner.

1.1.5 CONSULTANT - The term "Consultant" means the person and/or entity, whether singular or plural, either Architect, Engineer or other Consultant, who is or are identified as such in the Contract Documents.

1.1.6 CONSTRUCTION MANAGER or CONSTRUCTION MANAGER AT RISK (CM) - The term "Construction Manager" or "Construction Manager at Risk" (CM) means the person or entity who will or has entered into a contract with the Owner that assumes the risk for construction of the Project as the construction manager, and who will provide consultation and collaboration regarding the construction during and after design of the Project. The CM shall execute and hold all construction Trade Contracts and Purchase Orders for the Project.

1.1.7 CONTRACT - The term "Contract" means the Contract between Owner and Construction Manager and consists of all Contract Documents as defined in Article 1.1.10 of these General Conditions.

1.1.8 CONTRACT AMOUNT - The term "Contract Amount" means the sum stated in the Agreement which represents the total amount payable by the Owner to the Construction Manager for the performance of the Work under the Contract Documents, plus or minus adjustments as provided for in the Contract Documents or by approved Change Orders.

1.1.9 CONTRACT DOCUMENTS - The "Contract Documents" include the Agreement of Contract between the Owner and the Construction Manager (the "Agreement"); the Request for Proposal; the General Conditions; the Special Conditions; the Construction Manager's Form of

Proposal; the Construction Manager's Bonds; the Specifications, Drawings and Addenda for the construction of the Project which are to be used for bidding of the bid pack/Trade Contracts; and any Change Orders issued after execution of this Contract. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Owner and any Sub-contractor, or any person or entity other than the Construction Manager. Documents not included or expressly contemplated in this Article do not, and shall not, form any part of the Contract for Construction. Without limiting the generality of the foregoing, shop drawings and other submittals from the Construction Manager or its Sub-contractors and suppliers do not constitute a part of the Contract Documents. Except as otherwise provided, where these Contract Documents obligate the Construction Manager to certain responsibilities or require the Construction Manager to perform certain actions, the Construction Manager may require these same responsibilities and/or actions of one or more Sub-contractors. However, assignment of such responsibilities or actions to one or more Sub-contractors shall not be construed to relieve the Construction Manager of its obligation to the University under this contract.–

1.1.10 CONTRACT TIME - The term "Contract Time", unless otherwise provided, means the specified number of consecutive Calendar Days following the stipulated commencement of the Work as stated in the Work Order, plus or minus adjustments as provided for by approved Change Orders, within which the Construction Manager shall complete the Work required by the Contract and shall achieve certification of substantial and final completion.

1.1.11 KRS REFERENCES - Reference to “KRS” means the "Kentucky Revised Statutes" adopted by the Commonwealth of Kentucky, including all laws that may have been revised, amended, supplemented or new laws enacted.

1.1.12 OWNER - The term "Owner" means the University of Kentucky, a statutory body corporate existing pursuant to Sections 164.100 et seq. of the Kentucky Revised Statutes.

1.1.13 PROJECT - The term "Project" means the total construction of the Work performed under the Contract Documents, which may be the whole or a part, and which may include construction by the Owner or by separate contracts.

1.1.14 PROJECT MANAGER - The term "Project Manager", when used alone, means the Owner's representative responsible for administration and management of the Project. The Owner's Project Manager during construction shall be the designated University of Kentucky Capital Projects Management Project Manager that is in charge of the Project. The term “CM Project Manager” means the individual employed by the Construction Manager who is assigned to the Project to provide overall management during both the design and construction phases of the Project, and who has total responsibility for the successful completion of the Project

1.1.15 PROVIDE - The term "Provide," as used throughout the specifications, shall mean furnish, install and pay for.

1.1.16 SHOP DRAWINGS - The term "Shop Drawings" means drawings, diagrams, schedules, and other data specially prepared for the Work by the Construction Manager or any Sub-contractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

1.1.17 SUBSTANTIAL COMPLETION - The term "Substantial Completion" is the point at which, as certified in writing by the Owner, a project is at the level of completion, in strict compliance with the contract, where (a) necessary approval by public regulatory authorities (and by other authorities having jurisdiction or as identified in Article 11.2, as necessary) has been given; (b) the Owner has received all required warranties and documentation, and (c) the Owner may enjoy beneficial use or

occupancy and may use, operate, and maintain the project in all respects, for its intended purpose. Partial use or occupancy shall not necessarily result in the project being deemed substantially complete and shall not be evidence of Substantial Completion. In order for the Owner to enjoy beneficial use or occupancy and use, operate, and maintain the project in all respects, for its intended purpose, the stage or progress of the Work or a designated portion thereof shall be sufficiently complete, accessible, operable and usable, and all parts, systems and site Work shall be 100% complete, cleaned and available for the Owner's full use without interruption in accordance with the Contract Documents, including but not limited to the provisions of Article 28 of these General Conditions. The Work will not be considered acceptable for Substantial Completion review until all Project systems included in the Work are operational as designed and scheduled, all designated or required governmental inspections and certifications have been made and approvals provided to the Owner, designated instruction of the Owner's personnel in the operation of systems has been completed, and all final finishes within the Contract Documents are in place. In general, the only remaining Work shall be minor in nature so that the Owner and/or the Owner's tenants could occupy the Project on that date and the completion of the Work by the Construction Manager would not materially interfere or hamper the Owner's or the Owner's tenants' normal business operations. As a further condition of Substantial Completion acceptance, the Construction Manager shall certify in writing that all remaining Work, the same being solely of a "punch list" nature, will be completed within thirty (30) consecutive Calendar Days following the date of Substantial Completion.

1.1.17.1 The parties agree that "substantial completion" as defined in Article No. 2 of the Agreement and Article 1 of the General Conditions, as extended by approved Change Order(s) pursuant to Article 18.1 of the General Conditions, shall be the "date of completion specified in the contract" for purposes of KRS. 45A.250(2).

1.1.18 SUB-CONTRACTOR - The term "Sub-contractor" means the person, company, corporation, joint venture or other legal entity with whom the Construction Manager has executed a Contract for a portion of the Work.

1.1.19 WORK - The term "Work" means the scope of construction and services required by the Contract Documents and all approved Change Orders, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Construction Manager to perform and complete the Construction Manager's obligations under the Contract in an expeditious, orderly and workmanlike manner. The Work may constitute the whole or a part of the Project.

1.1.20 WORK ORDER - The term "Work Order" means a written notice by the Owner to the Construction Manager authorizing the Construction Manager to commence Work under the Contract and establishing the beginning date from which the time for Substantial and Final Completion shall be established.

1.1.21 UNIT PRICE - The term "Unit Price" means the amount per unit of measurement for materials or services as described in the bid documents.

ARTICLE 2 - CONSULTANT

2.1 The Consultant will be the Owner's representative during construction and until the Work is complete. The Consultant will advise and consult with the Owner. The Owner's instructions to the Construction Manager may be forwarded through the Consultant.

2.2 The Consultant will regularly, but no less frequently that monthly, visit the site to become familiar with the progress of the Work, the quality of the Work being provided and to determine if the

Work is proceeding in accordance with the Contract Documents. On the basis of these on-site inspections, the Consultant will inform the Owner of the progress of the Work, will advise the Owner of any defects and deficiencies observed in the Work and, when appropriate, will certify to the Owner that the Work in place equals or exceeds the amount requested by the Construction Manager on all applications for progress payments.

2.2.1 If applicable for the Work, the Consultant will verify to the Owner that the Construction Manager is performing erosion prevention and sediment control inspections as required by the Kentucky Division of Water Construction General Permit (KYR10) at least once every 7 days and shall include the findings in the site visit reports.

2.3 The Consultant will be the interpreter of the requirements of the drawings and specifications and any changes made to the drawings and specifications.

2.4 Claims, disputes, and other matters in question that arise relating to the execution or the progress of the Work shall be referred in writing to the Consultant by the Construction Manager. The Consultant will provide a response in accordance with and subject to the provisions of Article 38 of these General Conditions.

2.5 The Consultant will have the authority to reject Work which does not conform to the Contract Documents or to the required level of quality and performance.

2.6 The Consultant will review and approve, or take other appropriate action upon receipt of the Construction Manager's submittals such as Shop Drawings, product data, and samples. The review of submittals will be for general conformance with the design concept of the work, and for compliance with the information provided by the Contract Documents. Such review will not relieve the Construction Manager of any responsibility for errors or omissions in submittals, and will in no way constitute a waiver of or change to the requirements of the Contract Documents.

2.6.1 The Consultant’s review and response will be completed with reasonable promptness with a goal of ten (10) business days or less. The Consultant’s review of a specific item shall not indicate approval of an assembly of which the item is a component.

2.7 The Consultant will prepare Change Orders for the Owner to direct changes in the Work. Minor changes in the Work, not involving modifications to the contract cost or completion times and that are consistent with the purpose of Work, may be directed by the Consultant through Architect’s Supplemental Instructions (ASI).

2.8 When requested by the Construction Manager, the Consultant will conduct inspections to determine if the Project is at the level of completion required by and is in strict compliance with the Contract such that the Owner may enjoy beneficial use or occupancy and may use, operate, and maintain the project in all respects for its intended purpose, as further defined in the Contract. If the level of completion warrants, the Consultant will confirm that all necessary approvals by public regulatory authorities or other authorities having jurisdiction have been given, will confirm that the Owner has received all required warranties and documentation, will recommend dates for certification of Substantial Completion and Final Completion by the Owner, and will complete and submit the Notice of Termination of coverage under the KPDES General Permit for Storm Water Discharges Associated with Construction Activity.

2.9 The Construction Manager will accept direction for the Work on the Project only from the Owner's Project Manager or from the Consultant. Requests for information from the Construction Manager shall be directed to the Consultant.

ARTICLE 3 - CORRELATION AND INTENT OF CONTRACT DOCUMENTS

3.1 Execution of the Contract by the Construction Manager is a representation that the Construction Manager has or shall thoroughly and carefully examine the site of the of Work; shall timely investigate all conditions which can affect the Work or its cost, including but not limited to availability of labor, materials, supplies, water, electrical power, roads, access to the site, uncertainties of weather, water tables, the character of equipment and facilities needed to perform the Work, and local conditions under which the Work is to be performed; and further, that the Construction Manager shall insure that the documents issued for bidding by Sub-contractors reflect the results of this investigation and are adequate to complete the Work. It is the responsibility of the Construction Manager to be familiar with and comply with all Federal, State, and local laws, ordinances, and regulations which might affect those engaged in the Work, and to be familiar with the materials, equipment, or procedures to be used in the Work, or which in any other way could affect the completion of the Work. The Construction Manager shall carefully study and compare the Contract Documents with each other and with other information provided to the Construction Manager by the Consultant or the Owner pursuant to the Contract Documents and shall notify the Owner and the Consultant in writing of any errors, inconsistencies or omissions in the Contract Documents recognized by the Construction Manager. Any failure to properly familiarize itself with the proposed Work shall not relieve the Construction Manager from the responsibility for completing the Work in accordance with the Contract Documents.

3.2 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Construction Manager. All labor or materials which are reasonably inferable from the Contract Documents and which are necessary to produce the desired result, even though not specifically mentioned in the Contract Documents, shall be included in the Work at no additional cost to the Owner.

3.3 In the event a question arises regarding the meaning or intent of the Contract Documents, the Construction Manager shall report it by preparing an RFI in eCommunication® to the Consultant. The Consultant shall furnish, with reasonable promptness and with a goal of three (3) business days and by whatever means as may be appropriate, additional instructions necessary for the proper execution of the Work. All such drawings and instructions shall be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom. The Work shall be executed in conformity therewith and the Construction Manager shall do no Work without proper drawings and instructions. Items indicated on drawings as "N.I.C." or "Not In Contract" are shown for explanation purposes only and are not to be included in this Contract.

3.4 The Contract Documents are complementary, and what is required by one shall be binding as if required by all. In case of conflicts between the various documents, the order of precedence will be as follows: (1) Addenda, (2) Special Conditions, (3) General Conditions, (4) Technical provisions of the Specifications and (5) Drawings.

3.5 Any notice to the Construction Manager from the Owner regarding this Contract shall be in writing and delivery and service of such notice shall be considered complete when sent by certified mail to the Construction Manager at Construction Manager's last known address. Such notice may also, at the Owner's election, be hand-delivered to the Construction Manager or the Construction Manager’s authorized representative.

ARTICLE 4 - PRE-CONSTRUCTION CONFERENCE

4.1 Following the execution of the Contract, a pre-construction conference will be held. Representatives of the Capital Project Management Division, Consultant, Construction Manager, and all major Sub-contractors shall be present to discuss the time for construction, methods and plan of operation, authority of the Consultant, procedures for handling shop drawings, progress estimates and requests for payments, and other relevant issues. The time and location of this meeting will be the responsibility of the Construction Manager in consultation with the Consultant, Owner and other interested parties.

4.2 Environmental aspects of the project, including erosion prevention and sediment control (EPSC) and storm water management shall be discussed during this conference. The Group shall discuss the Storm Water Pollution Prevention Plan (SWPPP) to ensure that all parties understand the requirements. During this meeting the responsibility for reading the rain gage on a daily basis will be established. The Construction Manager will identify the initial measures to be installed prior to land disturbing activities beginning. Any modifications to the SWPPP due to constructability issues should be discussed at this conference.

ARTICLE 5 - SHOP DRAWINGS

5.1 The Construction Manager shall submit a shop drawing and product sample submittal schedule to the Consultant establishing dates for the submission of Shop Drawings and product samples prior to the submittal of the Construction Manager's first application for payment for construction phase services. The schedule shall have been coordinated with all Sub-contractors and material suppliers as well as the Construction Manager’s construction schedule and shall allow for adequate and reasonable time for review of the samples and submittals by the Consultant. The Construction Manager shall be responsible for compliance with the submittal schedule and shall insure that the submittal schedule is maintained in order to accurately reflect the status of processing all required submittals.

5.2 The Construction Manager shall review product samples and Shop Drawings for compliance with the requirements of the Contract Documents, and shall submit them to the Consultant in accordance with submittal procedure and schedule established. The Construction Manager's review and submittal to the Consultant of any Shop Drawing or sample shall constitute a representation to the Owner and Consultant that a) the Construction Manager has determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or assumes full responsibility for doing so, and that b) each Shop Drawing or sample has been reviewed or coordinated with the requirements of the Work and the Contract Documents. Shop Drawings and submittal requirements shall not be deemed satisfied until approvable documents are received by the Consultant. Incorrect or incomplete submittals will be returned to the Construction Manager without action. No claim for additional time or extension of the contract will be considered if such claim is the result of failure by the Construction Manager to provide correct, accurate, complete and approvable submittals.

5.3 The Consultant will review submittals with reasonable promptness, and take appropriate action or return submittals to the Construction Manager for corrections as may be required. The Construction Manager shall make any corrections required by the Consultant for compliance with the Contract and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. The Construction Manager shall direct specific attention, in writing, or on resubmitted Shop Drawings, to revisions other than the corrections called for by the Consultant on previous submissions.

5.4 Where a Shop Drawing or sample submission is required by the specifications, no related Work shall be commenced until the submission has been accepted in writing by the Consultant. The review and acceptance shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The acceptance of a separate item will not indicate acceptance of the assembly in which the item functions. A copy of each accepted Shop Drawing and product sample shall be kept in good order by the Construction Manager at the site and shall be made available to the Consultant on request.

5.5 The Consultant's acceptance of Shop Drawings or samples shall not relieve the Construction Manager from the responsibility for any deviations from the requirements of the Contract Documents unless the Construction Manager has in writing called the Consultant's attention to such deviation at the time of submission and the Consultant has given written approval to the specific deviation. Any acceptance by the Consultant does not relieve the Construction Manager from responsibility for errors or omissions in the Shop Drawings.

ARTICLE 6 - LAYING OUT WORK

6.1 The Construction Manager will secure all data at the site of the building such as grades of lot, convenience of receiving and sorting material, location of public services, and other information which will have a bearing proposals or on the execution of the Work and shall address these issues in the preparation of scopes of work for the Subcontract bid packages. No allowance shall be made for failure of the Construction Manager to obtain such site information prior to submitting their proposal or to include such information in the Subcontract bid packages, and no adjustment to the Construction Manager's Contract amount or stipulated time for completion shall be allowed when due to failure by the Construction Manager to do so.

6.2 The Construction Manager shall be responsible for all lines, levels and measurements of all Work executed under the Contract. The Construction Manager shall verify all dimensions before laying out the Work and will be held responsible for any error resulting from failure to do so. Working from lines and levels established by the property survey or by other Contract Documents, and as shown in relation to the Work, the Construction Manager will establish and maintain bench marks and other dependable markers to set lines and levels for Work at each area of construction and elsewhere on the site as needed to properly locate each element of the entire Project. The Construction Manager shall calculate and measure from the bench marks and dependable markers required dimensions as shown (within recognized tolerances if not otherwise indicated), and shall not scale drawings to determine dimensions. The Construction Manager shall advise Sub-contractors and trades persons performing Work of marked lines and levels provided for their use in layout work. The Construction Manager shall verify layout information shown on drawings as required for the Work.

6.3 The Construction Manager shall be responsible for coordination of the installation of all elements of the Work, including preparation of coordination drawings if required by the Contract Documents or deemed necessary by the Construction Manager for performance of the Work.

6.4 If any encroachments are made by the Construction Manager or any Sub-contractor on any adjacent property, the Construction Manager shall, at the Construction Manager's expense, and within thirty (30) Calendar Days after written notice from the Owner or the Consultant, correct any encroachments and obtain approval from the owner of such adjacent property for any encroachments that cannot be feasibly corrected. The Construction Manager shall not be entitled to any adjustment to the Contract Amount or the Contract Time as a result of any such encroachment or the correction thereof.

ARTICLE 7 - PLANS, DRAWINGS, SPECIFICATIONS AND RECORD DRAWINGS

7.1 Unless otherwise provided in the Contract Documents, the Owner will furnish the Construction Manager free of charge one electronic or reproducible copy of the Drawings and Specifications for execution of the Work. The Construction Manager shall pay for the cost of duplication of all sets required over and above this amount.

7.2 The cost of additional plans, specifications and official contract documents for use by Sub-contractors for bidding and for construction shall be borne by the Construction Manager or by the Sub-contractors. Arrangements for orders and payment for plans, specifications and other contract documents must be made with Lynn Imaging, Lexington, Kentucky (http://www.ukplanroom.com) or by phone at 1.800.888.0693 or 859.255.1021) before a set of documents will be issued.

7.3 The Construction Manager shall keep one copy of all Contract Documents, including Drawings, Specifications and Shop Drawings on the site and in good order. A qualified representative of the Construction Manager shall record on these documents, from day to day as Work progresses, all changes and deviations from the Contract Documents. Prior to Substantial Completion, the Construction Manager shall complete and turn over to the Consultant the As-Built drawings, with a digital copy (in PDF format) submitted to the Owner simultaneously. The As-Built drawings shall consist of a set of drawings which indicate all field changes that were made to adapt to field conditions, changes resulting from Change Orders and all concealed and buried installations of piping, conduit and utility services. All buried and concealed items, both inside and outside the facility, shall be accurately located on the As-Built drawings as to depth and in relationship to not less than two permanent features such as interior or exterior wall faces. The As-Built drawings shall be clean and all changes, corrections and dimensions shall be given in a neat and legible manner in a contrasting color. For any changes or corrections in the Work which are made subsequent to the Substantial Completion Inspection, revisions shall be made to the As-Built drawings and submitted to the Consultant prior to final payment. Approval of the final payment request shall be contingent upon compliance with these provisions.

7.4 All drawings, specifications and copies thereof, furnished by the Consultant to the Owner, are the property of the University of Kentucky. They shall not be used by the Consultant, Construction Manager, or any Sub-contractor or Supplier on any other Project.

ARTICLE 8 - TEMPORARY UTILITIES

8.1 The Construction Manager shall provide and pay for, unless modified in the Special Conditions, all temporary conveniences including, but not limited to, wiring, lighting, power and electrical outlets, heat, water, and sanitary facilities required for construction. In the event the Owner elects to make available, at no cost to the Construction Manager, the electric power required for construction activities, the electric power supplied shall not be utilized as a means to provide temporary heat or for welding.

8.2 The Construction Manager is responsible for paying all utility costs, whether the costs are from an outside utility company or from the University, for utility services used in the course of completing the Work. The Construction Manager shall provide temporary heating, ventilation, telephones, water, electricity, portable gas, lighting for the Work, safety lighting, security lighting, and trash removal/dumpster service for both Construction Manager and Sub-contractor use during the Project. Work and safety lighting shall be provided continuously during working hours. Security lighting shall be provided at all hours of darkness.

ARTICLE 9 - MATERIALS, EQUIPMENT, APPLIANCES, AND EMPLOYEES

9.1 Unless otherwise provided in the Contract Documents, the Construction Manager shall provide and pay for all materials, labor and personnel, tools, equipment, construction equipment and machinery, utilities, supplies, appliances, transportation, taxes, temporary facilities, licenses, permits and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and the proper execution and completion of the Work safely, without damage to persons and property, and in compliance with all applicable law. The Construction Manager shall furnish, erect, maintain, and remove at the completion of the Contract, all temporary installations as may be required during the construction period.

9.2 Immediately following the execution of each of the Trade Contracts, the Construction Manager shall determine the source of supply for all materials required under that Trade Contract and the length of time required for their delivery, and shall assure that orders are placed for such materials in sufficient time to assure delivery to the site so that such materials are available to be incorporated into the Work when needed to comply with the schedule of Work.

9.3 The Construction Manager shall immediately notify the Consultant in writing of any known problems with the procurement, fabrication or ordering of any materials. Unless changes are approved in writing by the Consultant, the Construction Manager will not be excused for delays in securing materials specified.

9.4 The Construction Manager or Sub-contractors shall not place purchase orders or issue contracts for materials, supplies, equipment and services necessary to complete this Project using the name of the University of Kentucky. All orders placed by the Construction Manager that are related to this Project must use the name of the Construction Manager or Sub-contractor placing the order. The use of the University of Kentucky's name for ordering purposes is strictly prohibited. Payment for all goods and services required for the completion of the Work is the sole responsibility of the Construction Manager. Any invoices received at the University that are related to this Project will be immediately forwarded to the Construction Manager. Copies of these invoices will be made and placed in the Construction Manager's file and proof must be provided that these invoices have been paid in full prior to the processing of the next scheduled application for progress payment.

9.5 The route for delivery of all materials to the Project shall be coordinated with the Owner's Project Manager.

9.6 The Construction Manager shall be responsible for the proper and adequate storage of materials and equipment. Unless otherwise provided in the Contract Documents, all materials shall be of good quality and new. Workmanship and materials supplied and incorporated into this Work shall be of first quality. The Construction Manager, if required, shall furnish satisfactory evidence as to the kind and quality of materials.

9.7 The Construction Manager shall at all times enforce strict discipline and good order among all employees and Sub-contractors. The conduct of all individuals performing Work or operations related to the Work is the responsibility of the Construction Manager. The consumption of alcohol or drugs on the job by any workers is strictly prohibited. Any individual apprehended under the influence of alcohol or drugs on the premises at any time shall be subject to automatic removal from the Project by the Construction Manager, the Consultant or the Owner. Improper conduct of any kind will not be permitted and may result in the offending individual, Sub-contractor or Construction Manager being barred from the Owner's premises. The Construction Manager shall not permit the employment on the Project of any person unfit or not skilled in the Work assigned.

ARTICLE 10 - ROYALTIES AND PATENTS

10.1 The Construction Manager shall pay all royalties and license fees. If a particular process, product or device is specified in the Contract Documents and it is known to be subject to patent rights or copyrights, the existence of such rights shall be disclosed in the Contract Documents and the Construction Manager is responsible for payment of all associated royalties. The Construction Manager hereby agrees to indemnify, defend and hold the Owner, and any subsidiary, parent, or affiliates of the Owner, or other persons or entities designated by the Owner, and their respective directors, officers, agents, employees and designees (collectively, the "Indemnities") harmless from all losses, claims, liabilities, injuries, damages and expenses, including attorneys' fees and legal expenses, that the Indemnities may incur as a result of the Construction Manager's failure to strictly comply with its obligations under this Paragraph 10.1.

ARTICLE 11 - SURVEYS, PERMITS, REGULATIONS, AND STANDARD CODES

11.1 The Owner will furnish only such surveys that are specifically required by the Contract Documents. Approvals, assessments, and easements for permanent structures or permanent changes in existing structures shall be secured and paid for by the Owner, unless otherwise specified. All required utility tap-on fees shall be secured and paid for by the Construction Manager, or included in a Trade Contract, including the Lexington-Fayette Urban County Government (LFUCG) sewer tap-on fee**.** All construction permits, where required by local ordinances, except excavation permit, shall be obtained by the Construction Manager, but no fee shall be charged to or paid by the Construction Manager as the Owner is exempt from such charges. A Contractor's license fee for doing business in the locale, if applicable, shall be paid for by the Construction Manager.

11.2 All branches of Work shown on the plans and specifications shall be executed in strict compliance with all state and federal regulations and codes, with all national codes, and with the requirements of both ADA and JCAHO when applicable.

11.3 The Contractor, on projects disturbing 1 acre or more, or projects less than 1 acre that are part of a large common development plan, including grading, clearing, excavation, material laydown or other earth moving activities, shall assure full compliance with the requirements of the KYR10 and shall:

11.3.1 File a Notice of Intent (KPDES FORM eNOI-SWCA) with the Kentucky Division of Water and copy the UKCPM Project Manager and Water Quality Manager prior to the start of any excavation, grading or site development work.

11.3.2 The permittee (contractor) shall develop a Stormwater Pollution Prevention Plan (SWPPP) based on the Erosion Prevention and Sediment Control Plan (EPSC) as a minimum design standard. Ensure all requirements of KYR10 are fully addressed in the SWPPP. **Once the SWPPP is written, forward a copy to the Capital Projects Project Manager and to the Water Quality Manager for approval. Work cannot begin until SWPPP is approved and permit coverage obtained.**

11.3.3 Install BMP's such as, basins, traps, drainage, and sediment barriers before beginning land disturbing activities, including the construction entrance/exit. Once prevention measures have been installed, grading can commence. In the event a new construction entrance is added to the site, this new entrance must be built according to the EPSC design details with a wheel wash, a water supply and a sediment catch basin for washed wheel sediment.

11.3.4 Maintain all measures in working condition. Perform maintenance activities identified during inspections prior to the next rain event. Remove sediment from BMPs when 1/3 the storage volume has been filled.

11.3.5 Stabilize disturbed areas within 14 days of inactivity or reaching final grade on any portion of the site according to permit requirements.

11.3.6 Inspect the site every 7 calendar days and after each rainfall of ½"or more. Document site conditions, rainfall, maintenance activities needed and performed, stabilization needed and performed, and where new measures are needed. Discuss deficiencies with UK Project Manager and Water Quality Manager and note on the SWPPP Inspection Sheets.

Per the KPDES Permit, Section 2.1.7. "Inspections – Permittee Conducted". "Inspections shall be performed by personnel knowledgeable and skilled in assessing conditions at the construction site that could impact storm water quality and assessing the effectiveness of erosion prevention measures, sediment control measures, and other site management practices chosen to control the quality of the storm water discharges. Inspectors shall have training in storm water construction management such as Kentucky Erosion Prevention & Sediment Control (KEPSC), Certified Professional in Stormwater Quality (CPSWQ), Certified Erosion, Sediment and Stormwater Inspector (CESSWI), or other similar training."

Inspections shall include a tour of the total site and verification that all BMPs are performing as constructed. Inspector shall certify that all observations are correct as stated and sign and date the inspection form.

11.3.7 Keep Permit, SWPPP, weekly/rain event inspections sheets in binder in construction trailer. Any BMP change/alteration from SWPPP and EPSC plan must be noted on the EPSC and SWPPP.

11.3.8 **No soil and sediment shall leave the construction site. BMPs shall be repaired immediately if failure has occurred. No Mud shall be permitted on any street. All entrances/exits shall have a means by which to wash wheels. If an entrance/exit does not have a wheel wash, that exit shall not be used in muddy conditions. If for any reason mud is tracked offsite, the area must be cleaned in such a way as to prevent sediment from entering the storm sewer system. The use of tractor brooms solely will not be permitted.**

11.3.9 When it is necessary to dewater an excavation, proper BMPs must be implemented. Dewatering filter bags must be sized and used according to manufacturer's requirements and Standard Operating Procedures for Dewatering Bags.

11.3.10 UK (the MS4) routinely inspects sites for compliance with the EPSC/SWPPP. Any deficiencies noted become record for the Kentucky Division of Water and shall be remedied/installed as soon as site conditions are favorable but no more than 7 days from the inspection date.

11.3.11 At the conclusion of the project and all bare areas, slopes and ditches are 70% vegetated with the permanent ground cover, the contactor shall notify the UK Project Manager and Water Quality Manager and request a final site inspection prior to filing a "Notice of Termination (NOT) with the state. This inspection verifies that Construction BMPs can be removed, and Post-Construction BMPs are in place and functioning.

11.3.12 **Failure of the site contractor (permitee of the KPDES Permit) to timely comply with requirements of KPDES, the Construction Manager shall inform the site contractor that a third party contractor shall be retained to remediate all BMP deficiencies immediately, and all third party costs shall be passed to the permitee of the KPDES Permit. Any fines or other costs**

resulting from failure to comply, levied against the Owner will be assessed against the Construction Manager's or General Constructor's funds.

11.3.13 Refer to 334000S01 STORM DRAINAGE UTILITIES – Information for Consultants & Contractors.

11.3.14 Reference to standards, codes, specifications, and regulations refer to the latest edition of printing in effect at the date of issue shown in the Contract Documents unless another date is implied by the suffix number of the standard.

11.4 Reference to standards, codes, specifications, and regulations refer to the latest edition of printing in effect at the date of issue shown in the Contract Documents unless another date is implied by the suffix number of the standard

11.5 The Construction Manager shall furnish a final occupancy permit from the proper agency or agencies as required.

11.6 The Construction Manager shall, by provision within each applicable subcontract or by inclusion in the lump sum fee proposed to the Owner, insure the payment of all sales, consumer, use and similar taxes for materials, equipment and supplies incorporated into the Work, by unless otherwise specified in the bid documents.

ARTICLE 12 - PROTECTION OF WORK, PROPERTY, AND PUBLIC

12.1 The Construction Manager shall continuously maintain adequate protection of all Work from damage and shall protect the Owner's property from injury or loss arising in connection with this Contract. Except as otherwise covered by Builder's Risk insurance, the Construction Manager shall pay for any damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or caused by agents or employees of the Owner. The Construction Manager shall adequately protect adjacent property as provided by law and the Contract Documents.

12.2 In an emergency affecting the safety of life, or of the Work, or of adjoining property, the Construction Manager, without special instruction or authorization from the Consultant or the Owner, is obligated to act to prevent such threatened damage, loss or injury.

12.3 The Construction Manager shall maintain fire protection as required by the Kentucky Building Code. Access to the Project site and surrounding buildings for local fire truck access during construction must be maintained. The Construction Manager shall maintain construction to allow access to new, existing or temporarily relocated standpipes, fire hydrant connections and fire alarm communication panels pursuant to Section 3018.8 of the Kentucky Building Code. If the Construction Manager utilizes the Owner's fire protection equipment, the Construction Manager shall replace any such materials lost, consumed or misplaced during the Contract period. The Construction Manager is responsible for any false alarms caused by dust created in the Work area or dust traveling to areas beyond the Work area due to inadequate dust protection barriers. Should there be a need for any existing or newly installed fire alarm system, or parts of a system that requires service, to be removed from service or disconnected, prior approval must be obtained from the Owner and the Construction Manager shall immediately provide alternate protection such as a fire watch until such systems are returned to full normal operations. When work or service is completed on a disabled fire alarm system, the Owner shall be immediately notified so the system can be placed in service.

12.4 The Construction Manager and Sub-contractors are responsible for the security of their own materials, tools and equipment at the Project site.

12.5 The Construction Manager shall provide to the Owner's Project Manager a key to Construction Manager's field office or job trailer.

ARTICLE 13 - BLASTING

13.1 Blasting is not allowed unless permission is granted in the Special Conditions. Should blasting be allowed by the Special Conditions, it shall be completed in accordance with all laws, regulations, ordinances and instructions contained in the Special Conditions.

ARTICLE 14 - CONSTRUCTION AND SAFETY DEVICES

14.1 The Construction Manager shall provide safety controls for protection of the life and health of employees and visitors. The Construction Manager will utilize precautionary methods for the prevention of damage to property, materials, supplies, and equipment, and for avoidance of work interruptions in the performance of this Contract. In order to provide such safety control, the Construction Manager shall comply with all pertinent provisions of the Kentucky Fire Prevention Code, Kentucky Building Code, Kentucky Labor Cabinet's Division of Occupational Safety and Health Program Construction Standards and Federal Occupational Safety and Health (Construction) Standards that are in effect at the time the Contract is entered into and during the period in which the Contract is to be performed.

14.2 The Construction Manager shall provide a written safety program which includes all pertinent written specialty standards such as, but not limited to, Control of Hazardous Energy Sources (Lockout/Tagout), Hazard Communications Program, First Aid, Blood Borne Pathogen Program, Respirator Use Program and Hearing Conservation Program. The Construction Manager shall require all Sub-contractors to have an effective written safety program or be required to follow the Construction Manager's written safety program.

14.3 The Construction Manager shall maintain an accurate record of and shall report to Kentucky Labor Cabinet's Division of Occupational Safety and Health in the manner and on the forms prescribed by that Division, exposure data and all accidents resulting in death, traumatic injury, or occupational disease. The Construction Manager shall maintain an accurate record of and shall report to the Owner's Project Manager, any damage to property, materials, supplies, or equipment incident to Work under this Contract.

14.4 The Kentucky Labor Cabinet's Division of Occupational Safety and Health may notify the Construction Manager of any noncompliance with the foregoing provisions. The Construction Manager shall, upon receipt of such notice, immediately correct the cited conditions. Notice delivered to the Construction Manager or the Construction Manager's representative at the site of the Work shall be deemed sufficient for this purpose. If the Construction Manager fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. Failure or refusal to comply with the order will be grounds for reducing or stopping all payments due under the Contract to the Construction Manager. No part of the construction time lost due to any such stop order shall be cause for, or the subject of a claim for, extension of time or for additional costs or damages by the Construction Manager.

14.5 The Construction Manager or any Sub-contractor shall immediately contact the University of Kentucky's Department of Occupational Health and Safety through the Owner’s Project Manager

should they be selected for an inspection by the Kentucky Occupational Safety and Health Compliance Division.

14.6 Compliance with the provisions of the foregoing sections by Sub-contractors shall be the responsibility of the Construction Manager.

14.7 Nothing in the provisions of this Article 14 shall prohibit the U.S. Department of Labor or the Kentucky Department of Labor Division of Occupational Safety and Health from enforcing pertinent occupational safety and health standards as authorized under Federal or State Occupational Safety and Health Standards.

14.8 The Construction Manager shall take all necessary precautions for the safety of employees on the Work, and shall comply with all applicable provisions of federal, state, and municipal safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where the Work is being performed. If the Construction Manager or any Sub-contractor has questions related to the health or safety required by their written safety program, they should contact the Kentucky Labor Cabinet Occupational Safety and Health Program Division of Education and Training. The Construction Manager shall designate a responsible member of the on-site work force as the safety officer and shall report to the Consultant and to the Owner the name of the person selected. The duties of the safety officer include the enforcement of safety regulations.

ARTICLE 15 - HAZARDOUS MATERIALS

15.1 If the Construction Manager encounters material reasonably believed to be or suspected to be asbestos containing material, lead, polychlorinated biphenyls (PCBs), fluorescent light bulbs and ballasts, mercury or other hazardous material, the following procedures must be followed:

15.1.1 The Construction Manager shall immediately stop work in the affected area and notify the Owner's Project Manager. The Owner’s Project Manager will contact the Owner's Environmental Health and Safety unit to arrange for collection of samples, review of existing data, or other testing necessary to confirm the presence of hazardous materials. The Owner’s Project Manager will notify the Construction Manager in writing of the results. Until that notification is received, the Work must not continue in the affected area.

15.1.2 If the material is confirmed to be asbestos, lead, polychlorinated biphenyls (PCBs), fluorescent light bulbs and ballasts, mercury or other hazardous material, the Owner will take appropriate action to remove the material before the Construction Manager can continue Work in the affected area.

15.1.3 The Construction Manager shall not be required to perform any Work related to asbestos, lead, polychlorinated biphenyls, or other hazardous material. The Construction Manager is advised that certain classes of building materials (thermal system insulation, sprayed or troweled surfacing materials, and resilient flooring) installed before 1981 are required by law to be treated as asbestos containing until proven otherwise. These presumed asbestos containing materials must not be disturbed without confirmation from the Owner that asbestos is not present.

15.2 The Owner, the Construction Manager, and Sub-contractors will be under the requirements of the OSHA Hazard Communication Standard (29) CFR 1910.1200. The Construction Manager and Sub-contractors must provide their own written Hazard Communication Program. The Hazard Communication Standard must include: (1) A list of the hazardous chemicals to which the Construction Manager's employees may be exposed; (2) Statement of the measures that Construction Manager's employees and Sub-contractors may take to lessen the possibility of exposure to the

hazardous materials; (3) The location of and access to the Material Safety Data Sheets (MSDS's) related to the hazardous chemicals located in the Work area; (4) Procedures that the Construction Manager's employees and Sub-contractors are to follow if they are exposed to hazardous chemicals above the Permissible Exposure Limit (PEL). Material Safety Data Sheets may be reviewed upon request by the Construction Manager or any Sub-contractor as they pertain to the Work areas of the Project. Photocopies of the MSDS's may be made by Construction Manager at its expense.

15.3 The Construction Manager and Sub-contractors shall provide the Owner with a list of any hazardous materials that will be used on the job site. The Construction Manager and Sub-contractors shall provide the Owner with copies of Material Data Sheets for all such materials to be used.

15.4 It is the policy of the Owner that PCB containing equipment will be treated by the Construction Manager and the Owner in a manner that conforms to the intent of all applicable laws and regulations (primarily 40 CFR Part 761). The following procedures shall be followed by the Construction Manager and Sub-contractors while present on the Owner's Project or other property: (1) Only authorized, trained personnel may inspect, repair, or maintain PCB transformers; and (2) No combustible materials may be stored within a PCB transformer room or within five meters of a PCB transformer. Such materials include, but are not limited to, paints, solvents, plastic, paper, and wood. The Construction Manager shall not use rooms containing PCB transformers for storage rooms, staging areas, job site offices or break rooms. Violation of this policy may be grounds for dismissal of the offending Construction Manager and/or Sub-contractor from the Project. All PCB transformers at the University of Kentucky are identified by a PCB label as defined in federal regulations. If the Construction Manager should have a question as to the location of a PCB transformer, it should contact the Owner's Project Manager.

15.5 The Construction Manager shall ensure that NO asbestos-containing materials (including but not limited to: drywall, joint compound, roof mastic or floor tile adhesive) will be install on any University project without prior written approval of the University’s Environmental Health and Safety Division. Additionally, the Construction Manager shall submit MSDS sheets and have prior approval before installing any materials that contains hazardous substances or could pose an environmental hazard. If any environmental hazardous materials are installed without written approval of the University, the Construction Manager will be responsible for all material replacement cost, all removal and all other associated damages. Any materials removed shall be taken out in accordance with all applicable federal, state and local regulations.

ARTICLE 16 - INSPECTION OF WORK

16.1 Inspections, tests, measurements or other acts of the Consultant are for the sole purpose of assisting the Consultant in determining if the Work, materials, rate of progress, and quantities comply with the Contract Documents. These acts or functions shall not relieve the Construction Manager from performing the Work in full compliance with the Contract Documents, nor relieve the Construction Manager from any of the responsibility for the Work assigned to it by the Contract Documents. No inspection by the Consultant shall constitute or imply acceptance. Approval of material is general and shall not constitute waiver of the Owner's right to demand full compliance with Contract Documents.

16.2 All Work completed and all materials incorporated for the Project are subject to inspection by the Owner, the Consultant or their representatives to determine conformance with the Contract Documents. The Owner, Consultant and their representatives shall at all times have access to the Work whenever it is in preparation or progress. The Construction Manager shall provide, at no additional cost to the Owner, any facilities necessary for sufficient and safe access to the Work to complete any inspections required. The Consultant shall be given timely notification in order to

arrange for the proper inspections to be performed on any Work outside of the normal working day or week. If the Consultant provides the Construction Manager with a list of construction milestones that require inspection, the Construction Manager shall provide the Consultant with at least five (5) Business Days written notice prior to the commencement of Work with respect to such milestone in order to permit the Consultant time to coordinate an inspection of the commencement of the applicable Work.

16.2.1 Normal Work hours are defined as a period between 7:00 a.m. and 5:00 p.m. Monday through Friday. The Construction Manager shall notify the Owner's Project Manager at least one working day prior to performance of any Work for permission to do any Work during non-normal Work hours.

16.3 If the Specifications, the Consultant's instructions, laws, ordinances, or any public authority require any Work to be specially inspected, tested or approved, the Construction Manager shall give the Consultant timely notice of the readiness of the Work for inspection. The Consultant shall promptly make all required inspections. If any portion of the Work should be covered contrary to the request of the Consultant, or to the requirements specifically expressed in the Contract Documents, the Work must be uncovered for inspection and observation and shall be uncovered and replaced at the Construction Manager's expense.

16.4 If any other portion of the Work has been covered, which the Consultant has not specifically requested to observe prior to being covered, the Consultant, with the Owner's approval, may request to see such Work and it shall be uncovered by the Construction Manager. If such Work is found to be in accordance with the Contract Documents, the cost of uncovering and replacement shall be charged to the Owner by appropriate Change Order. If such uncovered Work is not in accordance with the Contract Documents, the Construction Manager shall pay all costs for uncovering and replacement of such Work.

ARTICLE 17 - SUPERINTENDENT - SUPERVISION

17.1 The Construction Manager shall completely and thoroughly direct and superintend the Work in accordance with the highest standard of care for the Construction Manager's profession so as to ensure expeditious, workmanlike performance in accordance with requirements of the Contract Documents. Except as otherwise dictated by specific requirements of the Contract Documents, the Construction Manager shall be solely responsible for and have control over all construction means, methods, techniques, sequences and procedures. The Construction Manager shall be responsible for the acts and omissions of all Sub-contractors and persons directly or indirectly employed by the Construction Manager in the completion of the Work. The Construction Manager shall be responsible for coordinating and scheduling all portions of the Work unless the Contract Documents give other specific instructions. The Construction Manager shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by the activities of the Consultant in the administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Construction Manager.

17.2 The Construction Manager shall have a competent superintendent on the Project site at all times during the process of the Work. The superintendent shall have authority to act on the Construction Manager's behalf with regard to all aspects of performance of this Contract. The superintendent shall have such assistants with individual specialized competencies as may be necessary to fully understand and oversee all aspects of the Work. The Construction Manager shall also provide administrative, supervisory and coordinating personnel required to fully perform the Work and for interfacing the Work with other work of the Project. The superintendent and all assistants shall be physically fit for their work and capable of going to all locations where Work is being performed. A communication given to the superintendent shall be binding on the Construction

Manager. Immediately after the award of Contract, the Construction Manager shall submit to the Consultant a list of Construction Manager's employees and consultants, including names, positions held, addresses, telephone numbers and emergency contact numbers.

17.3 The superintendent assigned shall not be changed except under the following circumstances: (1) Where the superintendent ceases to be employed by the Construction Manager, in which case the Construction Manager shall give timely written notice to the Owner of the impending change of the superintendent and a reasonable explanation for the change; or (2) Where the Owner or the Consultant have reasonable grounds for dissatisfaction with the performance of the superintendent and give written notice to the Construction Manager of the grounds. In either case, the Construction Manager shall obtain prior written approval from the Owner of the qualifications of the proposed replacement superintendent. Such prior approval will not be unreasonably withheld.

17.4 If the Owner or Consultant determines that the superintendent is not performing, or is incompetent to perform the required Work, the Owner may direct the Construction Manager to remove the superintendent from the Project and replace the superintendent with an employee who has the necessary expertise and skills to satisfactorily perform the Work.

ARTICLE 18 - CHANGES IN THE WORK

18.1 The Owner, at any time after execution of the Contract, may make changes within the general scope of the Contract or issue additional instructions, require additional Work, or direct the deletion of Work. The Owner's right to make changes shall not invalidate the Contract or relieve the Construction Manager of any obligations under the Contract Documents. All such changes to the Work shall be authorized in writing by Change Order and shall be executed under the conditions of the Contract Document. Any adjustment of the Contract Amount or Time of Completion, as may be appropriate, shall be made only at the time of ordering such change. Change order proposals based on a reservation of rights, whether for additional compensation to be determined at a later date or for an extension of time to be determined at a later date, will not be considered for approval and shall be returned to the Construction Manager without action.

18.2 The cost or credit resulting from a change in Work shall be determined in one or more of the following ways:

18.2.1 By unit prices named in the Contract or additional unit prices subsequently agreed upon;

18.2.2 By agreement on a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

18.2.3 By an amount agreed upon by the Construction Manager and the Owner as a mutually acceptable fixed or percentage fee.

18.3 All lump sum proposals shall include a detailed cost breakdown satisfactory to the Consultant and to the Owner for each component of Work indicating both labor and material costs. This cost breakdown shall be submitted to the Consultant promptly and with a goal of seven (7) Calendar Days or less after receipt of the proposal request.

18.3.1 In computing labor costs, the hourly labor rates shall not exceed a mutually agreeable combined hourly labor rate plus fringe benefits negotiated with the Owner based on a presentation of acceptable documentation by the CM. For the purposes of this Article, the term “fringe benefits” shall mean those funds transferred irrevocably to a third party for payment/distribution. In addition,

there may be added by the Sub-contractor an amount agreed upon, but not to exceed ten percent (10%) of the actual cost, for overhead and profit.

18.3.2 The CM is entitled to a mark-up for bonds and insurance on all change orders. For change orders coded "End User Requested Changes" or "Other Owner Requested Changes" the CM may add overhead & profit in addition to the bonds and insurance referenced above. The mark-ups shall not exceed the combined percentage for overhead and profit, bonds, and insurance stated in the CM's "Financial Proposal Summary". These mark-ups will not be added to the individual change orders but will be reconciled by amendment at the completion of the project and/or on an annual basis for those projects exceeding 12 months in duration.

18.4 If none of the above methods are mutually agreed upon or if the Construction Manager does not respond promptly, a change may be made by unilateral determination by the Owner and/or the Consultant of reasonable costs or savings attributable to the change, including a reasonable allowance for overhead and profit. If this method is utilized, the Construction Manager shall promptly proceed with the Work involved in the change upon receipt of a written order signed by the Owner. In such case, the Construction Manager shall keep and present an itemized accounting of labor, equipment, material and other costs, in such form as may be prescribed by the Consultant.

18.5 In all cases where Change Orders are determined by unit prices set forth in the Contract Documents, no amount is to be added for additional overhead and profit.

18.6 The Construction Manager shall keep and present in such form as the Consultant may direct, a correct account of all items comprising the net cost of such Work, together with vouchers. The determination of the Consultant and/or the Owner shall be final upon all questions of the amount and cost of extra Work and changes in the Work, and it shall include in such cost, the cost to the Construction Manager of all materials used, the cost of all labor (including social security, old age and unemployment insurance, fringe benefits to which the employee is entitled, and Workers Compensation insurance), and the fair rental of all machinery used upon the extra Work, for the period of such use, which was upon the Work before or which shall be otherwise required by or used upon the Work before or after the extra Work is done. If the extra Work requires the use of machinery not already on the Project site, or to be otherwise used upon the Work, then the cost of transportation of such machinery to and from the Project site shall be added to the fair rental value. Transportation costs shall not be allowable for distances exceeding one hundred (100) miles.

18.7 The Construction Manager shall not include or allow to be included in the cost of change in the Work any cost or rental of small tools, or any portion of the time of the Construction Manager or the superintendent, or any allowance for the use of capital, or for the cost of insurance or bond premium or any actual or anticipated profit, or job or office overhead. These items are considered as being covered under the added amount for general overhead addressed in Article 18.3

18.8 The Owner will not pay claims made for lost opportunities, claims made for lost production or production inefficiencies or claims made that are formula based.

18.9 Pending final determination of value, partial payments on account of changes in the Work may be made on recommendation of the Consultant. All Change Orders shall be in full payment and final settlement of all claims for direct, indirect and consequential costs, including all items covered and affected. Any such claim not presented by the Construction Manager for inclusion in the Change Order shall be waived.

18.10 The Consultant may authorize minor changes in the Work which do not involve additional cost or extension of the Contract Time, and which are not inconsistent with the intent of the Contract

Documents. Such changes shall be made by an ASI issued by the Consultant, and shall be binding on the Owner and the Construction Manager. The Construction Manager shall carry out such orders promptly. If the Construction Manager should claim that an ASI involves additional cost or delay to the completion of the Work, the Construction Manager shall give the Consultant written notice thereof within ten (10) Calendar Days after receipt of the written ASI. If this notification does not occur, the Construction Manager shall be deemed to have waived any right to claim or adjustment to the contract sum or to the contract completion time.

18.10.1 If the Construction Manager claims that any instructions by the Consultant involve additional cost or time extension, the Construction Manager shall give the Consultant written notice thereof within ten (10) Calendar Days after the receipt of such instructions and before proceeding to execute the change in Work. The written notice shall state the date, circumstances, whether a time extension will be requested, and the source of the order that the Construction Manager regards as a Change Order. Unless the Construction Manager acts in accordance with this procedure, any oral order shall not be treated as a change and the Construction Manager hereby waives any claim for an increase of the Contract amount or extension of the contract time.

18.11 Requests for extension of time related to changes in the Work shall be submitted in accordance with the requirements of Article 21 of these General Conditions.

18.12 Prior to final payment, the Construction Manager shall provide to the Owner a full accounting of executed change orders by and between the Construction Manager and the Trade Contracts. The Construction Manager shall also provide a reconciliation of that accounting against the executed change orders by and between the Owner and the Construction Manager.

ARTICLE 19 - RULES AND MEASUREMENTS FOR EXCAVATION

19.1 If applicable, the following Rules and Measurements shall apply to the use of Unit Prices for the excavation portion of the Work:

19.1.1 Except as provided in this Article 19 for arbitrary measurements, the quantity of excavation shall be its in-place volume before removal.

19.1.2 No allowance will be made for excavating additional material of any nature taken out for the convenience of the Construction Manager beyond the quantity computed under these "Rules and Measurements."

19.1.3 The quantities of excavation shall be computed from instrument readings taken by the Consultant’s representative in vertical cross sections located at such intervals that will assure accuracy.

19.1.4 "Trench Excavation" for pipes shall arbitrarily be assumed to be two feet (2') wider than the outside diameter of the pipe barrel and with sides vertical.

19.1.5 The quantities shall be computed from plan size, or if there are no drawings, from actual measurements of the Work in place.

19.1.6 Each unit price shall cover, among other things, engineering (surveying) costs and keeping excavating dry.

19.1.7 Earth excavation for structures will be measured between the vertical planes passing 18 inches beyond the outside of the footings and from the surface of the ground to the neat lines of the bottom of the structure.

19.1.8 Rock excavation for structures will be measured between the vertical planes passing 18 inches beyond the outside of the footings and from the surfaces of the rock to the neat lines of the bottoms of the structures or the actual elevation of the rock ledge.

19.1.9 Rock excavation for pipelines trenches, unless otherwise provided for in the Specifications, shall be measured as follows: An arbitrary width of 18 inches plus the nominal diameter of the pipe multiplied by the depth from the surface the rock to six (6) inches below the invert for pipe 24 inches in diameter or less and eight (8) inches below the invert for all pipe greater than 24 inches in diameter. No additional compensation will be allowed for excavation for bell holes, gates or other purposes. The measurement of rock excavation for manholes shall be in accordance with Section 19.1.8 above.

19.1.10 Unclassified excavation shall be measured in the same manner as earth excavation.

ARTICLE 20 - CONCEALED CONDITIONS

20.1 The Contract Drawings show the approximate location of the existing and new utility lines. These lines have been identified and located as accurately as possible using available information. The Construction Manager is responsible for verifying all actual locations. If utilities require relocation or rerouting that is not shown or indicated to be relocated or rerouted, the Construction Manager shall contact and cooperate with the Consultant to make the required adjustments. Any request for change in the Contract Amount by the Construction Manager shall be made pursuant to Article 18 of the General Conditions.

20.2 If any charted or uncharted utility service is interrupted by activities of the Construction Manager or the Construction Manager's Sub-contractor(s) for any reason, the Construction Manager shall work continuously to restore service to the satisfaction of the Owner.

20.2.1 If any charted utility service, or any uncharted utility service the existence of which could have been discovered by careful examination and investigation of the site of the Work by the Construction Manager, is interrupted by activities of the Construction Manager or the Construction Manager's Sub-contractor(s) for any reason, the entire cost to restore service to the satisfaction of the Owner shall be paid by the Construction Manager. Should the Construction Manager fail to proceed with appropriate repairs in an expedient manner, the Owner reserves the right to have the work/repairs completed and the cost of such work/repairs deducted from the monies due or to become due to the Construction Manager pursuant to Article 22 of the General Conditions.

20.3 The Construction Manager shall promptly, but in no case more than ten (10) Calendar Days from the time of discovery, and before the conditions are disturbed, notify Consultant in writing of:

20.3.1 Subsurface or latent physical conditions or any condition encountered at the site which differ materially from those indicated in the Contract Documents and which were not known by Construction Manager or could not have been discovered by careful examination and investigation of the site of the proposed Work;

20.3.2 Unknown and unexpected physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered in the locale or generally recognized as inherent in the Work provided for in this Contract or,

20.3.3 Concealed or unknown conditions in an existing structure which are at variance with the conditions indicated by the Contract Documents, which are of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in this Contract, and which were not known by the Construction Manager and could not have been discovered by careful examination and investigation of the site of the Work.

20.4 The Consultant shall promptly investigate the conditions discovered. If the Consultant finds that conditions, which are materially different from those ordinarily encountered and generally recognized as inherent in the Work provided for in this Contract, were not known by the Construction Manager, and could not have been discovered by careful examination and investigation of the site of the Work, have caused or would cause a material increase or decrease in the Construction Manager's cost of construction or the time required for performance of any part of the Work under this contract, the Consultant will recommend and the Owner will make an equitable adjustment in the Contract Amount and/or the time allotted for performance in the Contract Documents. Failure by the Construction Manager to provide written notice to the Owner of such claims for additional compensation or time for performance within ten (10) Calendar Days of discovery of such conditions shall constitute a waiver by the Construction Manager of the right to make such claims. The Owner will not pay claims made for lost opportunities, claims made for lost production or production inefficiencies or claims made that are formula based.

20.5 If the Consultant determines that changed conditions do not exist or are not materially different and no adjustment in the Contract Amount or time is warranted, the Construction Manager shall continue performance of the Contract as directed by the Consultant. No claim by the Construction Manager under this clause shall be allowed unless the required written notice is given and the Consultant is given adequate opportunity to investigate the conditions encountered prior to disturbance. The failure of the Construction Manager to give the Consultant proper notice of a differing site condition shall not affect the Owner's right to an equitable adjustment of the contract price or time if there is a decrease in the Contract Amount or time required to perform the Work.

ARTICLE 21 - DELAYS AND EXTENSION OF TIME

21.1 It is agreed that time is of essence for each and every portion of this Contract and where additional time is allowed for the completion of the Work or any part of the Work under this Contract, the new time limit fixed by such time extension shall be of the essence of this Contract. An extension of time shall not be cause for extra compensation under this Contract, except as set forth in Article 21.10 below.

21.2 The Construction Manager will, subject to the provisions of Articles 21.7, 21.8 and 21.9 below, be granted an extension of time and/or relief from liquidated damages when the delay in completion of the Work is due to:

21.2.1 Any preference, priority, or allocation order duly issued by the government;

21.2.2 Unforeseeable causes beyond the control and without the fault or negligence of the Construction Manager including, but not limited to, acts of God, or of the public enemy, acts of the Owner, acts of another contractor in the performance of a contract with the Owner, floods, epidemics, quarantine restrictions, strikes, and freight embargoes.

21.2.2.1For such delays which stop all work on the Project for thirty (30) Calendar Days or more, the Construction Manager shall be authorized at its discretion to remove its people from the site and return when the normal progress of the work may continue.

21.2.3 Regardless of the cause of a delay, the Construction Manager shall expend all reasonable effort to mitigate the impact of any delay.

21.2.4 Requests for additional time due to delays in transportation or due to failures of suppliers shall not be considered for approval.

21.3 Requests for extensions of time and/or relief from liquidated damages, except for weather related claims, shall be made in writing not later than ten (10) Calendar Days after the beginning of the delay. Requests for extension of time or relief from liquidated damages shall be stated in numbers of whole Calendar Days.

21.4 Except as otherwise provided in the Contract Documents, extensions of the contractually required completion dates may be granted for unusually bad weather on the Project. Unusually bad weather as used herein means daily temperature or precipitation that exceeds the normal weather recorded and expected for the locality and/or the season or seasons of the year. For the purposes of this contract, it is mutually agreed that the following chart accurately defines the number of days in each month on which bad weather can reasonably be anticipated to impact weather dependent construction operations, and the Construction Manager shall anticipate this normal seasonal weather in the development of the Project baseline schedule.

Mean Number of Days When	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Max Temp 32° or Below	9	6	1	0	0	0	0	0	0	0	1	5
Precip. Is 0.10 Inch or Greater	7	6	9	7	8	8	8	6	5	5	7	7

For the purpose of this Contract, “unusually bad weather” shall be interpreted as either 1) those days in a given month on which rainfall was 0.10 inch or more that exceed the number of days shown in the row for “Precip” or 2) those days in a given month on which maximum temperature was 32 degrees F or below that exceed the number of days shown in the row for “Max Temp”, whichever is greater.

21.4.1 Requests for extension of time due to unusually bad weather that could not reasonably have been anticipated at the time of execution of the Contract shall be made in writing not later than the tenth calendar day of the month following the month in which the delay occurred.

21.4.2 Requests for an extension of time due to unusually bad weather shall be considered for approval only if it is shown that a) the unusual weather event delayed work on a specific weather dependent activity or activities that had been planned to be underway on the date(s) on which the weather event occurred, as shown in the most recent update to the Project schedule that had been submitted to the Owner prior to the date of the event, and b) only if the delay to that activity or activities is shown to be the proximate cause of a corresponding delay to the contractually required completion dates for the Project shown in the most recent update to the Project schedule. The actual dates on which the delay(s) occurred must be stated and the specific activities that were directly impacted must be identified. In the event of concurrent delays, only those activities actually

impacting contractually required completion dates will be considered in evaluating the merit of a delay request. Time extensions will not be considered if such adjustments do not exceed the total or remaining "float" associated with the impacted activities at the time of delay as shown in the most recent update to the Project schedule, nor for concurrent delays not caused by the Owner.

21.4.3 In anticipation of the possibility of delay due to unusually bad weather, the Construction Manager shall identify those activities in the baseline schedules, and those activities subsequently added to updated schedules, that might reasonably be expected to be delayed by such weather.

21.4.4 Delays caused by unusually bad weather shall be incorporated in the Project schedule when the schedule is next updated by showing actual dates and/or percent complete for those activities that were impacted by the unusually bad weather as well as the effects of any effort to mitigate such delays. When claims are submitted for time extensions resulting from more than one occurrence of unusually bad weather during a month, the Project schedule shall be updated to reflect such separate events sequentially so that the impact of each subsequent occurrence is shown on an adjusted Project schedule that includes all prior claims for additional time.

21.5 In addition to the requirements of Article 21.7 and Article 21.8 below, any request for an extension of time for strikes or lockouts shall be supported by a written statement of facts concerning the strike including, but not limited to, the dates, the craft(s) affected, the reason for the strike, efforts to resolve the dispute, and efforts to minimize the impact of the strike on the Project.

21.6 Approval of time extensions for changes in the Work will depend upon the extent, if any, to which the changes cause delay in the completion of the various elements of construction. The Change Order granting the time extension may provide that the Contract Time will be extended only for those specific elements so delayed and that other Work will not be altered.

21.7 The Contract Time will only be adjusted for causes specified above. Extensions of time will only be approved if the Construction Manager provides justification supported by the Project schedule or other acceptable data that 1) such changes are, in fact, on the critical path and extend the contractually required completion dates, and 2) the Construction Manager has expended all reasonable effort to minimize the impact of such changes on the construction schedule. No additional extension of time will be granted subsequently for claims having the basis in previously approved extensions of time.

21.8 In support of requests for an extension of time not caused by unusual inclement weather, and concurrently with the submittal of any such request, the Construction Manager shall submit to the Consultant and the Owner a written impact analysis showing the influence of each such event on contractually required completion dates as shown in the updated Project schedule most recently submitted to the Owner prior to the event. The analysis shall include a partial network diagram showing a sequence of new or revised activities and/or durations that are proposed to be added to the existing schedule including related logic (a "fragnet"). This impact analysis and the fragnet shall include the new activities and/or activity revisions proposed to be added to the existing schedule and shall demonstrate the claimed impact on the critical path and the contractually required completion dates. The Construction Manager will not be granted an extension of time and/or relief from liquidated damages when the delay to completion of the work is attributable to, within the control of, or due to the fault, negligence, acts, or omissions of the Construction Manager and/or the Construction Manager's contractors, subcontractors, suppliers, or their respective employees and agents. Time extensions will not be considered in the event such adjustments do not exceed the total or remaining "float" associated with the impacted activities at the time of delay, nor for concurrent delays not caused by the Owner. In the event of concurrent delays, only that event actually impacting contractually required completion dates will be considered in adjusting the schedule and evaluating the merit of a

delay claim. Requests for an extension of time which are not supported by this information shall not be considered for approval.

21.9 Approved extensions of time not caused by unusual inclement weather shall be incorporated in a revised schedule at the time of approval. No subsequent requests for time extension will be considered unless all previous approved time extensions have been incorporated in the Project schedule on which the requests are based.

21.10 Except as provided for in Article 21.10.1 through 21.10.3 below, no payment or compensation shall be made to the Construction Manager and extensions of the time fixed for completion of the Contract shall be the Construction Manager's sole remedy for any and all delays, hindrances, obstructions or impacts in the orderly progress of the Work.

21.10.1 In addition to the provisions of Articles 18.3 and 18.3.1 above, and subject to the requirements of Article 21.8 and 21.8.1 above, if the Owner orders changes to the scope of Work for the Project that extend the then current contractually required completion dates of the Project, the Construction Manager shall be entitled to reimbursement for job site, general conditions and staffing costs associated with such delay.

21.10.2 If delays, hindrances, impacts or obstructions of the Construction Manager's performance of the Contract are in whole or in part within the control of the Owner and, subject to the requirements of Article 21.8 and 21.8.1, extend contractually required completion dates of the Project, the Construction Manager shall be entitled to reimbursement for job site, general conditions and staffing costs for that portion of the costs caused by acts or omissions of the Owner.

21.10.3 Such reimbursements shall not include consequential or similar damages, exemplary damages, damages based on unjust enrichment theory, formula based delay claims, or any element of home office overhead.

ARTICLE 22 - CORRECTION OF WORK BEFORE FINAL PAYMENT

22.1 The Construction Manager shall promptly remove from the site and replace any material and/or correct any Work found by the Consultant to be defective or that fails to conform to the requirements of the Contract, whether incorporated in the Work or not, and whether observed before or after Substantial or Final Completion. The Construction Manager shall bear all costs of removing, replacing or correcting such Work or material including the cost of additional professional services necessary, and the cost of repairing or replacing all Work of separate contractors damaged by such removal or replacement.

22.2 The Consultant will notify the Construction Manager and the Owner immediately upon its knowledge that additional services will be necessary. The Owner may consent to accept such nonconforming Work and materials with an appropriate adjustment in the Contract Amount. Otherwise, the Construction Manager shall promptly replace and re-execute the Work in accordance with the Contract Documents and without expense to the Owner and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement. If the Construction Manager fails to commence and continue to correct non-conforming Work within a reasonable time as determined by the Consultant, the Owner may without limitation of other rights available to the Owner and without prejudice to other remedies, take any necessary action to make the necessary corrections. If the Owner makes required corrections for non conforming Work or materials, a Change Order will be issued reflecting an equitable deduction from the Contract Amount. This amount will be deducted from payments due to the Construction Manager or, if no additional

payments are due, Construction Manager or the Construction Manager's surety shall be responsible for payment of this amount.

ARTICLE 23 - CORRECTION OF WORK AFTER FINAL PAYMENT

23.1 Neither the final certificate of payment nor any provisions in the Contract Documents shall relieve the Construction Manager of responsibility for materials and equipment incorporated into the Work that fails to meet specification requirements, or for the use of faulty materials or poor quality workmanship. If within one year after the date of Substantial Completion of the Work or designated portion thereof, any of the Work is found to be defective or not in accordance with the requirements of the Contract Documents, the Construction Manager shall correct it promptly after receipt of written notice from the Owner to do so. The Construction Manager shall correct any defects due to these conditions and pay for any damage to other Work resulting from their use. Nothing contained in this clause shall be construed to establish a period of limitation with respect to any obligation of the Construction Manager under the Contract including, but not limited to, warranties. The obligation of the Construction Manager under this section shall be in addition to and not in limitation of any obligations imposed by special guarantees or warranties required by the Contract, given by the Construction Manager, or otherwise recognized or prescribed by law.

23.2 In addition to being responsible for correcting the Work and removing any non-conforming Work or materials from the job site, the Construction Manager shall bear all other costs of bringing the affected Work into compliance with the Contract requirements. This includes costs of any required additional testing and inspection services, Consultant's services, and any resulting damages to other property or to work of other contractors or of the Owner.

23.3 If the Construction Manager fails to correct nonconforming Work within a reasonable time as determined by the Consultant, the Owner may take necessary actions to make the necessary corrections. If the Owner makes required corrections for nonconforming Work or materials after Final Payment to the Construction Manager, the Owner shall be entitled to recover all amounts for such corrections, including costs and attorney's fees, from Construction Manager or surety.

ARTICLE 24 - TERMINATION OF CONTRACT FOR CONVENIENCE OF OWNER

24.1 The Owner, by written notice to the Construction Manager, may terminate this Contract in whole or in part when it is in the interest of the Owner, at the sole discretion of the Owner. In such case, the Construction Manager shall be paid for all Work in place and a reasonable allowance for profit and overhead on Work done, provided that such payments shall not exceed the total Contract price as reduced by the value of the Work as yet not completed. The Construction Manager shall not be entitled to profit and overhead on Work not performed.

ARTICLE 25- OWNER'S RIGHT TO STOP WORK

25.1 If the Construction Manager fails to correct defective Work as required, or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner by written notice may order the Construction Manager to stop the Work or any portion of the Work until the cause for the order has been eliminated to the satisfaction of the Owner. The Consultant may stop Work without written notice for 24 hours whenever in its professional opinion such action is necessary or advisable to insure conformity with the Contract Documents. The Construction Manager shall not be entitled to an adjustment in the Contract Time or Amount under this clause in the event such stoppages are determined to be the fault of the Construction Manager or its Sub-contractor(s). The right of the Owner or Consultant to stop Work shall not give rise to a duty on the part of the Owner or Consultant to exercise this right for the benefit of the Construction Manager or others.

ARTICLE 26 -TERMINATION OF CONTRACT FOR DEFAULT ACTION OF CONSTRUCTION MANAGER

26.1 In addition to its rights under Articles 24 and 25, the Owner may terminate the contract upon the occurrence of any one or more of the following events:

26.1.1 If the Construction Manager refuses or fails to prosecute the Work (or any separable part thereof) with such diligence as will insure its completion within the agreed upon time; or if the Construction Manager fails to complete the Work within such time;

26.1.2 If the Construction Manager is adjudged a bankrupt or insolvent, or makes a general assignment for the benefit of creditors, or if the Construction Manager or a third party files a petition to take advantage of any debtor's act or to reorganize under the bankruptcy or similar laws concerning the Construction Manager, or if a trustee or receiver is appointed for the Construction Manager or for any of the Construction Manager's property on account of the Construction Manager's insolvency, and the Construction Manager or its successor in interest does not provide adequate assurance of future performance in accordance with the Contract within ten (10) days of receipt of a request for assurance from the Owner;

26.1.3 If the Construction Manager repeatedly fails to supply sufficient qualified supervision of the work, or repeatedly fails to ensure that Sub-contractors supply adequate supervision, suitable materials or equipment, or adequate numbers of skilled workmen and supervision to the Work;

26.1.4 If the Construction Manager repeatedly fails to make prompt payments to Sub-contractors or suppliers at any tier, or for labor, materials or equipment;

26.1.5 If the Construction Manager disregards laws, ordinances, rules, codes, regulations, orders or similar requirements of any public entity having jurisdiction;

26.1.6 If the Construction Manager disregards the authority of the Consultant or the Owner;

26.1.7 If the Construction Manager performs Work which deviates from the Contract Documents, and neglects or refuses to correct rejected Work; or

26.1.8 If the Construction Manager otherwise violates in any material way any provisions or requirements of the Contract Documents.

26.2 Once the Owner determines that sufficient cause exists to justify the action, the Owner may terminate the Contract without prejudice to any other right or remedy the Owner may have, after giving the Construction Manager and its Surety three (3) Calendar Days notice by issuing a written Declaration of Default. The Owner shall have the sole discretion to permit the Construction Manager to remedy the cause for the contemplated termination without waiving the Owner's right to terminate the Contract.

26.3 In the event that the Contract is terminated, the Owner may demand that the Construction Manager's Surety take over and complete the Work on the Contract. The Owner may require that in so doing, the Construction Manager's Surety not utilize the Construction Manager in performing the Work. Upon the failure or refusal of the Construction Manager's Surety to take over and begin completion of the Work within twenty (20) Calendar Days after the demand, the Owner may take over the Work and prosecute it to completion as provided below.

26.3.1 In the event that the Contract is terminated and the Construction Manager's Surety fails or refuses to complete the Work, the Owner may take over the Work and prosecute it to completion in accordance with the laws of the Commonwealth, by contract or otherwise, and may exclude the Construction Manager from the site. The Owner may take possession of the Work and of all of the Construction Manager's tools, appliances, construction equipment, machinery, materials, and plant which may be on the site of the Work, and use the same to the full extent they could be used by the Construction Manager, without liability to the Construction Manager. At the Owner's sole discretion, the Owner has the right to take assignment of any or all portions of the contract work in order to prosecute the completion of the Work. In exercising the Owner's right to prosecute the completion of the Work, the Owner may also take possession of all materials and equipment stored at the site or for which the Owner has paid the Construction Manager but which are stored elsewhere, and finish the Work as the Owner deems expedient. In such case, the Construction Manager shall not be entitled to receive any further payment until the Work is finished.

26.3.2 If the unpaid balance of the Contract Price exceeds the direct and indirect costs and expenses of completing the Work including compensation for additional professional and Consultant services, such excess shall be used to pay the Construction Manager for the cost of the Work it performed and a reasonable allowance for overhead and profit. If such costs exceed the unpaid balance, the Construction Manager or the Construction Manager's Surety shall pay the difference to the Owner. In exercising the Owner's right to prosecute the completion of the Work, the Owner shall have the right to exercise its sole discretion as to the manner, methods, and reasonableness of the costs of completing the Work and the Owner shall not be required to obtain the lowest figure for Work performed in completing the Contract. In the event that the Owner takes bids for remedial Work or completion of the Project, the Construction Manager shall not be eligible for the award of such Contract.

26.3.3 The Construction Manager shall be liable for any damage to the Owner resulting from the termination or the Construction Manager's refusal or failure to complete the Work, and for all costs necessary for repair and completion of the Project above the amount of the Contract. The Construction Manager shall be liable for all attorney's fees, costs and expenses incurred by the Owner to enforce the provisions of the Contract.

26.3.4 If liquidated damages are provided in the Contract and the Owner terminates the Contract, the Construction Manager shall be liable for such liquidated damages, as provided for in Article 29.2 and 29.3 below, until Substantial Completion and Final Completion of the Work are achieved.

26.3.5 In the event the Contract is terminated, the termination shall not affect any rights of the Owner against the Construction Manager. The rights and remedies of the Owner under this Article are in addition to any other rights and remedies provided by law or under this Contract. Any retention or payment of monies to the Construction Manager by the Owner will not release the Construction Manager from liability.

26.3.6 In the event the Contract is terminated under this Article, and it is determined for any reason that the Construction Manager was not in default under the provisions of this Article, the termination shall be deemed a Termination for Convenience of the Owner pursuant to Article 24 and the rights and obligations of the parties shall be determined in accordance with Article 24.

ARTICLE 27 - SUSPENSION OF WORK

27.1 The Owner or the Consultant may, at any time and without cause, order the Construction Manager in writing or cause the Construction Manager to suspend, delay or interrupt all or any part of the Work for such period of time as the Owner may determine to be appropriate for its convenience.

Adjustment may be made for any increase in the Contract time necessarily caused by such suspension or delay, in accordance with Article 21.

ARTICLE 28 - TIME OF COMPLETION

28.1 The Construction Manager shall begin the Work on the date of commencement as specified in the Work Order. All time limits stated in the Contract Documents are of the essence of the Contract. The actual end of the Contract Time shall be the date specified on the approved certificate of Substantial Completion. The time for completion set forth in the Contract is a binding part of the Contract upon which the Owner may rely in planning the use of the facilities to be constructed and for all other purposes.

28.2 Substantial Completion is defined in Article 1.1.17 of these General Conditions. Only incidental corrective Work under punch lists and final cleaning (if required) for Owner's full use shall remain for Final Completion. The ability to occupy or utilize shall include regulatory authority approval unless regulatory approval is delayed due to actions of the Owner or the Consultant. When the Owner accepts and occupies a portion of the Project, the operation, maintenance, utilities, and insurance of that portion of the Project becomes the responsibility of the Owner.

28.3 The date of Substantial Completion shall be that date certified by the Owner, in accordance with the following procedures, that the Work is sufficiently complete to occupy or utilize as defined above.

28.3.1 When the Construction Manager considers the entire Work is substantially complete as defined in Article 1.1.17 of these General Conditions, and is ready for its intended use, the Construction Manager shall notify the Consultant in writing and request an inspection. The declaration and request shall be accompanied by a list prepared by the Construction Manager of those items of Work still to be completed or corrected. The failure of the Construction Manager or Consultant to include any item or items which are not completed or which need correction on such list shall not alter the responsibility of the Construction Manager to complete all Work in accordance with the Contract Documents.

28.3.2 The Consultant shall, within a reasonable time after receipt of notification from the Construction Manager of a declaration of Substantial Completion and request for inspection, make such inspection. Prior to the Substantial Completion Inspection and within sufficient time to allow the Consultant's review, the Construction Manager shall submit all As-Built drawings, Notice of Termination, catalog data, complete operating and maintenance instructions, manufacturer specifications, certificates, warranties, written guarantees and related documents required by the contract. The Consultant shall review said documents for accuracy and compliance with the Contract Documents and incorporate them into complete operating instructions and deliver them to the Owner.

28.3.3 If the Consultant considers the Work substantially complete, the Consultant shall recommend that the Owner prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion and the responsibilities between the Owner and Construction Manager for security, maintenance, heat, utilities and insurance, if not otherwise provided for in the Contract Documents, and a tentative list of items to be completed or corrected, and shall fix the time within which the Construction Manager shall complete the items listed therein. This time shall not exceed thirty (30) Calendar Days unless otherwise provided for in the Work Order. The Certificate of Substantial Completion shall be submitted to the Consultant and Construction Manager for their written acceptance of the responsibilities assigned to them in the certificate. The Project shall not be deemed substantially complete until the certificate is issued. If, after making the inspection, the

Consultant does not consider the Work substantially complete, the Consultant will notify the Owner and the Construction Manager in writing

28.4 Operation and Maintenance Manual Deliverables. In anticipation and preparation of completion of the Work and the closing out of the Project, and to facilitate training of the Owner's personnel in the maintenance and operation of the new installations, the Construction Manager shall comply with the requirements of Article 8.7 of the Special Conditions. (For the purposes of this article, air test and balance reports may be submitted at a later date with the request for certification of substantial completion.) These manuals shall be submitted to the Consultant for approval, and subsequently forwarded to the Owner's Project Manager by or before the time construction is 75% complete, as reflected by the Contractor's most recently submitted Application for Payment.

28.4.1 The provisions of Article 30.11 notwithstanding, if the Construction Manager meets the requirements of Article 28.4 above with respect to timely submittal of approvable Operation and Maintenance manuals and provided the project construction is 1) at least 75% complete and 2) is equal to or ahead of the approved progress schedule and 3) the Work completed is in compliance with the requirements of the contract documents, the Owner, at the sole discretion of the Director, Capital Projects Management Division may reduce the retainage to not less than three percent (5%) of the current Contract Amount. In the event the Construction Manager fails to submit acceptable O&M manuals prior to reaching 75% completion, it is agreed that the Owner at its sole discretion may deduct from the current and subsequent Applications for Payment an amount deemed by the Owner to be sufficient to encourage prompt compliance with this contractual requirement, until such time as acceptable O&M manuals are received.

28.5 Project Close Out. When the Construction Manager considers that all Work required by the Contract is 100% complete, including correction of any remaining punch list work or deficiencies, the Construction Manager shall notify the Consultant in writing and request a final inspection. The Consultant, upon receipt of written notice from the Construction Manager that the Work is complete and is ready for final inspection and acceptance, will promptly make such inspection and if the Consultant finds the Work completed and acceptable under the Contract Documents and the Contract fully performed, the Consultant will notify the Construction Manager in writing to submit, and will certify to the Owner a final Certificate for Payment in accordance with Articles 30.9 and 30.9.1 of these General Conditions. If the Construction Manager does not complete the punch items within the time designated, the Owner retains the right to have these items corrected at the expense of the Construction Manager including all architectural, engineering and inspection costs and expenses incurred by the Consultant and the Owner, and to deduct such costs and expenses from the funds being held in retainage. The Owner shall not be required to release the retainage until such items have been completed.

ARTICLE 29 - LIQUIDATED DAMAGES

29.1 The Owner and the Construction Manager recognize and agree that time is of the essence of this Contract and that the Owner will suffer financial loss if the Work is not completed within the time specified in the Contract plus any extensions that may be allowed. The parties further recognize the delays, expense and difficulties involved in proving the actual loss suffered by the Owner should the Work not be completed on time. The Owner and the Construction Manager agree on the amounts stated as liquidated damages in the Agreement. The Owner and Construction Manager agree that the amount stated as liquidated damages are not intended to be penalties.

29.2 Should the Construction Manager fail to satisfactorily complete the Work under Contract on or before the date stipulated for Substantial Completion, as adjusted by approved Change Orders, if any, the Construction Manager will be required to pay liquidated damages to the Owner for each

consecutive Calendar Day that the Owner is deprived of full use of the area beyond the date specified unless otherwise stipulated elsewhere by Owner. After the date for Substantial Completion has been certified by the Owner, the Construction Manager shall cease to owe liquidated damages until the date established for Final Completion.

29.3 If Final Completion is not achieved by the date established for Final Completion, as adjusted by approved Change Orders, if any, liquidated damages in the amount stipulated in the Agreement will become due and collectable. The Contract will be considered complete and Final Completion shall be deemed to have occurred when all Work has been completed in compliance with the Contract Documents and the Certificate of Final Completion has been issued by the Owner. No deduction or payment of liquidated damages will, in any degree, release the Construction Manager from further obligations and liabilities to complete the entire Contract. Permitting the Construction Manager to continue and finish the Work, or any part of it, after expiration of the Contract Time, shall in no way constitute a waiver on the part of the Owner of any liquidated damages due under the Contract.

ARTICLE 30 - PAYMENT TO THE CONSTRUCTION MANAGER

30.1 Payments on account of this Contract shall be made monthly as Work progresses. The Construction Manager shall submit to the Consultant, in the manner and form prescribed, an application for each payment, and, if required, receipts or other vouchers showing payments made for materials and labor, including payments to Sub-contractors. All payments shall be subject to any withholding or retainage provisions of this contract. All pay request documents, except the final payment, shall be submitted in whole dollar amounts. All payment applications from the Construction Manager shall include line items for overhead, profit and general condition costs.

30.2 The Consultant shall, within ten (10) Business Days after receipt of each application for payment, certify approval of payment in writing to the Owner and present the application to the Owner, or return the application to the Construction Manager indicating in writing its reasons for refusing to approve payment. The Owner, provided no exception is taken to the application for payment submitted by the Consultant, will issue payment on or within thirty (30) Business Days from the date received from the Consultant. A reasonable delay on the part of the Owner in making payment to the Construction Manager for any given payment shall not be grounds for breach of Contract. The Consultant may refuse to approve the whole or any part of any payment if it would be incorrect to make such presentation to the Owner.

30.3 If payment is requested on the basis of materials and equipment not incorporated in the Work, but delivered and suitably stored at an off jobsite location agreed to in writing by the Owner that meets the manufacturer's requirements for the stored material and not-comingled with other material, the Construction Manager must furnish the following:

30.3.1 A list of the materials consigned to the Project (which shall be clearly identified), giving the place of storage, together with copies of invoices.

30.3.2 Certification that all items have been tagged for delivery to the Project and that they will not be used for any other purpose.

30.3.3 A letter from the Surety indicating that the Surety agrees to the arrangements and that payment to the Construction Manager shall not relieve either the Construction Manager or its Surety of their responsibility to complete the Work.

30.3.4 Evidence of adequate insurance listing the Owner as an additional insured covering the material in storage.

30.3.5 Evidence that representatives of the Consultant have visited the Construction Manager's place of storage and checked all items listed on the Construction Manager's certificate. They shall certify, insofar as possible, that the items are in agreement with the Specifications and approve their incorporation into the Project.

30.4 The Owner will pay 80% of the invoiced value less retainage for materials stored off site providing the above conditions are met.

30.5 The Construction Manager's signature on each subsequent application for payment shall certify that all previous progress payments received on account of the Work have been applied to discharge in full all of the Construction Manager's obligations reflected in prior applications for payment.

30.6 Each payment made to the Construction Manager shall be on account of the total amount payable to the Construction Manager and the Construction Manager warrants and guarantees that the title to all materials, equipment and Work covered by the paid partial payment shall become the sole property of Owner free and clear of all encumbrances. Nothing in this Article shall be construed as relieving Construction Manager from the sole responsibility for care and protection of materials, equipment and Work upon which payments have been made or restoration of any damaged Work or as a waiver of the right of Owner to require fulfillment of all terms of the Contract Documents.

30.7 Within thirty (30) Calendar Days of the award of any Trade Contracts, and prior to submitting the next application for payment, the Construction Manager shall submit to the Consultant and the Owner for approval a detailed breakdown of the Contract Amount including all trade contracts that have been awarded as of the date of that application for payment pursuant to CSI specification divisions, divided so as to facilitate payment and correlated to the schedule required by General Conditions Article 32 of the Contract Documents. The total value of all activities shall add up to the Contract Amount. When approved by the Consultant and the Owner, this schedule shall be used as a basis for Construction Manager's applications for payment and may be used by the Owner to determine costs or credits resulting from changes in the Work. Failure to obtain the approval of the Schedules of Values shall be a basis for withholding payment to the Construction Manager.

30.8 Retainage – The Owner will retain ten percent (10%) of the Construction Manager’s progress payments, including amounts claimed for construction management fee until fifty one percent (51%) of the construction project has been completed. Thereafter, if the Work is fully in compliance with the requirements of the Contract and except as provided for in Article 28.4.1 above, the Owner shall retain five percent (5%) of the total contract amount until Substantial Completion and acceptance of all Work covered by this Contract, as collateral security to insure successful completion of the Work. For the purposes of this Article, the term “in full compliance” shall mean 1) that the progress of the Work is equal to or ahead of that predicted by the Project Baseline schedule and 2) the Work completed is in compliance with the requirements of the contract documents. Subsequent to the issuance of the Substantial Completion Certificate and depending upon the cost involved for the completion and/or correction of punch list items, the Consultant may recommend to the Owner an adjustment to the amount being held as retainage and, if approved by Owner, the amount of retainage may then be reduced and a sufficient sum retained by Owner to assure completion of the remaining unfinished Work. Retainage reduction as provided for in this Article 30.8 is contingent upon the Construction Manager and/or Sub-contractors being on or ahead of the approved progress schedule and on verification by the Consultant that the Work completed is in compliance with the requirements of the contract documents.

30.8.1 In addition to the retainage set forth above, the Owner may withhold from any monthly progress payments or nullify any progress payments in whole or in part as necessary to protect the Owner from loss on account of:

30.8.1.1 Defective Work which has not been remedied or completed Work which has been damaged requiring correction or replacement, or

30.8.1.2 Action required by the Owner to correct Defective Work or complete Work which the Construction Manager has failed or refused to correct or complete, or

30.8.1.3 Failure of the Construction Manager to perform any of its obligations under the Contract, or

30.8.1.4 Failure of the Construction Manager to make payment properly to Sub-contractors; suppliers of material, services or labor; or to reimburse the University for utilities or other services as provided for in the Contract;

30.8.1.5 Amounts to be withheld as liquidated damages for failure to complete the Project in the allotted Contract time.

30.8.2 When the Owner is satisfied that the Construction Manager has remedied any such deficiency, payments shall be made of the amount being withheld on the next scheduled application for payment.

30.9 Final Payment – When all Work is completed and acceptable and the Contract is fully performed, the Construction Manager will be directed to submit a final payment application for certification and the entire balance shall be due and payable upon a certification of completion by the Consultant that the Work is in accordance with the Contract Documents. Final change order reconciliation as per Article 18.12 must be provided prior to final payment.

30.9.1 Upon issuance of the Certificate of Final Completion by the Owner and submittal by the Construction Manager of all required documents and releases, all retained amounts shall be paid to the Construction Manager as part of the Final Payment. By accepting such payment, the Construction Manager certifies that all amounts due or that may become due to any Sub-contractor, any Consultant of the Construction Manager, or any vendors or material suppliers, have been paid or will be paid from the proceeds of the final payment; and that, further, there are not liens, claims or disputes involving the Owner or the Consultant that are outstanding or unresolved.

30.10 The Construction Manager shall promptly pay each Sub-contractor and material supplier upon receipt of payment from the Owner the amount to which said Sub-contractor and supplier is entitled, reflecting the percentage actually retained from payments to the Construction Manager on account of such Sub-contractor's work. The Construction Manager shall, by an appropriate Agreement with each Sub-contractor and material supplier, require each Sub-contractor and supplier to make payments to their sub-contractors, vendors and suppliers in similar manner.

The Consultant may, on request, furnish to any Sub-contractor or material supplier information regarding the percentages of completion applied for by the Construction Manager and the action thereon by the Consultant.

30.10.2 Neither the Owner nor the Consultant shall have any obligation to make payment to any Sub-contractor or material supplier except as may otherwise be required by law.

ARTICLE 31 - AUDITS

31.1 The Construction Manager's Trade Contractors', sub-contractors' and/or vendor's "records" shall upon reasonable notice be open to inspection and subject to audit and/or reproduction during normal business working hours as may be deemed necessary by the Owner at its sole discretion. Such audits may be performed by an Owner's representative or an outside representative engaged by the Owner. The Owner or its designee may conduct such audits or inspections throughout the term of this contract and for a period of three years after final payment, or longer if required by law. Owner's representative may (without limitation) conduct verifications such as counting employees at the Construction Site, witnessing the distribution of payroll, verifying information and amounts through interviews and written confirmations with Construction Manager's employees, field and agency labor, Trade Contractors and vendors.

31.2 "Records" as referred to in this Contract shall include any and all information, materials and data of every kind and character, including without limitation, records, books, papers, documents, subscriptions, superintendents' reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in the Owner's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Document. Such records shall include hard copy, as well as computer readable data if it can be made available, written policies and procedures; time sheets; payroll registers; cancelled payroll checks; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets; correspondence; change order files (including documentation covering negotiated settlements); back charge logs and supporting documentation; invoices and related payment documentation; general ledger; records detailing cash and trade discounts earned; insurance rebates and dividends; and any other Construction Manager or contractor records which may have a bearing on matters of interest to the Owner in connection with the Construction Manager's dealings with the Owner (all foregoing hereinafter referred to as the "records") to the extent necessary to adequately permit evaluation and verification of any or all of the following:

Compliance with Contract requirements for deliverables;
Compliance with approved plans and specifications;
Compliance with Owner's business ethics expectations;
Compliance with Contract provisions regarding the pricing of change orders;
Accuracy of Construction Manager representations regarding pricing of invoices; and
Accuracy of Construction Manager representations related to claims submitted by the Construction Manager or its payees.

31.3 The Construction Manager shall require all payees (examples of payees include Trade Contractors, Sub-contractors, vendors, and/or material suppliers) to comply with the provisions of this Article by including the requirements hereof in a written contract agreement between the Construction Manager and payees. Such requirements to include flow-down right of audit provisions in contracts with payees will also apply to Subcontractors and Sub-subcontractors, material suppliers, etc. The Construction Manager will cooperate fully and will cause all related parties and all of the Construction Manager's Trade Contractors and/or subcontractors (including those entering into lump sum subcontracts) to cooperate fully in furnishing or in making available to Owner from time to time whenever requested, in an expeditious manner, any and all such information, materials and data.

31.4 Owner's authorized representative or designee shall have reasonable access to the Construction Manager's facilities, shall be allowed to interview all current or former employees to discuss matters pertinent to the performance of this contract and shall provide adequate and appropriate work space in order to conduct audits in compliance with this Article. The Construction Manager and its payees agree bear their costs and expenses relating to any inspections and audits.

31.5 If an audit inspection or examination in accordance with this Article discovers any fraud or misrepresentation, or discloses overpricing or overcharges (of any nature) by the Construction Manager to the Owner, in addition to making adjustments for the overcharges, the reasonable actual cost of the Owner's audit shall be reimbursed to the Owner by the Construction Manager. Any adjustments and/or payments that must be made as a result of any such audit or inspection of the Construction Manager's invoices and/or records shall be made within Ninety (90) Calendar Days from presentation of the Owner's findings to the Construction Manager.

31.6 The provisions of Articles 31.1, 31.2 and 31.5 notwithstanding, the Owner shall have the right to conduct inspections and audits of any matter relating to the Contract Documents or the Work, which shall be for the Owner's sole benefit and shall not relieve the Construction manager, its sureties, contractors, subcontractors suppliers and their respective employees and agents of any obligations under the Contract Documents.

31.7 Any audits or inspections under Article 31 shall not constitute a waiver of any right the Owner has to accounting or discovery of records in the possession, custody or control of the Construction Manager, its sureties, contractors, subcontractors, vendors and their respective employees and agents

ARTICLE 32 - PROGRESS & SCHEDULING

32.1 If requested by the Owner during the Design Phase of the Project, and working in cooperation with the Owner and the Consultant(s), the Construction Manager shall prepare a Critical Path Method (CPM) type Design Phase schedule incorporating design phase and review activities through completion of the design and bidding of the Trade Contracts, shall include in this Design Phase schedule the broad categories of Work to be accomplished in the subsequent implementation of the design and construction of the Project, and shall modify and update this Design Phase schedule as necessary to reflect the actual status and then current plan for the Project.

32.2 The schedules submitted for this Project shall be prepared using Primavera P6 scheduling software. If approved by the University, and at the sole discretion of the University, schedules submitted using earlier versions of Primavera scheduling software (Primavera SureTrak or Primavera P3) may be converted to Primavera P6 format by the University for review purposes. However, the University will not be responsible for any inaccuracies that may result from such conversions.

32.2.1 Prior to bidding Trade Contracts, the Construction Manager shall prepare and submit to the Owner and the Consultant a preliminary CPM construction schedule for the Work that will be included in the Project bidding documents.

3.2.2.2 The schedules submitted for this Project shall coordinate Work in accordance with all schedules included in the Owner's approved Program. Construction work shall be scheduled and executed such that operations of the University are given first priority. This applies particularly to outages and restriction of access.

32.2.3 The schedules submitted for this Project shall not exceed time limits established for the Project. Schedules which reflect a duration less than the Contract Time are for the convenience of the Construction Manager and shall not be the basis of any claim for delay or extension of time.

32.2.4 Schedules shall be revised at appropriate intervals as required by the condition of the Work and the Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

32.2.5 The Construction Manager shall also submit a payment schedule indicating the percentage of the Contract Amount and the amount of the anticipated monthly payments that will be requested as the Project proceeds.

32.2.6 The Owner may withhold approval of all or a portion of progress payments until the progress payment schedule and construction schedule have been submitted by the Construction Manager.

32.3 The Construction Manager shall prepare and keep current, for the Consultant's approval, a separate schedule of submittals coordinated with the Construction Manager's CPM construction schedule that provides reasonable time for the Consultant to review the submittals.

32.4 The Construction Manager shall cause the work to be performed pursuant to the most recent schedules.

ARTICLE 33 - USE OF COMPLETED PORTIONS

33.1 Upon mutual Agreement between the Owner, Construction Manager, and Consultant, the Owner may use a completed portion of the Project after an inspection is made. Such possession and use shall not be deemed as acceptance of any Work not completed in accordance with the Contract Documents, nor shall such possession and use be considered to alter warranty obligations or cause any warranty period to commence prior to Substantial Completion.

ARTICLE 34 - INDEMNIFICATION

34.1 To the fullest extent permitted by law, the Construction Manager shall indemnify and hold harmless the Owner, its consultants, and their respective employees and agents from and against all claims, damages, losses and expenses, including attorney's fees, provided that any such claim, loss, damage or expense: (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (b) is caused in whole or in part by any negligent act or omission of the Construction Manager, any Sub-contractor or material supplier, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable This basic obligation to indemnify shall not be construed to nullify or reduce other indemnification rights which the Owner, its consultants, and their respective employees and agents would otherwise have.

34.2 The Construction Manager shall also indemnify and hold harmless the Owner, its consultants, and their respective employees and agents from any claims relating to the Project brought against the Owner, its consultants, and their respective employees and agents by any Sub-contractor unless such claims are due to the gross negligence or misconduct of the Owner or Consultant.

34.3 In any and all claims against the Owner its consultants, and their respective employees and agents, by any employee of the Construction Manager, any Sub-contractor, any one directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Article shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Construction Manager or any Sub-contractor under Worker's Compensation acts, disability benefit acts or other employee benefit acts.

34.4 The obligations of the Construction Manager under this Article shall not extend to the liability of the Consultant, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the

giving of or the failure to give directions or instructions by the Consultant, his agents or employees, provided such giving or failure to give is the primary cause of injury or damage.

ARTICLE 35 - INSURANCE

35.1 The Construction Manager shall furnish the Owner the Certificates of Insurance or other acceptable evidence that insurance is effective, and guarantee the maintenance of such coverage during the term of the Contract. Each policy of insurance, except Workers Compensation, shall name the University of Kentucky and the directors, officers, trustees and employees of the University as additional insured on a primary and non-contributory basis as their interest appears. Waiver of subrogation in favor of the University of Kentucky shall apply to all policies. Any endorsements required to validate such waiver of subrogation shall be obtained by the Construction Manager at the Construction Manager's expense.

35.2 The Construction Manager shall not commence, nor allow any Sub-contractor to commence Work under this Contract, until the Owner has reviewed the certificates and approved coverages and limits as satisfying the requirements of the bidding process.

35.3 Workers' Compensation and Employers' Liability Insurance. The Construction Manager shall acquire and maintain Workers' Compensation insurance with Kentucky's statutory limits and Employers' Liability insurance as defined in the Special Conditions for all employees who will be working at the Project site. In the event any Work is sublet, the Construction Manager shall require any Sub-contractor to provide proof of this insurance for the Sub-contractors' employees, unless such employees are covered by insurance provided by the Construction Manager.

35.4. The Construction Manager shall either require each Sub-contractor to procure and maintain insurance of the type and limits stated during the terms of the Contract, or insure the activities of such Sub-contractors under a blanket form as described below:

35.4.1 Commercial General Liability Insurance. The Construction Manager shall acquire and maintain a Broad Form Comprehensive General Liability (CGL) Insurance Policy including premises - operations, products/completed operations, blanket contractual, broad form property damage, real property fire legal liability and personal injury liability coverage. The Insurance Policy must be on an "occurrence" form only, unless approved by the Owner. Contractual liability must be endorsed to include defense costs. Products and completed operations insurance must be carried for two years following completion of the Work. Policies which contain Absolute Pollution Exclusion endorsements are not acceptable. Coverage must include pollution from "hostile fires". Where required by the risks involved, Explosion, Collapse and Underground (XCU) coverages shall be added by endorsement. If the work involved requires the use of helicopters, a separate aviation liability policy as defined in the Special Conditions will be required. If cranes and rigging are involved, a separate inland marine policy with liability limits as defined in the Special Conditions will be required.

35.4.1.1 The limits of liability shall not be less than defined in the Special Conditions.

35.4.2 Comprehensive Automobile Liability Insurance. The Construction Manager shall show proof and guarantee the maintenance of insurance to cover all owned, hired, leased or non-owned vehicles used on the Project. Coverage shall be for all vehicles including off the road tractors, cranes and rigging equipment and include pollution liability from vehicle upset or overturn. Policy limits shall not be less than defined in the Special Conditions.

35.4.3 Excess or Umbrella Liability Insurance. The Construction Manager shall acquire and maintain a policy of excess liability insurance in an umbrella form for excess coverages over the required primary policies of broad form commercial general liability insurance, business automobile liability insurance and employers' liability insurance. This policy shall have a minimum as defined in the Special Conditions for each occurrence in excess of the applicable limits in the primary policies. The excess liability policy shall not contain an absolute pollution exclusion and shall include coverages for pollution that may occur due to hostile fires and vehicle upset and overturn. The limits shall be increased as appropriate to cover any anticipated special exposures.

35.5 Builders Risk Insurance. The Construction Manager shall purchase and maintain an "all risk" Builder's Risk Insurance policy upon the Work at the site to the full insurable value thereof. Such insurance shall include interests of the Owner, Construction Manager, and all Sub-contractors and of their subcontractors. It shall insure against perils of fire, extended coverage, vandalism and malicious mischief. Construction Manager's work performed, and materials to be incorporated into the project and stored on the jobsite, will be covered. Builder's Risk does not include temporary buildings, or Construction Manager or Construction Manager's tools, equipment, or trailers and contents.

35.6 Insurance Agent and Company Insurance as required in the bidding process of the Project shall be written according to applicable state law in Kentucky. The policies shall be written by an insurer duly authorized to do business in Kentucky in compliance with KRS: 304.1-.100 and -110.

ARTICLE 36 - PERFORMANCE AND PAYMENT BONDS

36.1 The Construction Manager shall furnish a Performance Bond in the form provided in the Contract Documents in the full amount of the Contract Amount as security for the faithful performance of the Contract. The Construction Manager shall also furnish a Payment Bond in the form provided in the Contract Documents in the full amount of the Contract Amount for the protection of all persons performing labor or furnishing materials, equipment or supplies for the Construction Manager or its Sub-contractors for the performance of the Work provided for in the Contract, including security for payment of all unemployment contributions which become due and payable under Kentucky Unemployment Insurance Law.

36.2 Each bond furnished by the Construction manager shall incorporate by reference the terms of the Contract as fully as though they were set forth verbatim in such bonds. In the event the Contract Amount is adjusted by Change Order, the penal sum of both the performance bond and the payment bond shall be deemed increased by like amounts.

36.3 The performance and payment bonds shall be executed by a surety company authorized to do business in the Commonwealth of Kentucky, and the contract instrument of bonds must be countersigned by a duly appointed and licensed resident agent.

ARTICLE 37 - DAMAGED FACILITIES

37.1 The Construction Manager shall repair or replace, at no expense to the Owner, any damaged section of existing buildings, paving, landscaping, streets, drives, utilities, watersheds, etc. caused by Work performed under the Contract or incidental thereto, whether by the Construction Manager's own forces, Sub-contractors or by material suppliers. Such repair or replacement shall be performed by craftsmen skilled and experienced in the trade or craft for the original Work.

37.2 Water damage to the interior of any building caused by Work performed under the Contract or incidental thereto, whether by the Construction Manager's own forces, Sub-contractors, or by material suppliers, and whether occurring in a new or existing building, shall be repaired by the

Construction Manager at the Construction Manager's expense, and any materials damaged inside the building, including personal property, shall be repaired or replaced at the full replacement cost by the Construction Manager at the Construction Manager's expense.

37.3 For existing buildings, the Construction Manager, along with the Owner's Representative and Consultant, will tour the Project site to evaluate existing conditions and determine any existing damage before any Work on this Contract is done.

37.4 Should the Construction Manager fail to proceed with appropriate repairs in an expedient manner, the Owner reserves the right to have the Work/repairs completed and deduct the cost of such Work/repairs from amounts due or to become due to the Construction Manager. If the Owner deems it not expedient to repair the damaged Work, or if repairs are not done in accordance with the Contract, an equitable deduction from the Contract price shall be made.

ARTICLE 38 - CLAIMS & DISPUTE RESOLUTION

38.1 All Construction Manager's claims and disputes shall be referred to the Consultant for review and recommendation. All claims shall be made in writing to the Consultant and to the Owner's Project Manager not more than ten (10) days from the occurrence of the event which gives rise to the claim or dispute, or not more than ten (10) days from the date that the Construction Manager knew or should have known of the claim or dispute. Unless the claim is made in accordance with these requirements, it shall be waived. Any claim not submitted before Final Payment shall be waived. The Consultant shall render a written decision within fifteen (15) days following receipt of a written demand for the resolution of a claim or dispute.

38.1.1 The provisions of Article 43.2 notwithstanding, claims and disputes between the Construction Manager and any Sub-contractor or supplier shall not be referred to the Consultant except to request interpretation and/or clarification of the intent of the plans or specifications. Such claims and disputes between the Construction Manager and any Sub-contractor shall be resolved between those parties as required by Article 43.4 of these General Conditions.

38.2 The Consultant's decision shall be final and binding on the Construction Manager unless the Construction Manager submits to the Consultant and the Owner's Project Manager a written notice of appeal within fifteen (15) Calendar Days of the Consultant's decision. The Construction Manager must present within fifteen (15) Calendar Days of such notice to appeal a narrative claim in writing with complete supporting documentation. After receiving the written claim, the Project Manager will review the materials relating to the claim and may meet with the Consultant and/or the Construction Manager to discuss the merits of the claim. The Project Manager will render a decision within thirty (30) Calendar Days after receiving the written claim and supporting documentation. The decision of the Project Manager shall be final and binding pending further appeal as provided for in Article 39. If the Consultant or the Project Manager do not issue a written decision within thirty (30) calendar days after receiving the claim and supporting documentation, or within a longer period as may be established by the parties to the Contract in writing, then the Construction Manager may proceed as if an adverse decision had been received.

38.3 If the Project Manager does not agree with the Consultant's decision on a claim by the Construction Manager, the Project Manager shall notify the Construction Manager and the Consultant and direct the Construction Manager to perform the Work about which the claim was made and the Construction Manager shall proceed with such Work in accordance with the Project Manager's instruction. If the Construction Manager disagrees with a decision of the Project Manager concerning a Construction Manager's claim, the Construction Manager shall proceed with the Work as indicated by the Project Manager's decision.

38.4 The Construction Manager shall continue to diligently pursue Work under the Contract pending resolution of any dispute, and the Owner shall continue to pay for undisputed work in place.

ARTICLE 39 - CLAIMS FOR DAMAGE

39.1 Should either party to the Contract suffer damage because of wrongful act or neglect of the other party, or of anyone employed by them, or others for whose act they are legally liable, or if other controversy should arise under the Contract, such claim or controversy shall be made in writing to the other party within thirty (30) days after the first occurrence of the event. Prior to the institution of any action in court, the claim or controversy (together with supporting data) shall be presented in writing to the Director of the Capital Project Management Division at the University of Kentucky ("Director") or his designee. The Director, or designee, is authorized, subject to any limitations or conditions imposed by regulations, to settle, comprise, pay, or otherwise adjust the claim or controversy with the Construction Manager. The Director, or designee, shall promptly issue a decision in writing. A copy of the decision shall be mailed or otherwise furnished to the Construction Manager. The decision rendered shall be final and conclusive unless the Construction Manager files suit pursuant to KRS 45A.245. If the Director, or designee, does not issue a written decision within one hundred and twenty (120) days after written request for a final decision, or within a longer period as may be established by the parties to the Contract in writing, then the Construction Manager may proceed as if an adverse decision had been received.

39.2 Any legal action on the Contract shall be brought in the Franklin Circuit Court and shall be tried by the Court sitting without a jury. All defenses in law or equity, except the defense of government immunity, shall be preserved to the Owner. The Owner shall recover from the Construction Manager all attorney's fees, costs and expenses incurred to the extent the Owner prevails in defending or prosecuting each claim in litigation of disputes under the Contract. The Owner is the prevailing party under this provision and is entitled to recover attorneys' fees, costs and expenses on a claim-by-claim basis to the extent the Owner successfully defeats or prosecutes each claim. A recovery of a net judgment by the Construction Manager shall not be determinative of the Owner's right to recover attorneys' fees, expenses and costs. Rather, such a determination shall be made based on the extent that the Owner successfully defends or prosecutes each distinct claim in litigation under the Contract, even if the Owner does not prevail on every claim. The Construction Manager shall be liable to the Owner for all attorney's fees, costs and expenses incurred by the Owner to enforce the provisions of the Contract.

ARTICLE 40 - LIENS

40.1 The filing and perfection of liens for labor, materials, supplies, and rental equipment supplied on the Work are governed by KRS 376.195 et seq.

40.2 Statements of lien shall be filed with the Fayette County Clerk and any action to enforce the same must be instituted in the Fayette Circuit Court, pursuant to KRS 376.250 (5).

40.3 The lien shall attach only to any unpaid balance due the Construction Manager for the improvement from the time a copy of statement of lien, attested by the Fayette County Clerk, is delivered to the Owner, pursuant to the provisions of KRS 376.240.

ARTICLE 41 - ASSIGNMENT

41.1 Neither party to the Contract shall assign the Contract, or any portion thereof without the prior written consent of the other, which consent may be granted or withheld in the granting party's

sole and absolute discretion. The Construction Manager shall not assign any amount or part of the Contract or any of the funds to be received under the Contract unless the Construction Manager has the prior written approval of the Owner (which approval may be granted or withheld in the Owner's sole and absolute discretion) and the Surety on the Construction Manager's bond has given written consent to any such assignment.

ARTICLE 42 - SEPARATE CONTRACTS

42.1 The Owner reserves the right to enter into other Contracts in connection with the Project or to perform any work with the Owner's forces in the normal sequence of the work as depicted in the then current construction schedule. Except for work performed by University personnel, such contracts shall be assignable to the Construction Manager and shall contain the same terms and conditions as the contracts between the Construction Manager and the Sub-contractors. The Construction Manager will be entitled to a maximum of three percent (3%) overhead and profit on the value of such assigned contracts. The Construction Manager shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate its Work with theirs in such manner as the Consultant may direct.

42.2 Should the Construction Manager cause damage to any separate contractor on the Work, and the separate contractor sues the Owner on account of any damage alleged to have been so sustained, the Construction Manager shall be responsible for all costs, attorney's fees and expenses incurred by the Owner for defending such proceedings unless the Owner prevails on behalf of the Construction Manager in which case fees and expenses will be the responsibility of the separate contractor and if any judgment against the Owner arises therefrom, the Construction Manager shall pay or satisfy it and shall pay all costs, attorney's fees and expenses incurred by the Owner.

42.3 If any part of the Construction Manager's Work depends upon the work of any other separate contractor, the Construction Manager shall promptly report to the Consultant any observed defects in such work that render it unsuitable for proper execution connection. The failure to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the work, except as to defects which may develop in the other contractor's work after the execution of the work.

42.4 Whenever work being done by the Owner's forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various parties involved shall be established by the Owner to secure the completion of the various portions of the Work in general harmony.

ARTICLE 43 - CONSTRUCTION MANAGER/SUB-CONTRACTOR RELATIONSHIP

43.1 The Construction Manager is fully responsible to the Owner for the acts and omissions of the Sub-contractors and of persons either directly or indirectly employed by them. The Construction Manager is responsible for the acts and omissions of persons employed directly by the Construction Manager and for the coordination of the Work, including placement and fittings of the various component parts. No claims for extra costs as a result of the failure to coordinate the Work, or by acts or omissions of the various Sub-contractors, will be paid by the Owner.

43.2 Except as otherwise provided in these Contract Documents, the Construction Manager agrees to bind every Sub-contractor by the terms and conditions of the Contract Documents as far as applicable to their portion of the Work. Upon request, the Construction Manager shall provide copies of any subcontracts and purchase orders to the Owner or Consultant.

43.3 The Construction Manager shall make no substitution or change in any Sub-contractor listed and accepted by the Consultant or Owner except as approved in writing by the Owner. The Construction Manager shall not employ any Sub-contractor or supplier against whom the Owner or the Consultant has made reasonable and timely objection. The Construction Manager (CM) will not be allowed to self-perform work or bid on any of the proposed work categories unless a subcontractor fails to perform and upon prior approval by the Universities authorized representatives."

43.4 Nothing contained in the Contract Documents shall create any contractual relationship between the Owner and any Sub-contractor, Trade Contractor or Supplier, nor shall the Construction Manager include any language in their contracts with any Sub-contractor, Trade Contractor and/or Supplier that might Imply such a relationship. The Construction Manager is hereby notified that it is the Construction Manager's contractual obligation to settle disputes between Sub-contractors, Trade Contractors, and/or Suppliers. Neither the Owner nor the Consultant will settle disputes between the Construction Manager and any Sub-contractor, Trade Contractor, and/or Supplier or between Sub-contractors, Trade Contractors, and/or Suppliers.

43.4.1 The Owner does not waive sovereign immunity under KRS 45A.245(1) for any claim or claims made by parties not having a written contract with the University of Kentucky.

43.4.2 Third party and/or flow-through type claims, from Sub-contractors and/or suppliers or any other entity not having a written contract directly with the University, are specifically prohibited by this Contract and no provision of the Construction Manager's contracts with such entities shall indicate otherwise.

43.4.3 The Construction Manager shall indemnify and hold harmless the Owner and its agents and employees from any claims relating to the Project brought against the Owner by any of the Construction Manager's Sub-contractors or suppliers, or between their sub-contractors or suppliers.

ARTICLE 44 - CASH ALLOWANCE

44.1 The Construction Manager is to provide or require the Sub-contractor(s) to include in the Contract Amount all costs necessary to complete the Work. Costs based on "allowances" shall be permitted only for objectively quantifiable material items and only with the prior written approval of the Owner.

ARTICLE 45 - PROJECT SITE LIMITS

45.1 The Construction Manager shall confine the apparatus, the storage of materials, and the operations of Workmen to Project site limits indicated in the Contract Documents and as permitted by law, ordinances, and permits, and shall not unreasonably encumber the site with materials and equipment.

ARTICLE 46 - CLEAN UP

46.1 The Construction Manager shall at all times keep the premises free from accumulation of waste material or rubbish caused by the operations in connection with the Work. All corridors and exit doors must be kept clear at all times. All exit ways, walks, and drives must be kept free of debris, materials, tools and vehicles.

46.2 At the completion of the Work, and prior to final inspection and acceptance, the Construction Manager shall remove all remaining waste materials, rubbish, Construction Manager's construction equipment, tools, machinery, and surplus materials and shall leave the Work in a clean and usable

condition, satisfactory to the Consultant and the Owner. If the Construction Manager fails to clean up as provided in the Contract Documents, the Owner may perform the cleaning tasks and charge the cost to the Construction Manager.

ARTICLE 47 - POINTS OF REFERENCE

47.1 The Construction Manager shall carefully preserve bench marks, reference points and stakes, and in case of willful or careless destruction, the Construction Manager shall be charged with the resulting expense of replacement and shall be responsible for any mistake that may be caused by their loss or disturbance.

ARTICLE 48 - SUBSTITUTION - MATERIALS AND EQUIPMENT

48.1 Reference to or the listing of items to be incorporated in the construction without referring to any specific article, device, equipment, product, material, fixture, patented process, form, method or type of construction, or by name, make, trade name, or catalog number shall be interpreted as establishing the general intent of the Contract and the general standard of quality for that item.

48.2 Specific references in the Contract Documents to any article, device, equipment, product, material, fixture, patented process, form, method or type of construction, or by name, make, trade name, or catalog number, with the words "or equal", shall be interpreted as establishing a minimum standard of quality, and shall not be construed as limiting competition.

48.2.1 Substitution of other equipment and materials as “or equal” to items named in the specifications will be allowed provided the proposed substitution is approved by the Consultant and will perform the functions called for by the general design, be similar and of equal quality to that specified and be suited to the same use and capable of performing the same function of that specified. The Construction Manager has the burden to prove equality of any substitution requested.

48.3 Specific references in the Contract Documents to any article, device, equipment, product, material, fixture, patented process, form, method or type of construction, or by name, make, trade name, or catalog number, without the words “or equal”, shall be interpreted as defining an item or source that has after careful consideration been determined by the University as necessary to be compliant with, and/or to function properly within, the University operational system. No substitutions will be allowed.

48.3.1 In the event the Contract Documents contain specific reference to two or more items as described in Article 48.3, any of those listed will be acceptable.

48.4 Substitution of equipment and materials previously submitted by the Construction Manager and approved by the Consultant will be considered only for the following reasons:

48.4.1 Unavailability of the materials or equipment due to conditions beyond the control of the supplier.

48.4.2 Inability of the supplier to meet Contract Schedule.

48.4.3 Technical noncompliance to specifications.

48.5 In substituting materials or equipment, the Construction Manager assumes responsibility for any changes in systems or modifications required in adjacent or related work to accommodate such substitutions, despite consultant approval, and all costs associated with the substitution shall be the

responsibility of the Construction Manager. The Consultant shall be reimbursed by the Construction Manager for any architectural or engineering revisions required as the result of such substitutions.

48.6 Inclusion of a certain make or type of materials or equipment in the Construction Manager's bid proposal shall not obligate the Owner to accept such materials or equipment if they do not meet the requirements of the Contract Documents and any such substitutions in the preparation of the bid without written approval shall be at the sole risk of the Construction Manager.

ARTICLE 49 - TEST AND INSPECTION

49.1 Regulatory agencies of the government having jurisdiction may require any Work to be inspected, tested or approved. The Construction Manager shall assume full responsibility therefore, pay all costs in connection therewith, unless otherwise noted, and furnish the Consultant the required certificates of inspection, testing or approval.

49.2 The Construction Manager shall give the Consultant timely notice of readiness of the Work for all inspections, tests or approvals.

49.3 The technical specifications may indicate specific testing requirements to be performed by the Construction Manager. Unless otherwise provided in the Contract Documents, the cost of all such testing shall be the responsibility of the Construction Manager. Testing shall be completed using a testing facility or laboratory approved by the Owner.

49.4 The costs of all inspection fees as may be required to construct and occupy the Work shall be the responsibility of the Construction Manager.

ARTICLE 50 - WARRANTY

50.1 The Construction Manager warrants to the Owner and the Consultant that all materials and equipment furnished under this Contract shall be new and in accordance with the requirements of the Contract Documents, and that all Work shall be of good quality, free from faults and defects and in conformance with the Contract Documents. If required by the Consultant or the Owner, the Construction Manager shall furnish satisfactory evidence as to the kind and quality of materials and equipment. If the Construction Manager requests approval of a substitution of material or equipment, the Construction Manager warrants that such installation, construction, material, or equipment will equally perform the function for which the original material or equipment was specified. The Construction Manager explicitly warrants the merchantability, the fitness for a particular purpose, and quality of all substituted items in addition to any warranty given by the manufacturer and/or supplier. Approval of any such substitution is understood to rely on such warrant of performance. Prior to the Substantial Completion inspection, the Construction Manager shall deliver to the Consultant all warranties and operating instructions required under the Contract or to which the Construction Manager is entitled from manufacturers, suppliers, and Sub-contractors. All warranties for products and materials incorporated into the Work shall begin on the date of Substantial Completion. The warranty provided in this Article 50 shall be in addition to and not a limitation of any other warranty or remedy required by law or by the Contract Documents, and such warranty shall be interpreted to require the Construction Manager to replace defective material and equipment and re-execute defective Work which is disclosed to the Construction Manager by or on behalf of the Owner within a period of one (1) year after Substantial Completion of the entire Work in addition to other warranty obligations beyond one year from Substantial Completion as provided for by law or by the Contract Documents.

50.2 Neither the final payment, any provision in the Contract Documents nor partial or entire use or occupancy of the premises by the Owner shall constitute an acceptance of Work not done in accordance with Contract Documents or relieve the Construction Manager or its Sureties of liability with respect to any warranties or responsibilities for faulty materials and workmanship. The Construction Manager or its sureties shall remedy any defects in Work and any resulting damage to Work at the Construction Manager's own expense. The Construction Manager shall be liable for correction of all damage resulting from defective Work. If the Construction Manager fails to remedy any defects or damage, the Owner may correct Work or repair damages and the cost and expense incurred in such event shall be paid by or be recoverable from the Construction Manager or the surety. The Owner will give notice of observed defects with reasonable promptness.

50.3 The Construction Manager shall guarantee that labor, material, and equipment will be free of defects for a period of one (1) year from the date shown on the Certificate of Substantial Completion unless special conditions or additional warranty periods are required by the contract pursuant to Article 23 in addition to warranty obligations which extend beyond one year from Substantial Completion. The Owner will give notice of observed defects with reasonable promptness. Expendable items and wear from ordinary use are excluded from this warranty.

50.4 Should the Construction Manager be required to perform tests that must be delayed due to climate conditions, it is understood that such tests will be accomplished by the Construction Manager at the earliest possible date with provisions of the general warranty beginning upon satisfactory completion of said test. The responsibility of the Construction Manager under this Article will not be abrogated if the Owner should elect to initiate final payment. If the Owner initiates final payment, consent of Construction Manager's surety acknowledging that Work not yet tested is required. The Construction Manager shall warrant that the entire Project will conform to the Contract Documents.

50.5 In addition to the foregoing, the Construction Manager shall warrant for a period of one (1) year that all buildings and other improvements constructed as a part of the Work shall be watertight and leak proof at every point and in every area. The Construction Manager shall, immediately upon notification by or on behalf of the Owner of water penetration, determine the source of water penetration and, at the Construction Manager's expense, (a) do any work necessary to make such buildings or improvements watertight and (b) repair and replace any other damaged material, finishes and furnishings damaged as a result of such water penetration and return the buildings or other improvements to their original condition.

50.6 The Construction Manager shall address and resolve to the Owner's satisfaction any warranty claims made by or on behalf of the Owner during the above described warranty period and all repairs and replacements made by the Construction Manager pursuant to this Article 50 shall be warranted by the Construction Manager, on the terms set forth in this Article 50, for a period of time commencing upon the completion of such repairs and replacements and ending on the later of (a) the expiration of the one (1) year warranty period provided for above or (b) six (6) months after the date such repair or replacement is completed.

50.7 All costs, attorney's fees and expenses incurred by the Owner as a result of the Construction Manager's failure to honor any warranty for the Work shall be paid by or recoverable from the Construction Manager.

ARTICLE 51 - PREVAILING WAGE LAW REQUIREMENTS (NO LONGER USED AS OF 1/9/17)

ARTICLE 52 - APPRENTICES

52.1 Apprentices (for all classifications of work) shall be permitted to work only under an apprenticeship agreement approved by the Kentucky Supervisor of Apprenticeship and by the Kentucky Apprenticeship and Training, United States Department of Labor.

ARTICLE 53 - GOVERNING LAW

53.1 This Contract and all issues and disputes arising out of this Contract shall be governed by, construed and enforced in accordance with the laws of the Commonwealth of Kentucky without consideration of its conflicts of laws principles.

ARTICLE 54 - NONDISCRIMINATION IN EMPLOYMENT

54.1 During the performance of the Contract, the Construction Manager agrees as follows:

54.1.1 The Construction Manager will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or disability in employment. The Construction Manager will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, age, national origin, or disability in employment. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Construction Manager agrees to post in conspicuous places available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

54.1.2 The Construction Manager will, in all solicitations or advertisements for employees placed by or on behalf of the Construction Manager; state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age, national origin or disability in employment.

54.1.3 The Construction Manager will send to each labor union or representatives of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representatives of the Construction Manager's commitments under this Article, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

54.2 Failure to comply with the above nondiscrimination clause constitutes a material breach of Contract.

ARTICLE 55 - AFFIRMATIVE ACTION; REPORTING REQUIREMENTS

55.1 The Construction Manager and any Sub-contractor is exempt from any affirmative action or reporting requirements, under the Kentucky Equal Employment Opportunity Act of 1978, KRS 45.550 to KRS 45.640 “The Act", if any of the following conditions are applicable:

55.1.1 The Trade Contract awarded is in the amount of two hundred and fifty thousand dollars ($250,000.00) or less, and the amount of the Trade Contract is not a subterfuge to avoid compliance with the provisions of the Act;

55.1.2 The Construction Manager or Sub-contractor utilizes the services of fewer than eight (8) employees during the course of the Contract;

55.1.3 The Construction Manager or Sub-contractor employs only family members or relatives;

55.1.4 The Construction Manager or Sub-contractor employs only persons having a direct ownership interest in the business and such interest is not a subterfuge to avoid compliance with the provisions of The Act.

55.2 The Construction Manager and any Sub-contractor, not otherwise exempted, shall:

55.2.1 For the length of the Contract, hire DBE's from within the drawing area to satisfy the agreed upon goals and timetables. Should the union with which the General Contractor or Sub-contractor have collective bargaining agreements be unwilling to provide sufficient DBE's to satisfy the agreed upon goals and timetables, the General Contractor and Sub-contractors shall hire DBE's from other sources within the drawing area.

Diverse Business Enterprises (DBE) consist of minority, women, disabled, veteran and disabled veteran owned business firms that are at least fifty-one percent owned and operated by an individual(s) of the aforementioned categories. Also included in this category are disabled business enterprises and non-profit work centers for the blind and severely disabled. MBE, WBE, Veterans, Disabled Veterans and Disabled make up Diverse Business Enterprises (DBE)

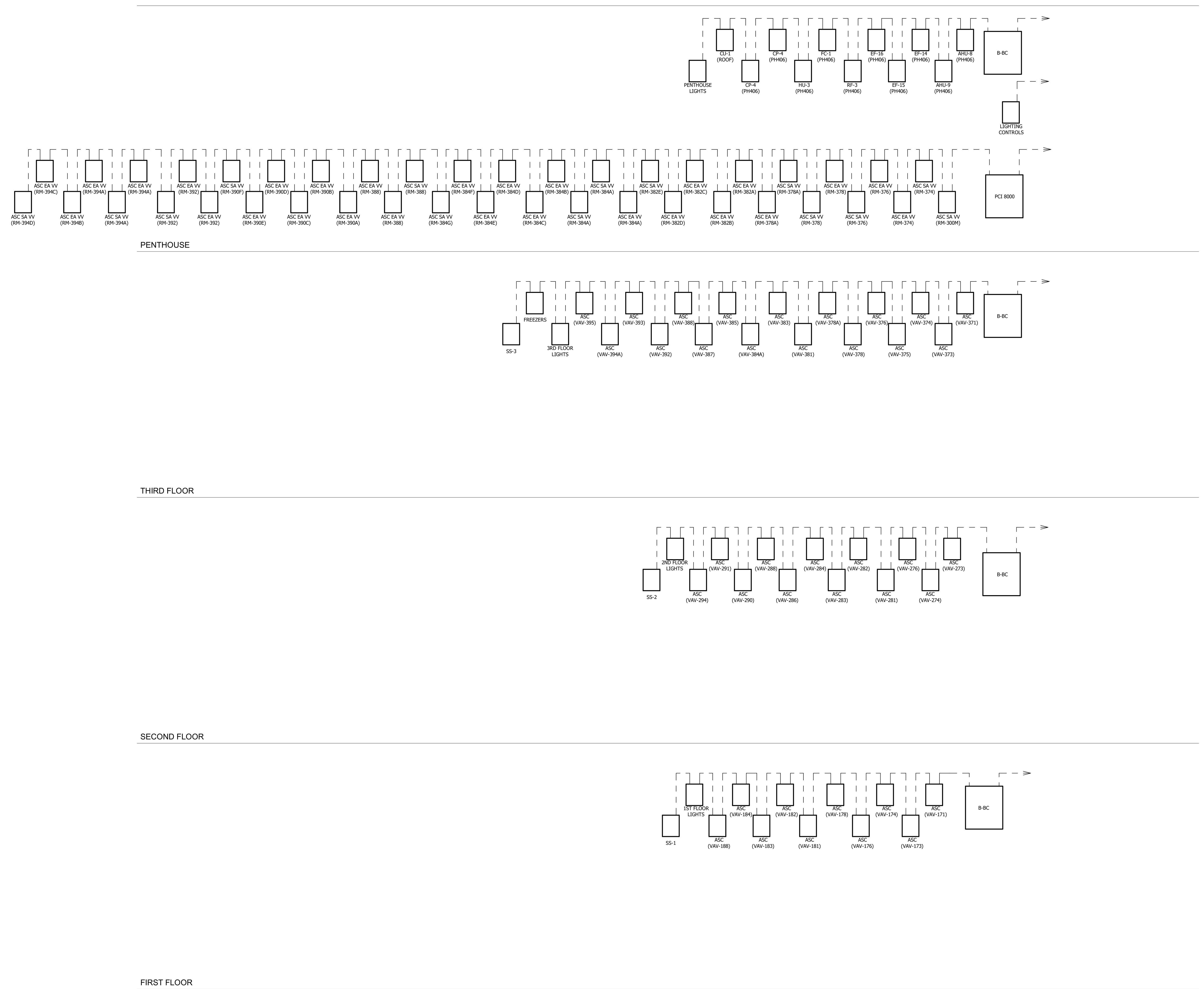
55.2.2 The equal employment provisions of The Act may be met in part by the Construction Manager contracting to a DBE contractor or Sub-contractor. A DBE contractor, or Sub-contractor shall mean a business established under the definition of a DBE in Article 55.2.1

55.2.3 The Construction Manager shall, for the length of the Contract, furnish such information as required by The Act and by such rules, regulations and orders issued pursuant thereto and will permit access by the contracting agency and the department to all books and records pertaining to its employment practices and Work sites for purposes of investigation to ascertain compliance with The Act and such rules, regulations and orders issued pursuant thereto.

55.3 If the Construction Manager is found to have committed an unlawful practice against a provision of The Act during the course of performing under this Contract, a Trade Contract or a subcontract covered under The Act, the Owner may cancel or terminate the Contract, conditioned upon a program for future compliance approved by the Owner. The Owner may also declare such Construction Manager ineligible to submit proposals on further contracts until such time as the Construction Manager complies in full with the requirements of The Act.

55.4 Any provisions of The Act notwithstanding, the Construction Manager shall not be required to terminate an existing employee, upon proof that employee was employed prior to the date of the Contract, nor to hire anyone who fails to demonstrate the minimum skills required to perform a particular job.

END OF DOCUMENT



(A) BUILDING CONTROLS ARCHITECTURE

1/16" = 1'-0"

RESPONSIBILITY MATRIX

RESPONSIBILITY	CC	CC-B	FMCE
BAS GRAPHICS FOR ALL NEW NON-LAB HVAC,PLUMBING, ELECTRICAL, AND CONTROLS			X
BAS GRAPHICS FOR NEW VENTURI VALVES AND LAB HOODS			X
CONTROLS COMMINSSIONING			X
CONTROLS PROGRAMMING ON ALL NEW LABORATORY VENTURI VALVES AND FUME HOODS	X	X	
CONTROLS PROGRAMMING ON NEW LAB EXHAUST FAN	X		
INTEGRATION FOR ALL NEW CONTROLLERS			X
PROVIDE ALL SENSORS, ALARMS, CONDUIT AND WIRING, CONTRACTORS, RELAYS, AND RELATED EQUIPMENT FOR LABORATORY FREEZER MONITORING AND ALARMS	X		
PROVIDE NEW DDC CONTROLS FOR ALL NEW HVAC, PLUMBING, ELECTRICAL AS SHOWN ON CONTROLS DRAWINGS FOR BASE BID. PROVIDE ALL CONTROLLERS, CONDUIT AND WIRING, SENSORS, ACTUATORS, AND RELATED EQUIPMENT FOR A COMPLETE NEW DDC CONTROLS SYSTEM TO MEET UNIVERSITY OF KENTUCKY STANDARDS.	X		
PROVIDE NEW VENTURI VALVES AND LAB CONTROLS COMPLETE FOR NEW LABS AS SHOWN ON DRAWINGS. PROVIDE OPEN B-BC LEVEL CONTROLLER AND CONTROL PANEL AND MOUNT IN LOCATION SHOWN ON PLANS. PROVIDE ALL CONDUIT AND WIRING REQUIRED FOR NEW BACNET/MS/TP COMMUNICATIONS BETWEEN DEVICES. PROVIDE NEW CONTROL PANEL AND MOUNT AS SHOWN ON DRAWINGS. PROVIDE LAB EXHAUST HOOD CONTROLS INCLUDING PROXIMITY SENSOR, SASH POSITION SWITCH, FUME HOOD MONITOR, ALARMS, DISCHARGE AIR SENSORS, VOLTAGE CONVERTORS, POWER SUPPLIES, AND ALL RELATED COMPONENTS PER UNIVERSITY OF KENTUCKY STANDARDS	X	X	
TERMINATE ALL WIRING TO CONTROL DEVICES FOR BOTH NEW AND EXISTING NON-LAB CONTROLS EQUIPMENT FOR BASE BID AND BID ALTERNATE#1	X		

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RESERVED FOR AHJ STAMP

CMTA

CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

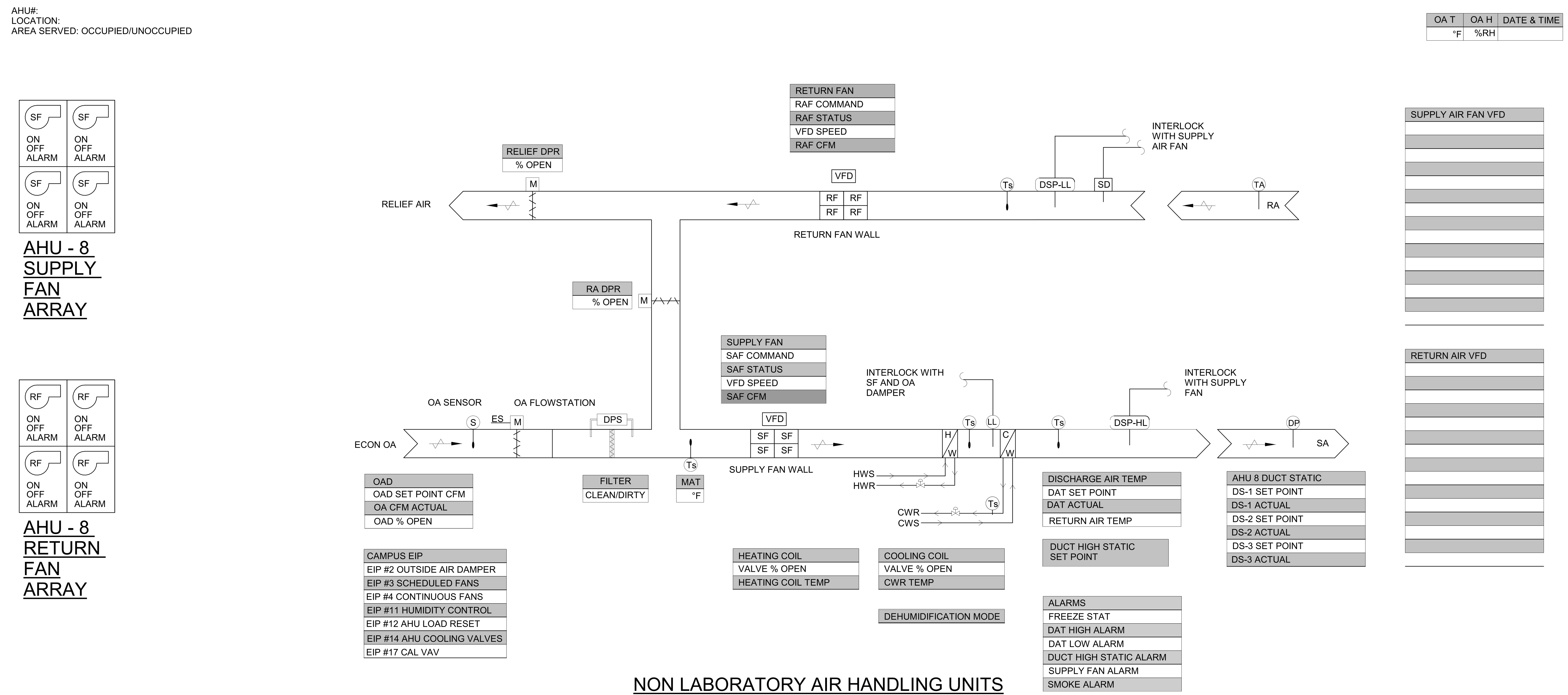
REVISIONS

No.	Description	Date

CONTROLS ARCHITECTURE

IC-001

AHU-8 Non-Laboratory Units						
Point Description	Object Name	DI	DO	AI	AO	Override
Outside Air Damper	OA_DPR				X	X
Outside Air Flow Setpoint	OAF_SP				X	X
Outside Air Flow	OA_F			X		
Filter Status	FILTER_S	X				
Economizer Damper	MA_DPR				X	X
Mixed Air Temp	MAT			X		
Supply Fan Command	SF_C		X			X
Supply Fan #1 Status	SF1_S	X				
Supply Fan #2 Status	SF2_S	X				
Supply Fan #3 Status	SF3_S	X				
Supply Fan #4 Status	SF4_S	X				
Return Fan #1 Status	RF1_S	X				
Return Fan #2 Status	RF2_S	X				
Return Fan #3 Status	RF3_S	X				
Return Fan #4 Status	RF4_S	X				
Supply Air Fan CFM	DA_F			X		
Supply Air Fan Speed	SF_SPD				X	X
Supply Fan Bypass	SF_BYP		X			
Supply Air Fan VFD Alarm	SFVFD_AL		X			
Heating Valve	PHT_VLV_1				X	X
Preheat Temp	PHT_T			X		
Cooling Valve	CLG_VLV				X	X
Chilled Water Return Temp	CHWR_T			X		
Humidity Actual Floor 1	ZN1_H			X		
Humidity Actual Floor 2	ZN2_H			X		
Humidity Acutal Floor 3	ZN3_H			X		
Dehumidification Command	DEHUM_ENA	X				X
Discharge Air Temp Actual	DA_T			X		
Discharge Air Temp Setpoint	DAT_SP				X	X
Low Limit Alarm	LL_A	X				
Discharge Air Temp Alarm	DAT_A	X				
Duct High Static Alarm	HS_A	X				
Supply Fan Alarm	SF_A	X				
Smoke Detector Alarm	RA_SD	X				
Discharge #1 Static Setpoint	DAS_SP				X	X
Discharge #1 Static Actual	DA_S			X		
Discharge #2 Static Setpoint	DAS_SP				X	X
Discharge #2 Static Actual	DA_S			X		
Discharge #3 Static Setpoint	DAS_SP				X	X
Discharge #3 Static Actual (AHU-8)	DA_S			X		
Discharge #4 Static Setpoint (AHU-8)	DAS_SP				X	X
Discharge #4 Static Actual (AHU-8)	DA_S			X		
Zone Average Temperature	ZN_T			X		
Return Fan Command	RF_C		X			X
Return Air Fan CFM	RF_F			X		
Return Air Fan Speed	RF_SPD				X	X
Return Fan Bypass	RF_BYP		X			
Return Air Fan VFD Alarm	RFVFD_AL		X			
Return Air Temperature	RA_T			X		
Exhaust Air Damper	EA_DPR				X	



NON LABORATORY AIR HANDLING UNITS

AHU - 8

1. Classroom/Admin Air Handling Units (AHU-8) - Supply/Return Units

1.1. Occupancy Schedule:

1.1.1. Schedules to be set by UK.

1.1.2. The unit shall be placed into occupied or unoccupied mode from the DDC control system.

1.2. Outside Air Damper Control: The outside air damper shall only be open when in the occupied mode. In the unoccupied mode the outside air damper shall be closed. However, the outside air damper shall be enabled when in the unoccupied mode and the chilled water system is not available to allow for unoccupied cooling without the chilled water system.

1.3. Supply and Return Fan Control

1.3.1. Supply and Return fan will be started and stopped from the local DDC Panel per the FMS schedule. When the start command is issued the outside air and relief air dampers will open. When the dampers are full open an end switch will engage an EP which will then allow the fan to start. If the end switch fails to engage the EP the fan will not be allowed to start. If for this or any other reason the fan status does not match the commanded value an alarm will be generated. When the fan status indicates the fan has started, the control sequence will be enabled.

1.3.2. The air handling unit utilizes a fan array for the supply and return fan systems for distribution of air. The entire fan array shall be controlled from a single VFD with a bypass and has been sized utilizing a N+1 arrangement. Refer to the control drawings for the number of duct mounted static pressure sensors which shall control the fan array to maintain a duct static pressure setpoint of 1.25" (adj.) at all location. The locations of the duct static pressure sensors are located on the drawings. Fan supply static pressure optimization shall be utilized by polling of associated VAV and CAV air valve positions and adjusting the supply fan static pressure control using a PID loop.

1.3.3. The minimum OA volume shall be monitored through a duct mounted airflow station. A control loop shall be field determined in conjunction with the Test and Balance Contractor. The return fan CFM shall be equal to the supply fan minus a pressurization offset of 2,000 CFM (adj.). In conjunction with the Test and Balance Contractor, confirm minimum OA damper position is properly set during non-economizer operation. A differential airflow sensor shall be mounted across each fan to determine fan in the fan array system to determine system status. Minimum outside Air CFM shall be constant when not operating in economizer mode. The minimum outside air volume shall have a enable/disable point to allow for a fixed % (adj.) to be entered from the DDC system.

1.4. Supply Air Temperature Controls - Cooling

1.4.1. A duct mounted, discharge air temperature sensor shall control the unit's 2-way chilled water valve (CLG-VLV) and hot water heating valve (PHT-VLV). The DDC shall monitor the chilled water return temperature. If the chilled water return temperature is below 54 F (adj.) than the DDC system shall receive an advisory.

1.4.2. When cooling is required, and the outdoor air temperature is above 65 degrees F (adj.), the 2-way chilled water control valve shall modulate as required to maintain 55 degrees F (adj.) supply air temperature. The relief air damper shall be closed, and the return air damper shall be open. The minimum outside air damper shall be open. The OA economizer damper shall be closed.

1.4.3. When cooling is required, and the outdoor air temperature is below 65 degrees F (adj.), the OA economizer damper, relief air damper and the return air damper shall modulate as required to maintain 55 degrees F (adj.) supply air temperature. The minimum OA damper shall be open. Normally under this condition, the chilled water 2-way control valve shall be closed, however, if further cooling is required, the 2-way chilled water control valve shall modulate as required. The chilled water coil control valve shall be locked out if the outside air temperature is below 50 F (adj.) or when the EIP chilled water shut down is initiated.

1.4.4. The discharge air temperature setpoint shall be reset based on the average room temperatures in the building served by these units. This average shall be calculated using all VAV thermostats from this unit. The air handling unit discharge air setpoint will be Reset between 55 F and 65 F based on a University of Kentucky ideal zone average temperature of 72 F. This reset schedule shall utilize a PID loop for resetting the temperature. The Load Reset program can be enable or disabled by an operator and a fixed setpoint entered.

1.5. Supply Air Temperature Controls - Heating

1.5.1. When heating is required to maintain the supply air temperature at 55 degrees F (adj.), then the 2-way hot water control valve shall modulate as required to maintain 55 degrees F (adj.) supply air temperature. The relief air damper shall be closed, the return air damper shall be open, and minimum outside air damper shall be open. The OA economizer damper shall be closed. The chilled water valve and the hot water valve shall not be permitted to modulate at the same time.

1.5.2 The hot water valve shall remain under control when the AHU is shut down due to alarm. The valve shall be modulated to maintain a minimum of a 55 degrees F (adj.) plenum temperature.

1.6. Freeze Protection:

1.6.1. Upon activation of the freeze stat, the return air damper shall open. Upon activation of the freeze stat the outside air damper shall close and the relief air damper shall close.

1.6.2. The hot water coil control valve must remain under full control during any low limit freeze protection trip to prevent any over-heating of the air handling unit and proper restart of the unit.

1.6.3. If the heating coil plenum temperature falls below 35F (adj.) then the supply fan shall shut down, the outside air damper shall close, and the hot water control valve shall control preheat plenum to 55F (adj.). The hot water valve shall remain under control.

1.6.4. The freeze protection wire shall be serpentine across the entire face of the coil every six inches on center. The freeze stat shall be a dual contact one hardwired to the supply fan and the other to the controller to maintain appropriate control. The hardwired freeze stat shall be a manual reset.

1.7. Smoke Shutdown:

1.7.1. Smoke detectors shall be located in the return air streams. If smoke is detected, the supply and return fans shall de-activate and an audio/visual alarm shall activate. Upon activation of the smoke detector, the outside air damper shall be closed and the relief air damper shall be opened. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. The smoke detectors shall provide a supervisory signal to the Fire Alarm System. This shall be reset automatically when smoke is no longer present.

1.7.2. This unit is not part of the building smoke control system.

1.8. Over Pressurization Control:

1.8.1. A static pressure sensor shall be located at the AHU supply air outlet in the discharge plenum. If the pressure in the supply plenum exceeds 4 .0" W.G. (adj.) the fan shall be shut down. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. This shall be a manual reset.

1.9. Unoccupied Mode:

1.9.1. In the unoccupied mode, the air handling unit shall be "off". The outside air damper and relief air damper shall be closed and the return air damper shall be open unless cooling is needed when the chilled water system is unavailable. The chilled water control valve shall be closed and the hot water control valve shall be closed. The DDC control system shall monitor the average room temperature throughout the building, if the temperature falls to 60°F or raises above 80°F (adj.) than the unit shall be activated. When the unit is activated in the unoccupied mode it shall operate under normal conditions. The unit shall operate in this mode until the average room temperature has risen or fallen to 3 F (adj.) above or below the unoccupied setpoint. The VAV boxes shall be energized to operate to maintain unoccupied setpoints.

1.9.2. Morning Warm-Up (Building temperature is allowed to drop to 65°F): Under morning warm-up the unit shall be activated at a time provided by the DDC control system. During this warm-up, the outside air damper and relief air damper shall remain closed. The unit shall circulate air through the building and the supply air temperature shall be control to 85°F (adj.) when all temperatures throughout the building have been raised to 68°F (adj.). The unit shall go into normal operation. This shall occur 2 hours (adj.) before the occupied schedule.

1.9.3. Morning Cool Down (The Building temperature is allowed to raise to 78°F adj.): Under morning cool-down the unit shall be activated at a time provided by the DDC control system. During this cool down the outside air damper and relief air damper shall remain closed. The unit shall circulate air through the building and the supply air temperature shall be controlled to 55 F (adj.) until the temperature drops to 75°F (adj.) When all temperatures throughout the building have been lowered to 75°F (adj.) the unit shall go into normal operation. This shall occur 2 hours (adj.) before the occupied schedule.

1.9.4. All systems shall be disabled in the unoccupied mode. If the system is required to be enabled in the unoccupied mode due to space conditions, then all relevant PID loops shall be enabled as well to maintain appropriate control.

1.10. Humidification/Dehumidification Mode

1.10.1. Humidification: This unit is not provided with a humidifier.

1.10.2. Dehumidification Mode: The unit shall have the capability of going into dehumidification mode as directed from the operator. When activated the heating system shall be enabled. Under the dehumidification mode, the discharge air temperature shall be cooled to 55F (adj.) and the reheat hot water system shall be energized when the average zone temperature served by this AHU is one degree (adj.) below setpoint or a single zone is more than 3 degrees (adj.) below setpoint. When engaged in dehumidification mode the unit shall run for a minimum of 30 mins (adj.). Reheat coils are located in the ductwork downstream of the VAV boxes.

1.10.3. Dehumidification Mode: The unit shall be enabled in dehumidification mode by any space humidity sensor that is above 65% RH (adj.) in Unoccupied Mode. In this mode, the AHU shall discharge 55°F (adj.) air until the space RH is below 55% RH (adj.).

1.10.4. Humidity sensors shall be located in the corridor on each floor of the building.

1.11. Mixed Air Low Limit Sequence

1.11.1. The DDC system shall monitor the mixed air temperature of the air handling unit. Whenever the mixed air temperature is below 45 (adj.), the return and outside air dampers shall modulate using a PID loop and the discharge air temperature sequence.

1.13. Campus Wide Event Issued Programs (EIP)

1.13.1. The Delta Center shall have the capability of a campus wide global command of certain functions of the air handling unit. These commands already exist at the Delta Room and this control system shall interact with these Event Issued Programs to allow the following functions to occur. This is a single command at the Delta Room which globally commands all controls functions campus wide. The EIP while issued from a global command at the delta room shall initiate building only EIP command. This allows an individual building being released while the campus wide EIP is still activated. Under initiation of EIP the local programs will not function while the EIP is issued.

1.13.1.1. EIP 01: Chilled Water System. This EIP is used when the campus chiller plants are shutoff for the winter months. The EIP shall be issued to LOCK-ON the chilled water system when the chiller plant is available. During this time, the local sequences of operation shall be followed. When a LOCK-OFF command is issued, the chilled water plants are off and the chilled water pumps in the building along with chilled water control valves shall not operate.

1.13.1.2. EIP 02: Outside Air Dampers #1. The local controller shall follow the standard sequence of operation and operate the OA dampers under local control (Normal) or a command may be sent to lock all dampers in the full open (LOCK-OPEN) or full closed (LOCK-CLOSED) positions. This command shall not close lab air handling unit dampers as they are 100% outside air and must remain operational.

1.13.1.3. EIP 03: Scheduled Fans #1. The local controller shall follow the standard sequence of operation (NORMAL (LOCAL)) under typical operation. An EIP may be issued to LOCK-ON or LOCK-OFF fans. When a LOCK-ON command is issued, the fans shall operate to maintain static pressure but typical occupancy schedules will be ignored until the status is returned to NORMAL. Scheduled fans does not include lab air handling unit fans.

1.13.1.4. EIP 04: Continuous Run Fans Emergency. The local controller shall follow the standard sequence of operation (NORMAL (LOCAL)) under typical operation. An EIP may be issued to RUN-ALL or LOCK-OFF fans. When a RUN-ALL command is issued, the fans shall operate to maintain static pressure but typical occupancy schedules will be ignored until the status is returned to NORMAL.

1.13.1.5. EIP 05: Reheat System. Under normal operation, the system shall be in NORMAL (LOCAL) operation. The Delta room may issue a signal to LOCK-OFF or LOCK-ON the reheat system. Under a LOCK-OFF sequence, the hot water heat exchanger control valves shall be off and all reheat valves shall be commanded to the off position.

1.15.1.6. EIP 06: Hot Water System Emergency. LOCK-ON, LOCK-OFF, NORMAL (LOCAL). This EIP allows the Delta Room to issue an EIP that keeps the hot water pumps pumps operating under control, along with the heat exchangers. When the utdoor temperature drops to a certain temperature and is falling, they will lock on the air handling units and prior to that command they lock on the hot water system.

1.13.1.7. EIP 11: Humidity Control. The local controller shall follow the standard sequence of operation (NORMAL (LOCAL)) under typical operation. An EIP may be issued to operate the dehumidification sequence. When this is ENABLED, the equence of operations for humidification and dehumidification shall be followed as listed on the M700 series drawings. This sequence may be locked out by the use of the DISABLE command.

1.13.1.8. EIP 12: AHU Load reset. The discharge air temperature shall be reset based average zone temperatures of the rooms served by the air handling unit per the sequence of operations. This sequence may be ENABLED or DISABLED by the Delta Room. When this sequence is DISABLED, a set discharge air temperature shall be programmed with a default of 55 deg F.

1.13.1.10. EIP 14: AHU Cooling Valves #1. The unit will operate under the local controls and operate the chilled water control valve to maintain discharge air setpoint under NORMAL (LOCAL) operation. An EIP may be issued to drive the AHU chilled water valves either 100% OPEN or 100% CLOSED.

1.13.1.11. EIP 17: Cont Run CAL-VAV. This EIP shall modify the alarm temperatures from 67-76F during occupied mode to 59-81F during unoccupied mode. This EIP shall be ENABLED or DISABLED.

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CONTRACT DOCUMENTS

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

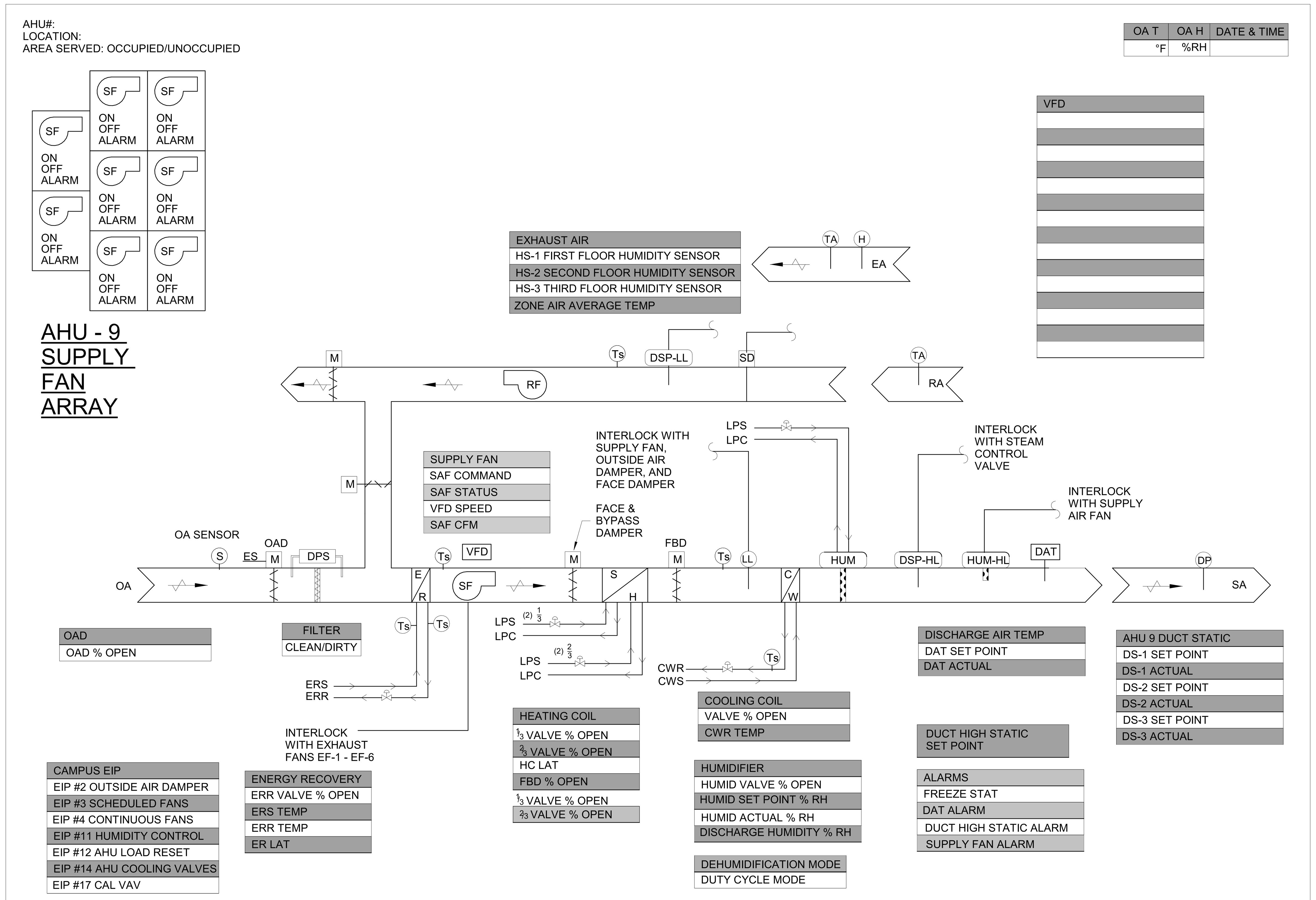
REVISIONS

No.	Description	Date

INTEGRATED CONTROLS

IC-101

AHU-9 Laboratory Units						
Point Description	Object Name	DI	DO	AI	AO	Override
Outside Air Damper	OA_DPR				X	X
Filter Status	FILTER_S	X				
Energy Recovery Supply Water Temp	ERS_T			X		
Energy Recovery Return Water Temp	ERR_T			X		
Energy Recovery Valve	ERR_VLV				X	X
Energy Recovery LAT	ER_T			X		
Supply Fan Command	SF_C		X			X
Supply Fan #1 Status	SF1_S	X				
Supply Fan #2 Status	SF2_S	X				
Supply Fan #3 Status	SF3_S	X				
Supply Fan #4 Status	SF4_S	X				
Supply Fan #5 Status	SF5_S	X				
Supply Fan #6 Status	SF6_S	X				
Supply Fan #7 Status	SF7_S	X				
Supply Fan #8 Status	SF8_S	X				
Supply Fan #9 Status	SF9_S	X				
Return Fan Command	RF_C		X			
Return Fan Status	RF_S	X				
Return Air Fan CFM	RF_F			X		
Return Air Fan Speed	RF_SPD				X	X
Return Fan Bypass	RF_BYP		X			
Return Air Fan VFD Alarm	RFVFD_AL		X			
Return Air Temperature	RF_T			X		
Supply Air Fan CFM	DA_F			X		
Supply Air Fan Speed	SF_SPD				X	X
Supply Fan Bypass	SF_BYP		X			
1/3 Steam Valve	PHT_VLV_1				X	X
2/3 Steam Valve	PHT_VLV_2				X	X
Preheat LAT	PHT_T			X		
Face and Bypass Damper	F&B_DPR				X	X
Cooling Valve	CLG_VLV					
Chilled Water Return Temp	CHWR_T				X	
Humidity Valve	HUM_VLV				X	X
Humidity Setpoint	ZNH_SP			X		X
Humidity Actual Floor 1	ZN1_H				X	
Humidity Actual Floor 2	ZN2_H				X	
Humidity Acutal Floor 3	ZN3_H				X	
Humidity High Limit Alarm	HUM_AL				X	
Humidification Command	HUM_C	X				X
Discharge Air Temp Actual	DA_T			X		
Discharge Air Temp Setpoint	DAT_SP				X	X
Low Limit Alarm	LL_A	X				
Discharge Air Temp Alarm	DAT_A	X				
Duct High Static Alarm	HS_A	X				
Supply Fan Alarm	SF_A	X				
Discharge #1 Static Setpoint	DAS_SP			X		X
Discharge #1 Static Actual	DA_S				X	
Discharge #2 Static Setpoint	DAS_SP			X		X
Discharge #2 Static Actual	DA_S				X	
Discharge #3 Static Setpoint	DAS_SP			X		X
Discharge #3 Static Actual	DA_S				X	
Discharge #4 Static Setpoint (AHU-9)	DAS_SP			X		X
Discharge #4 Static Actual (AHU-9)	DA_S				X	
Zone Average Temperature	ZN_T				X	



LABORATORY AIR HANDLING UNITS
AHU - 9

1. Laboratory Air Handling Units (AHU-9) - This unit has return air for current operation

1.1. Occupancy Schedule: The unit shall be occupied mode continuously since it serves laboratory functions. However, occupied/unoccupied capability shall be provided.

1.2. Outside Air Damper Control: The outside air damper shall be open at all times unless directed when the supply air fan is operating or a Freeze Protection condition.

1.3. Supply Fan Control

1.3.1. Supply fan will be started and stopped from the local DDC Panel per the FMS schedule. When the start command is issued the outside air dampers will open. When the dampers are full open an end switch will engage an EP which will then allow the fan to start. If the end switch fails to engage the EP the fan will not be allowed to start. If for this or any other reason the supply fan status does not match the commanded value an alarm will be generated. When the supply fan status indicates the fan has started, the control sequence will be enabled.

1.3.2. The air handling unit utilizes a fan array system for distribution of air. The entire fan array shall be controlled from a single VFD with a bypass and has been sized utilizing a N+1 arrangement. Refer to the control drawings for the quantity of duct mounted static pressure sensors which shall control the fan array to maintain a duct static pressure setpoint of 1.25" (adj.) at all location. The locations of the duct static pressure sensors are located on the drawings. Fan supply static pressure optimization shall be utilized by polling of associated Phoenix Air Valve positions and adjusting the supply fan static pressure control using a PID loop. Each fan shall be provided with a current sensor to prove fan status.

1.4. Supply Air Temperature Controls - Cooling

1.4.1. A duct mounted, discharge air temperature sensor shall control the unit's 2-way chilled water valve and steam heating valve. The DDC shall monitor the chilled water return temperature. If the chilled water return temperature is below 54 F (adj.) than the DDC system shall receive an advisory.

1.4.2. When cooling is required, and the outdoor air temperature is above 50 degrees F (adj.), the 2-way chilled water control valve shall modulate as required to maintain 55 degrees F (adj.) duct supply air temperature (DAT)

1.4.3. When cooling is required, and the outdoor air temperature is below 50 degrees F (adj.) the chilled water 2-way control valve is normally closed. However, if further cooling is required, the 2-way chilled water control valve shall modulate as required. The chilled water coil control valve shall be locked out when the building EIP chilled water shut down is initiated.

1.4.4. The discharge air temperature setpoint shall be reset based on the average room temperatures in the building served by these units. This average shall be calculated from all individual VAV thermostat locations served by this unit. The air handling unit discharge air setpoint will be Reset between 55 F and 65 F based on a University of Kentucky ideal zone average temperature of 72 F. This reset schedule shall utilize a PID loop for resetting the temperature. The Load Reset program can be enable or disabled by an operator and a fixed setpoint entered.

1.5. Supply Air Temperature Controls - Energy Recovery Coil

1.5.1. The unit is provided with a "run around" energy recovery coil which transfers energy from the laboratory exhaust air stream to the preheat/precool coil of the air handling unit. The energy recovery coil shall be provided with a 2-way 2-postion control valve. The system shall be enabled from the DDC system when the outside air temperature is below 40F(adj.) and above 85F (adj.). When enabled, the 2-way control valve shall be open.

1.6. Supply Air Temperature Controls - Heating

1.6.1. The heating system is composed of two 1/3 (PHT-VLV-1) and 2/3 (PHT-VLV-2) steam control valve with integral face and bypass dampers around the steam heating coil. The 1/3 and 2/3 steam heating valves shall be sized for -5F entering air temperature. The steam control valves shall be controlled via an outdoor temperature reset schedule and the face and bypass dampers shall be control to the DAT. There are two sets of control valves for the future when the second and third floor are converted to labs. it is expected that one set will provide adequate heat now with the return air. If the DAT is too low, the additional 1/3-2/3 valves shall be used along with the associated dampers opened.

1.6.2. The control valve shall operate under an outdoor temperature reheat schedule to prevent low limit temperature trips by requiring the valves to be open. The 1/3 (PHT-VLV-1) steam preheat control valve shall always be the lead valve and then followed by the 2/3 (PHT-VLV-2) should additional heat be required. These valves shall be controlled via one ouput for both valves and shall maintain a plenum temperature of 55F (adj.). The valves shall use the following outdoor air temperature reheat schedule. The steam coil control valves shall be locked out anytime the temperature is above 55F.

1.6.2.1. The steam control valve shall be 0% (adj.) when the outdoor air temperature is 48F (adj.) and shall be 100% (adj.) minimally when the outdoor air temperature is -10F (adj.). This shall be controlled via a PID loop and not a straight inverse reset schedule.

1.6.3. The internal face and bypass shall control the discharge air temperature of the unit. The face and bypass damper shall modulate as required to maintain a discharge temperature of 55F (adj.)

1.7. Freeze Protection:

1.7.1. The steam coil control valves must remain under full control during any low limit freeze protection trip to prevent any over-heating of the air handling unit and proper restart of the unit.

1.7.2. If the heating coil plenum temperature falls below 35F (adj.) then the supply fan shall shut down, the outside air damper shall close, the face and bypass dampers shall close fully (adj) and the preheat plenum shall control to 55F. (adj.) via the steam control valves.

1.7.3. The freeze protection wire shall be serpentine across the entire face of the coil every six inches on center. The freeze stat shall be a dual contact one hardwired to the supply and the other to the controller to maintain appropriate control. The hardwired freeze stat shall be a manual reset.

1.8. Smoke Shutdown: Honeywell system. Wires from alarm relay to the duct detector to the Honeywell control panel to power a 2 pole relay. One pole is to be inserted in the safety circuit for the associated vfd's and the other pole is to provide status to the BAS system. The BAS shall be able to determine if the unit is off due to failure of VFD or the smoke detector.

1.9. Over Pressurization Control: A static pressure sensor shall be located at the AHU supply air outlet in the discharge plenum. If the pressure in the supply plenum exceeds 5.0" W.G. (adj.) the fan shall be shut down. Upon correction of the problem, the system shall be reset and unit shall return to normal operation. This shall be a manual reset.

1.10. Unoccupied Mode:

1.10.1. For all AHU's unoccupied modes (e.g. Morning warm up, cool down, unoccupied heating, unoccupied cooling etc.) will be enabled on Average Building room temperature.

1.10.2. All PID loops shall be enabled during unoccupied control.

1.11. Humidification/Dehumidification Mode

1.11.1. Humidification: The unit shall be provided with a clean steam humidifier coil. The 2-way modulating steam humidifier control valve (HUM-VLV) shall modulate as required to maintain an exhaust air duct mounted humidity level of 30% (adj.). If the steam humidifier control valve has been enabled, and the exhaust air duct mounted humidistat is 40% or higher, then a visual alarm shall be activated and the steam coil control valve shall close.

1.11.2. Dehumidification Mode: The unit shall have the capability of going into dehumidification mode as directed from the operator. Dehumidification mode will be enabled by operator from Delta room. The economizer mode will be disabled (only for dehumidication cycle) and OA damper will be commanded to min OA position. When activated the heating system shall be enabled. Under the dehumidification mode, the discharge air temperature shall be cooled to 55F (adj.) and the reheat hot water system shall be energized when the average zone temperature served by this AHU is one degree (adj.) below setpoint or a single zone is more than 3 degrees (adj.) below setpoint. When engaged in dehumidification mode the unit shall run for a minimum of 30 mins (adj.). Reheat coils are located in the ductwork downstream of the VAV boxes.

1.11.3. Provide a humidity sensor on every floor in the corridor located 84" AFF as indicated on the drawings. This shall be a monitoring point only and not a control point.

1.12. Mixed Air Low Limit Sequence

1.12.1. Since this unit is a 100% outside air unit there is not a mixed air low limit sequence for this air handling unit.

1.13. Interlocks

1.13.1. The supply fan array shall be interlocked to the building laboratory exhaust fans (EF-1 through EF-6). The exhaust fans shall not be allowed to operate unless either AHU-3 or AHU-4 are in operation and supply fans are operating.

1.15. Campus Wide Event Issued Programs (EIP)

1.15.1. The Delta Center shall have the capability of a campus wide global command of certain functions of the air handling unit. These commands already exist at the Delta Room and this control system shall interact with these Event Issued Programs to allow the following functions to occur. This is a single command at the Delta Room which globally commands all controls functions campus wide. The EIP while issued from a global command at the delta room shall initiate building only EIP command. This allows an individual building being released while the campus wide EIP is still activated. Under initiation of EIP the local programs will not function while the EIP is issued.

1.15.1.1. EIP 01: Chilled Water System. This EIP is used when the campus chiller plants are shutoff for the winter months. The EIP shall be issued to LOCK-ON the chilled water system when the chiller plant is available. During this time, the local sequences of operation shall be followed. When a LOCK-OFF command is issued, the chilled water plants are off and the chilled water pumps in the building along with chilled water control valves shall not operate.

1.15.1.2. EIP 02: Outside Air Dampers #1. The local controller shall follow the standard sequence of operation and operate the OA dampers under local control (Normal) or a command may be sent to lock all dampers in the full open (LOCK-OPEN) or full closed (LOCK-CLOSED) positions. This command shall not close lab air handling unit dampers as they are 100% outside air and must remain operational.

1.15.1.3. EIP 03: Scheduled Fans #1. The local controller shall follow the standard sequence of operation (NORMAL (LOCAL)) under typical operation. An EIP may be issued to LOCK-ON or LOCK-OFF fans. When a LOCK-ON command is issued, the fans shall operate to maintain static pressure but typical occupancy schedules will be ignored until the status is returned to NORMAL. Scheduled fans does not include lab air handling unit fans.

1.15.1.4. EIP 04: Continuous Run Fans Emergency. The local controller shall follow the standard sequence of operation (NORMAL (LOCAL)) under typical operation. An EIP may be issued to RUN-ALL or LOCK-OFF fans. When a RUN-ALL command is issued, the fans shall operate to maintain static pressure but typical occupancy schedules will be ignored until the status is returned to NORMAL.

1.15.1.5. EIP 05: Reheat System. Under normal operation, the system shall be in NORMAL (LOCAL) operation. The Delta room may issue a signal to LOCK-OFF or LOCK-ON the reheat system. Under a LOCK-OFF sequence, the hot water heat exchanger control valves shall be off and all reheat valves shall be commanded to the off position.

1.15.1.6. EIP 06: Hot Water System Emergency. LOCK-ON, LOCK-OFF, NORMAL (LOCAL). This EIP allows the Delta Room to issue an EIP that keeps the hot water pumps pumps operating under control, along with the heat exchangers. When the outdoor temperature drops to a certain temperature and is falling, they will lock on the air handling units and prior to that command they lock on the hot water system.

1.15.1.7. EIP 11: Humidity Control. The local controller shall follow the standard sequence of operation (NORMAL (LOCAL)) under typical operation. An EIP may be issued to operate the dehumidification sequence. When this is ENABLED, the sequence of operations for humidification and dehumidification shall be followed as listed on the M700 series drawings. This sequence may be locked out by the use of the DISABLE command.

1.15.1.8. EIP 12: AHU Load reset. The discharge air temperature shall be reset based average zone temperatures of the rooms served by the air handling unit per the sequence of operations. This sequence may be ENABLED or DISABLED by the Delta Room. When this sequence is DISABLED, a set discharge air temperature shall be programmed with a default of 55 deg F.

1.15.1.10. EIP 14: AHU Cooling Valves #1. The unit will operate under the local controls and operate the chilled water control valve to maintain discharge air setpoint under NORMAL (LOCAL) operation. An EIP may be issued to drive the AHU chilled water valves either 100% OPEN or 100% CLOSED.

1.15.1.11. EIP 17: Cont Run CAL-VAV. This EIP shall modify the alarm temperatures from 67-76F during occupied mode to 59-81F during unoccupied mode. This EIP shall be ENABLED or DISABLED.

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REVISIONS

No.	Description	Date

INTEGRATED CONTROLS

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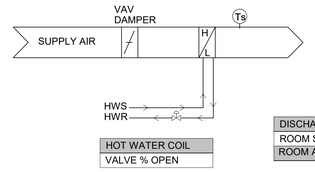
VAV BOXES
LOCATION:
AREA SERVED: OCCUPIED/UNOCCUPIED

OA T	OA H	DATE & TIME
°F	%RH	

VAV MIN SET POINT
VAV CFM ACTUAL
VAV DAMPER % OPEN



DISCHARGE AIR TEMP
ROOM SET POINT
ROOM ACTUAL

HOT WATER COIL
VALVE % OPEN

VARIABLE AIR VOLUME (VAV) BOXES
NON- LABORATORY

MISCELLANEOUS EXHAUST FANS
LOCATION:
AREA SERVED: OCCUPIED/UNOCCUPIED

OA T	OA H	DATE & TIME
°F	%RH	

EXHAUST FAN EF-16
EXHAUST FAN 16 COMMAND
EXHAUST FAN 16 STATUS
EXHAUST FAN 16 ALARM

MISCELLANEOUS EXHAUST FANS

VAV Box with Heating Coil

Point Description	Object Name	DI	DO	AI	AO	Override
VAV Damper	VAV_DPR				X	X
Hot Water Valve	HTG_VLV				X	X
Supply Air Discharge Air Temp	DA_T			X		
Zone Temp Room Setpoint	ZN_SP				X	X
Zone Temp Room Actual	ZN_T			X		
Room Temp Alarm	ZN_T_AL	X				
Room CFM Supply Air	DA_F				X	X

Exhaust Fan EF-16

Point Description	Object Name	DI	DO	AI	AO	Override
Exhaust Fan 16 Command	EF16_C		X			X
Exhaust Fan 16 Status	EF16_S	X				
Exhaust Fan 16 Alarm	EF16_AL	X				

1. VARIABLE AIR VOLUME (VAV) BOXES (NON LABORATORY)

1.1. Refer to drawings if room is controlled via a wall mounted temperature sensor, duct mounted temperature sensor or wall mounted thermostat.

1.2. When cooling is required, the inlet damper shall modulate between the maximum and minimum air flow setpoints as required to maintain space temperature. When heating is required, the inlet damper shall modulate to the minimum position and the 2-way control valve shall be modulated as required.

1.3. Primary air CFM, leaving air temperature, room temperature and room setpoint shall be monitored by the DDC control system. An air flow sensor shall be located on the inlet side of the VAV box and duct temperature sensor shall be located on the discharge side of the VAV box.

1.4. Occupied/Unoccupied Control: Each room is provided with an occupancy sensor which shall control the lights and the HVAC system. This occupancy sensor is provided and installed by the electrical contractor and shall provide (2) outputs one for the lighting control and one for the HVAC control. The control of the occupany sensor shall be hardwired into the DDC system and shall not be accomplished via software. In rooms that are not provided with an occupancy sensor that controls the lights, the controls contractor is responsible for providing this occupancy sensor. Refer to electrical drawings for rooms that are provided with a lighting occupancy sensor. If during the building occupied schedule as dictated by DDC system, the occupant leaves his space for more than 15 mins (adj.), the lights will go out and the room shall go into an HVAC setback mode. In this room setback mode the VAV shall close, and the room temperature shall be allowed to drift between 68F and 75F. When the occupant returns, the room shall go back into occupied mode and the room shall control to the space thermostat.

1.4.1. Unoccupied Mode. When the AHU is enabled during unoccupied mode, the VAV shall operate at minimum position to maintain the unoccupied setpoints.

1.5. Occupancy Sensors shall not be installed in any laboratory that has fume hoods.

1. VESTIBULE HEATING SYSTEM

1.1. The vestibule heating system includes a supply fan SF-1 located above the ceiling and a hot water duct mounted heating coil with a 2-way modulating control valve. On a call for heating the fan shall be activated and the control valve shall modulate as required to maintain a setpoint of 65F (adj.). This shall be monitored through the DDC control system. The DDC system shall have the capability to start and stop these units. The VAV Box serving this area shall be locked out if the heating system has been activated.

1. MISCELLANEOUS EXHAUST FANS

1.1. EF-16 serve restrooms throughout the building. This fan shall operate whenever AHU-8 is in operation. Provide a current sensor indicating fan status for each unit.

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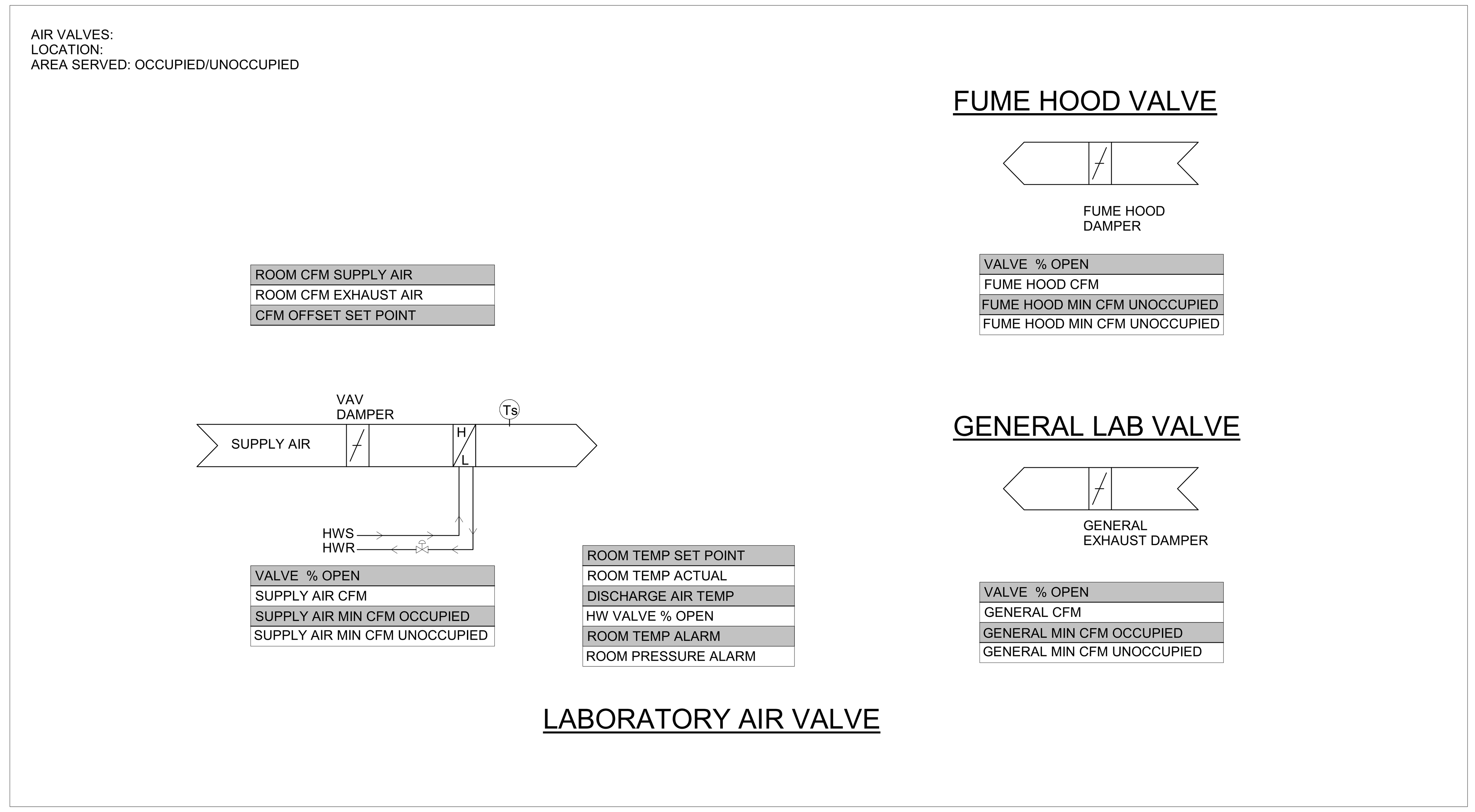
No.	Description	Date

INTEGRATED CONTROLS

IC-103

Laboratory Air Valve with Hood						
Point Description	Object Name	DI	DO	AI	AO	Override
VAV Damper	VAV_DPR				X	X
Hot Water Valve	HTG_VLV				X	X
Supply Air Discharge Air Temp	DA_T				X	
Zone Temp Room Setpoint	ZN_SP_T				X	X
Zone Temp Room Actual	ZN_T			X		
Room Temp Alarm	ZN_AL	X				
Fume Hood Valve	FH_VLV			X	X	X
Fume Hood CFM	FH_F				X	
Fume Hood Min CFM Occ	FH_MIN_OC			X		X
Fume Hood Min CFM Unocc	FH_MIN_UOC			X		X
General Exhaust Valve	GE_VLV			X	X	X
General Exhaust CFM	GE_F				X	
General Exhaust Min CFM Occ	GE_MIN_OC			X		X
General Exhaust Min CFM Unocc	GE_MIN_UOC			X		X
Room CFM Supply Air	DA_F				X	X
Room CFM Exhaust Air	EA_F				X	
Room CFM Offset Setpoint	OFF_F				X	X
Room Pressure Alarm	RP_AL	X				



1. LABORATORY CONTROL (2) AIR VALVES - NO FUME HOODS

1.1. All control of the Phoenix Laboratory Valves shall be accomplished through the Phoenix control system. Each room shall be provided with its own Celeris Control Unit (CCU) which shall be connected to the Phoenix control server. All airflow control shall occur in one second.

1.2. Supply Air Valve Control - The supply air valve shall modulate to maintain the minimum and maximum supply airflow as required to maintain the space temperature to 72F (adj.). The air valve shall go to its minimum position if the space temperature drops below the setpoint. The corresponding exhaust air valve shall modulate in each space and maintain the appropriate pressurization by modulating the exhaust air valve to the differential provided on the drawings.

1.3. Space Temperature Control - If the space temperature continues to drop below the setpoint at the minimum airflow, then the 2-way hot water control valve shall modulate to maintain space temperature.

1.4. Loss of Communication/Power Fail Safe - The valves in this application have been configured to fail in the following manner. Under loss of room-level network communication, the supply and general exhaust valves will maintain setpoint as determined by the temperature sensor. This zone fails in a negative pressurization mode with no change in offset.

1.5. In the unoccupied mode, the setpoint to each room shall be modified to allow the setpoint to drift between 60F (adj.) and 80F (adj.)

1.6. If the supply air in the room is more than the total exhaust a Room Pressure Alarm shall be provided to the DDC.

2. LABORATORY CONTROL (3) AIR VALVES - WITH FUME HOODS

2.1. All control of the Phoenix Laboratory Valves shall be accomplished through the Phoenix control system. Each room shall be provided with its own Celeris Control Unit (CCU) which shall be connected to the Phoenix control server. All airflow control shall occur in one second.

2.2. Supply Air Valve Control - The supply air valve shall modulate to maintain the minimum and maximum supply airflow as required to maintain the space temperature to 72F (adj.). The air valve shall go to its minimum position if the space temperature drops below the setpoint.

2.3. Fume Hood Exhaust Air Valve Control - The laboratories are provided with variable air volume fume hoods and each fume hood air valve shall maintain a face velocity as indicated on the airflow schedule at the sash opening regardless of the sash position. As each sash opening increases or decreases, the airflow exhausted through its associated hood exhaust valve changes proportionately, thereby maintaining a constant average face velocity at the sash opening. When the sash is completely closed the exhaust valve shall maintain the minimum flow indicated on the airflow schedule.

2.4. General Exhaust Air Valve Control - The general exhaust air valve shall operate to maintain the minimum airflow of the space as indicated in the airflow schedule. This valve shall modulate if the summation of the fume hood valves do meet the minimum airflow provided in the schedule. As the airflow modulates in the space to maintain the minimum airflow, the supply air valve shall modulate to provide the airflow offset indicated on the airflow schedule.

2.5. Space Temperature Control - The supply air valve shall modulate as required to maintain space temperature and required pressurization. If the space temperature is above 72F (adj.) then supply air valve shall open providing additional 55 F air in the space. This will require the general exhaust air valve to increase to maintain appropriate space pressurization. If the space temperature falls below 72 F (adj.), then supply air valve shall close to the point where it meets the pressurization requirement. The general exhaust valve shall modulate accordingly. If the air valve is at its required position and the If the space temperature continues to drop below the setpoint at the minimum airflow, then the 2-way hot water control valve shall modulate to maintain space temperature.

2.6. Fume Hood Setbacks - Fume hood shall be provided with zone presense sensors that reduce fume hood airflows to 60 fpm.

2.7. Each valve shall generate a digital feedback signal equal to the valves airflow in CFM and shall transmit this information to the CCU.

2.8. Loss of Communication - Failsafe - Each hood exhaust valve will maintain setpoint as determined by the sash position. The general exhaust valve will fail to its maximum software clamp. The supply air valve will maintain last setpoint. This zone fails in a negative pressurization mode with an increased offset.

2.9. Loss of Power - Failsafe - Each hood exhaust valve and the general exhaust valve will fail to their maximum mechanical limits and the supply air valve will fail to their minimum mechanical limits. This zone fails in a negative pressurization mode with a largely increased offset.

2.10. Unoccupied Mode - The laboratories in the building will be in unoccupied mode based on schedule set by building owner. During this time, there shall be one fume hood which contains the chemicals that will maintain traditional minimum flow. The remaining fume hood exhaust valves will be 100% closed since there should not be anything stored in these fume hoods. The general exhaust valve will be reduced to its unoccupied schedule allowing the minimum airflow indicated on the CONTRACT DOCUMENTS.

2.11. If the supply air in the room is more than the total exhaust a Room Pressure Alarm shall be provided to the DDC.

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No.	Description	Date

INTEGRATED CONTROLS

IC-104

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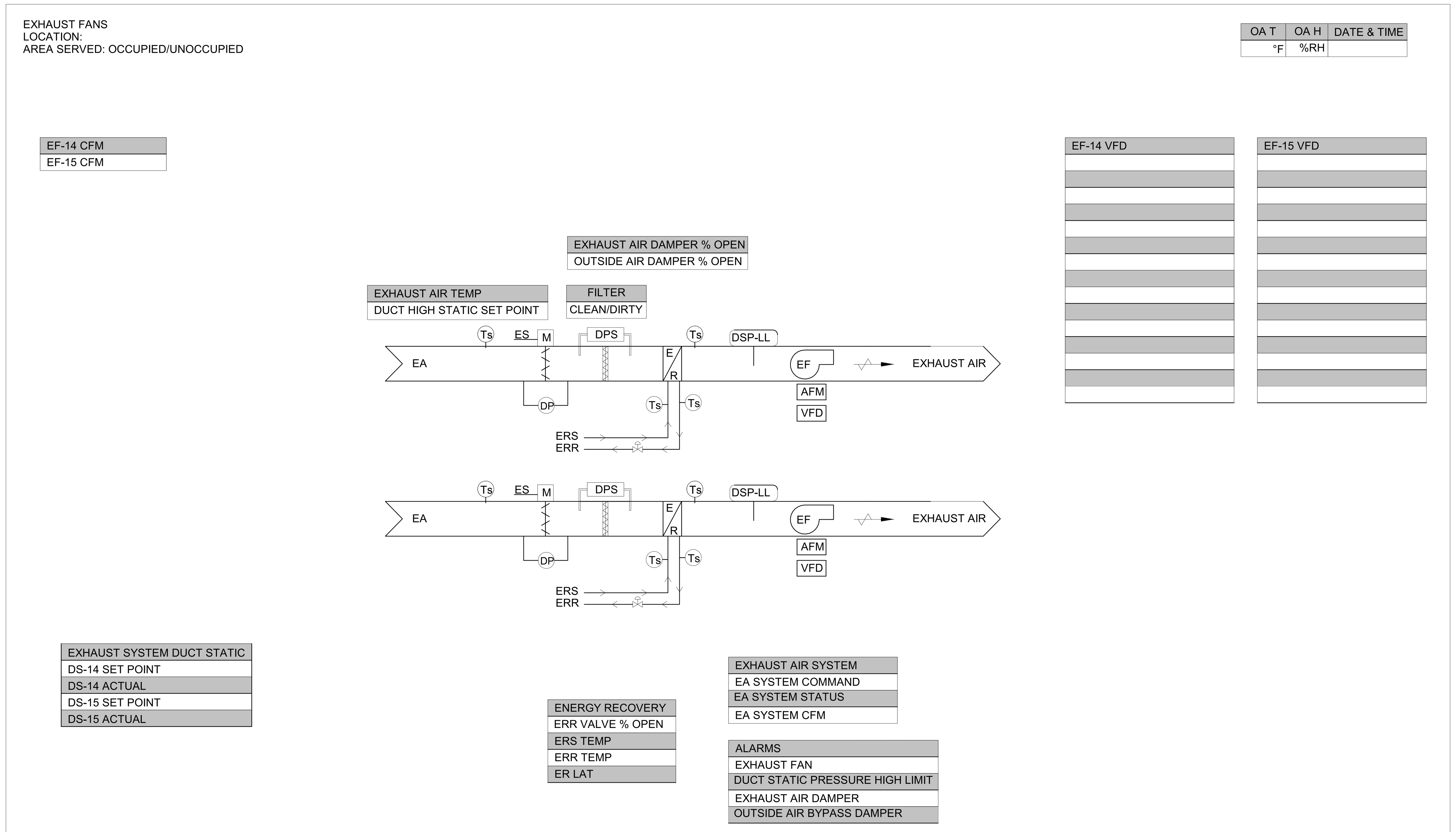
Lab Exhaust Fan EF-14						
Point Description	Object Name	DI	DO	AI	AO	Override
Exhaust #14 Static Setpoint	DAS_SP				X	X
Exhaust #14 Static Actual	DA_S			X		
Exhaust Fan System Command	EF_C		X			X
Exhaust Fan System Status	EF_S	X				X
Exhaust Fan System CFM	EA_F				X	
Exhaust Air Damper #14	EA14_DPR				X	X
Exhaust #14 Damper Diff. Pressure	EA14_DPR_DP				X	
Exhaust Air Damper #14 Alarm	EA14_DPRM_AL	X				
Filter Status #14	FILTER14_S	X				
Exhaust Fan #14 Command	EF14_C		X			X
Exhaust Fan #14 Status	EF14_S	X				X
Exhaust Air Fan CFM	EA14_F				X	
Exhaust Air Fan Speed	EF14_SPD				X	X
Exhaust Fan Bypass	EF14_BYP		X			
Exhaust Fan VFD Alarm	EFVFD14_AL	X				
Exhaust Air Temp Before Recovery	EXBR14_T				X	
Exhaust Air Temp After Recovery	EXAR14_T				X	
Energy Recovery Supply Water Temp	ERS14_T				X	
Energy Recovery Return WaterTemp	ERR14_T				X	
Energy Recovery Valve	ERR14_VLV				X	X
Low Limit Alarm	LL_A	X				
Outside Air Bypass Damper	OA_DPR				X	X

Lab Exhaust Fan EF-15						
Point Description	Object Name	DI	DO	AI	AO	Override
Exhaust #15 Static Setpoint	DAS_SP				X	X
Exhaust #15 Static Actual	DA_S			X		
Exhaust Fan System Command	EF_C		X			X
Exhaust Fan System Status	EF_S	X				X
Exhaust Fan System CFM	EA_F				X	
Exhaust Air Damper #15	EA15_DPR				X	X
Exhaust #15 Damper Diff. Pressure	EA15_DPR_DP				X	
Exhaust Air Damper #15 Alarm	EA15DPRM_AL	X				
Filter Status #15	FILTER15_S	X				
Exhaust Fan #15 Command	EF15_C		X			X
Exhaust Fan #15 Status	EF15_S	X				X
Exhaust Air Fan CFM	EA15_F				X	
Exhaust Air Fan Speed	EF15_SPD				X	X
Exhaust Fan Bypass	EF15_BYP		X			
Exhaust Fan VFD Alarm	EFVFD15_AL	X				
Exhaust Air Temp Before Recovery	EXBR15_T				X	
Exhaust Air Temp After Recovery	EXAR15_T				X	
Energy Recovery Supply Water Temp	ERS15_T				X	
Energy Recovery Return WaterTemp	ERR15_T				X	
Energy Recovery Valve	ERR15_VLV				X	X
Low Limit Alarm	LL_A	X				
Outside Air Bypass Damper	OA_DPR				X	X



LABORATORY EXHAUST FANS
EF 14-15

1. LABORATORY EXHAUST FANS (EF-14,15)

1.1. Occupancy Schedule:

1.1.1. The fans shall operate continuously to maintain a safe lab environment.

1.2. Occupied Mode

1.2.1. The fans are provided with (7) duct mounted pressure sensors as located on the drawings and shall control to maintain a 2.5" (adj.) duct static pressure sensor at all of the locations. Each fan shall be provided with an isolation damper to prevent air from short cycling as fans cycle through their control requirements. When the isolation damper is full open an end switch will engage an EP which will then allow the fan to start. If the end switch fails to engage the EP the fan will not be allowed to start. A current sensor shall be provided at each fan to prove fan status.

1.2.2. The fans shall operate in a lead lag scenario with the lead fan rotating each month through all (8) fans. The fans shall stage themselves as required to maintain the duct static pressure. Each fan is provided with a VFD and shall ramp up or down the VFD as required to maintain the duct static pressure. The fan system shall be set up to ramp up the speed of a single fan until it is at 75% capacity (adj.). At this time a second fan shall be engaged. In order to prevent a sudden drop in duct static pressure the isolation damper shall open slowly until the secondary exhaust fan has matched the speed of the lead exhaust fan. The PID loop shall continue to control the lead exhaust fan re-adjusting itself to maintain the duct static pressure. When both fans are at the same speed, they shall together to maintain the duct static pressure setpoint. Both fans shall operate unless the speed is reduced to 35%. If both fans are operating at 35%, then the lead fan shall increase its speed to 50% (adj.). The secondary fan shall close its isolation damper in a 3 minute duration (adj.). When the secondary isolation damper reaches 25% open (adj.), the secondary exhaust fan shall begin to ramp down in a 3 minute duration. At this time, the lead fan shall control via the PID loop to maintain the duct static pressure setpoint. This control process shall continue to utilize all exhaust (fans) connected to exhaust manifold. Once a fan has been deactivated due to a reduced exhaust airflow need, this fan should not start for 10 minutes (adj.) unless the lead exhaust fan reaches 90% capacity (adj.). The duct static pressure sensor shall be hardwired to the fan controller and not passed through software. The DP sensor for the control of the speed of the exhaust fans shall be hardwired to the controller and shall not pass through via software to allow for a faster response time in the control system.The damper should be open if the fan is in operation but it should not open to 100% prior to the fan starting. If the damper is opened 100% prior to the fan starting, the exhaust stack will become the path of least resistance for airflow and the fans already operating will pull air through the exhaust stack in lieu of pulling air from the labs and result in fume hood alarms activating. The damper shall begin opening just prior to the fan start and slowly open until it reaches 100% open. Once the damper is open, it shall remain full open until the fan is to be disabled. The timing of the damper closing after tha fan is off will be confirmed during commissioning with the assistance of the TAB contractor.

1.2.3. There is a main bypass damper installed in the exhaust manifold to be used under low flow condition. If a single exhaust fan is in operation and drops to 30% speed at the VFD, then the bypass damper shall open to a 15% minimum position (adj.) to prevent unstable operation of the fans. This shall be verified during the test and balance to determine both the minimum VFD speed and the damper position to use the smallest amount of fan hp while providing a stable operation. During this time, the exhaust fan shall maintain a minimum of 1,000 FPM in the exhaust stack to prevent re-entrainment. This minimum fan speed shall be determined by the TAB contractor. The damper shall be provided with an end switch and shall provide an alarm if commanded open and does not open.

1.2.4. All speed controls of the fans shall utilize a PID loop.

1.3. Heat Recovery Operation

1.3.1. Each fan shall be provided with a heat recovery coil connected into the lab air handling units and shall be enabled only when its corresponding fan is in operation. The energy recovery coil shall be provided with a 2-way 2-position control valve. The system shall be enabled from the DDC system when the outside air temperature is below 40F (adj.) and above 85F (adj.). When enabled, the 2-way control valve shall be open.

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INTEGRATED CONTROLS

IC-105

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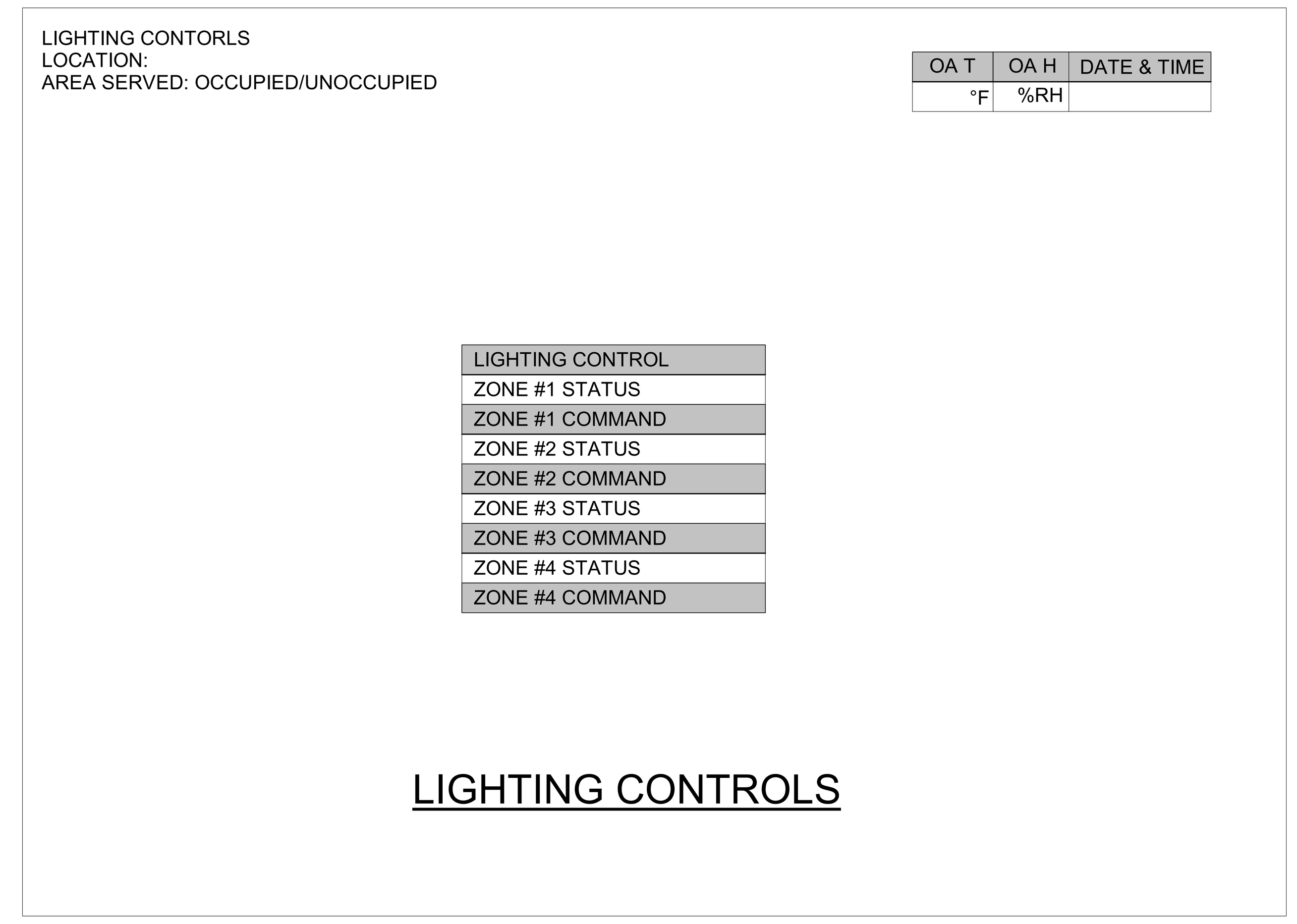
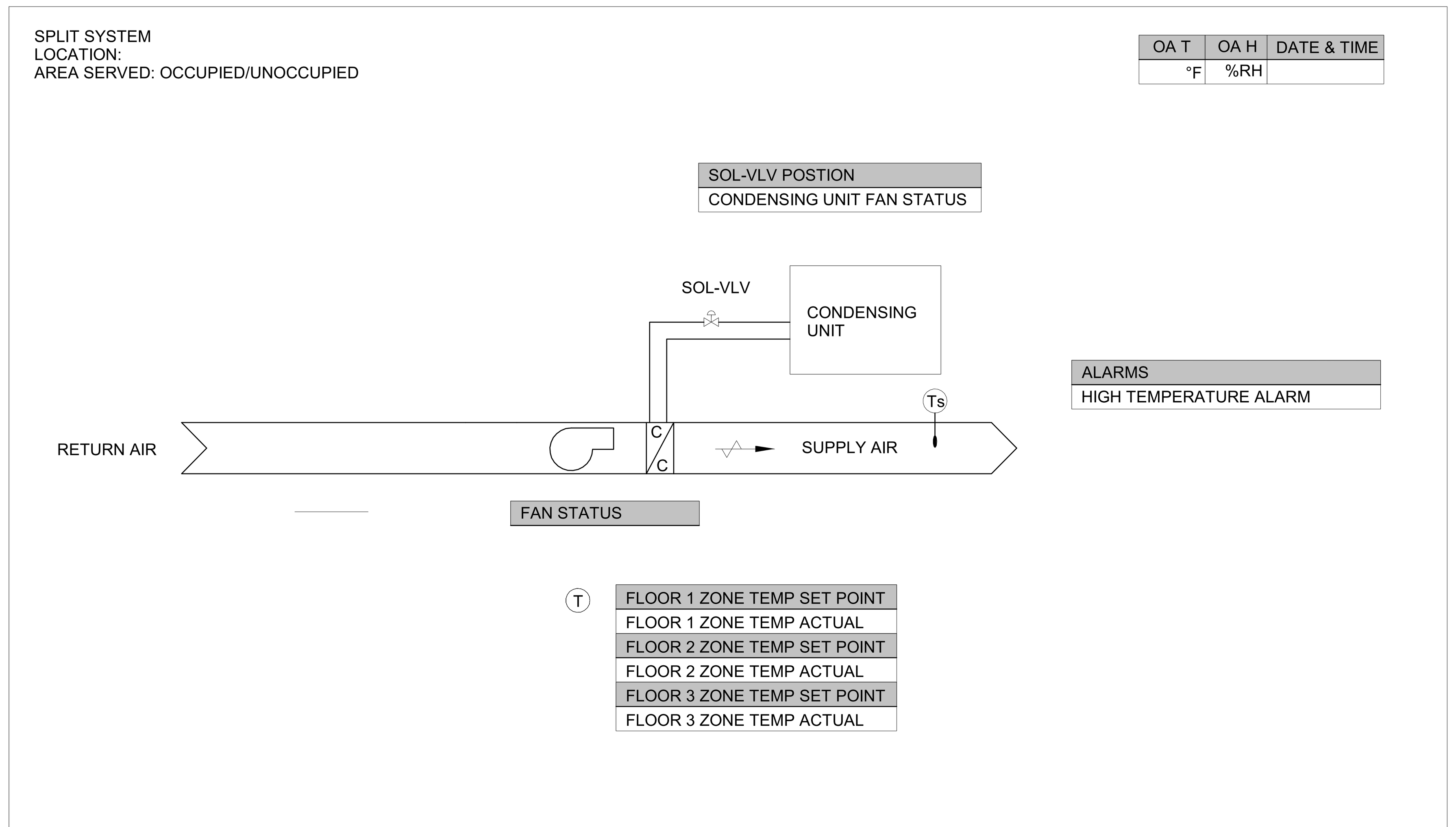


LIGHTING CONTROLS

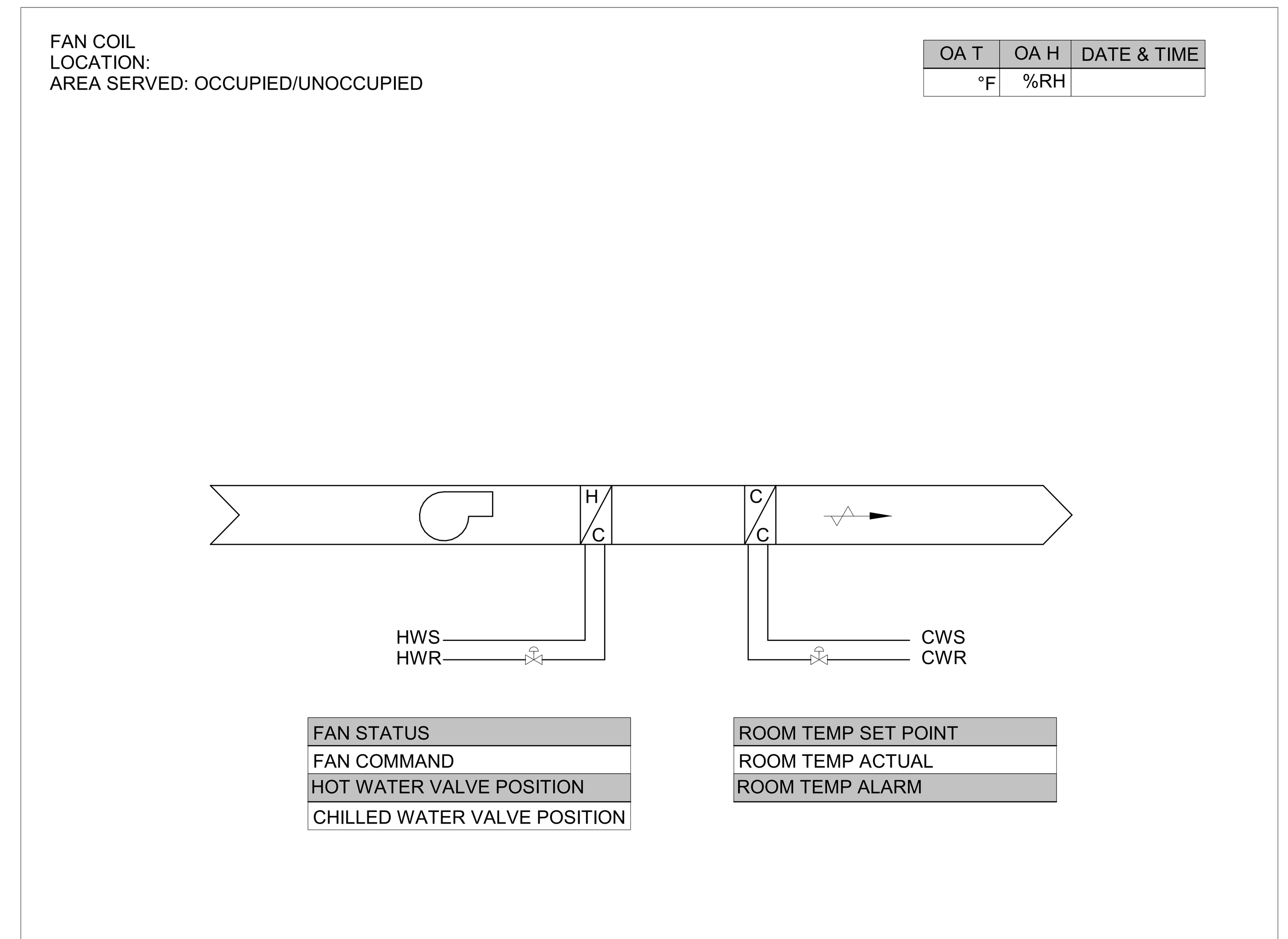
Lighting Control System						
Point Description	Object Name	DI	DO	AI	AO	Override
Lighting Zone #1 Status	LT_1_S	X				
Lighting Zone #1 Command	LT_1_C		X			X
Lighting Zone #2 Status	LT_2_S	X				
Lighting Zone #2 Command	LT_2_C		X			X
Lighting Zone #3 Status	LT_3_S	X				
Lighting Zone #3 Command	LT_3_C		X			X
Lighting Zone #4 Status	LT_4_S	X				
Lighting Zone #4 Command	LT_4_C		X			X

Split Systems						
Point Description	Object Name	DI	DO	AI	AO	Override
Split System 1 - Fan Status	SF_S	X				
Split System 1 - Solenoid Valve	SOL_VLV		X			
Split System 1 - Condensing Unit Status	CU_S	X				
Split System 1 - Compressor Status	COMP_1_S	X				
Zone Temp 1st Floor Setpoint	ZN_1_T_SP				X	X
Zone Temp 1st Floor Actual	ZN_1_T			X		
Zone Temp 2nd Floor Setpoint	ZN_2_T_SP				X	X
Zone Temp 2nd Floor Actual	ZN_2_T			X		
Zone Temp 3rd Floor Setpoint	ZN_3_T_SP				X	X
Zone Temp 3rd Floor Actual	ZN_3_T			X		
Zone Temp Alarm	ZN_T_AL	X				
Split System 2 - Fan Status	SF_S	X				
Split System 3 - Fan Status	SF_S	X				
CU-1 Fan Status	SF_S	X				
CU-1 Solenoid Valve	SOL_VLV		X			
CU-1 Condensing Unit Status	CU_S	X				
CU-1 Temperature Set Point	ZN_3B_T_SP				X	X
CU-1 Temperature Actual	ZN_3B_T			X		

Fan Coil						
Point Description	Object Name	DI	DO	AI	AO	Override
Fan Status	SF_S	X				
Fan Command	SF_C		X			X
Hot Water Valve Position	HTG_VLV				X	X
Chilled Water Valve Position	CLG_VLV				X	X
Zone Temp Setpoint	ZN_T_SP				X	X
Zone Temp Actual	ZN_T			X		
Zone Temp Alarm	ZN_T_AL	X				



SPLIT SYSTEM
SS-1, SS-2,& SS-3/CU-1



FAN COIL

1. LIGHTING CONTROL SYSTEM

1.1. The DDC shall monitor the lighting control system both the interior and exterior lighting zones and shall have a visual indication on the graphics screen of the building if the lights are on or off for each room/area. The DDC system shall have the availability to turn on and off the lights and control all schedules at each of the following zones.

1.1.1. First Floor Corridor
1.1.2. Second Floor Corridor
1.1.3 Third Floor Corridor
1.1.4. Stairwell Lighting

1.2. Provide all required relays, panels, controllers, etc. as required to control this system. Coordinate all requirements with lighting control vendor. Refer to electrical specifications for additional information.

1. SPLIT SYSTEM SS-1 and SS-2 MDF and IDF Rooms

1.1. These units shall be provided with factory controls. The DDC system shall monitor space temperature and provide a high temperature alarm. Provide all necessary wiring conduit, etc. as required to interlock the DDC thermostat with unit and condensing unit. Al (3) rooms shall have space temperature and the split system shall control to maintain all spaces a minimum of 72°F (adj.).

1.2. SS-1 shall also be provided with economizer capability. This unit shall be provided with the ability to provide economizer cooling when the outside air temperature is below 60 F (adj.). Provide a return air and outside air damper. In the economizer mode, the outside air damper shall be 100% open and the return air damper shall be 100% closed. If the temperature is above 60 F (adj.), than the outside air damper shall be closed and the return air damper shall be 100% open.

1.3. The DDC system shall have the ability to start and stop the split system. These shall be provided with a BACnet over MSTP communication and all points shall be available to the DDC system. MIU-1/MCU-1 split system AC units to be controlled with Honeywell room temperature sensor in the data room.

1.4. The mini-split system shall be provided with a bacnet controller. The DDC system shall monitor the space temperatures.

1. 4-PIPE FAN COIL UNITS

1.1. The units are provided with 2-way modulating control valves for the chilled and hot water coils. On a call for heating or cooling, the fan shall be activated and the control valve shall modulate as required to maintain setpoint. This shall be monitored through the DDC control system. The DDC system shall have the capability to start and stop these units. If the CW pumps are enabled which shall only occur when campus chilled water is available, then the fan coils may operate in cooling mode.

1.2. Unoccupied Mode - In the unoccupied mode, the space temperatures shall be allowed to float between 80F and 60F (adj.). When the fan coil units operate in unoccupied mode, they shall operate until they are two degrees warmer than unoccupied setpoint in heating mode or two degrees cooler than unoccupied setpoint in cooling mode prior to shutting off.

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STATE OF KENTUCKY
CHRISTOPHER M. REEVES
25045
LICENSED PROFESSIONAL ENGINEER

CMTA

RESERVED FOR AHJ STAMP

CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

INTEGRATED CONTROLS

IC-106

AHU-9 Humidifier						
Point Description	Object Name	DI	DO	AI	AO	Override
Humidifier #1 Command	HUM_1_C		X			X
Humidifier #1 Status	HUM_1_S	X				
Humidifier #2 Command	HUM_2_C		X			X
Humidifier #2 Status	HUM_2_S	X				
Humidier Valve	HUM_VLV				X	X

Laboratory Emergency Shower Alarm						
Point Description	Object Name	DI	DO	AI	AO	Override
Lab Shower Alarm	LS_AL	X				

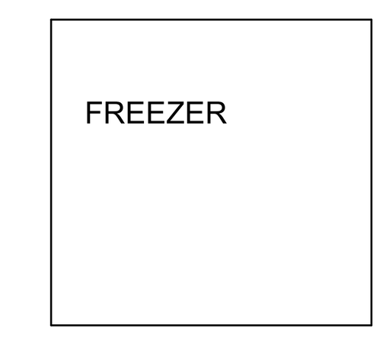
1. AHU-9 HUMIDIFIER

1.1. AHU-9 shall be provided with a steam to steam humidifier. These shall be provided with a BACnet over MSTP communication and all points shall be available to the DDC system. The humidifier shall operate under its own controls to maintain appropriate humidity levels in the building. The humidifier shall be enabled from the DDC system. When enabled from the DDC, the humidifier shall control the steam control valve. The valve shall be provided by the DDC contractor.

1. LABORATORY EMERGENCY SHOWER ALARM

1.1. Each laboratory emergency shower shall be provided with a local alarm and a contactor that can be connected into the DDC system. The DDC system shall indicate an alarm anytime a shower has been activated.

FREEZER
LOCATION:
AREA SERVED: OCCUPIED/UNOCCUPIED

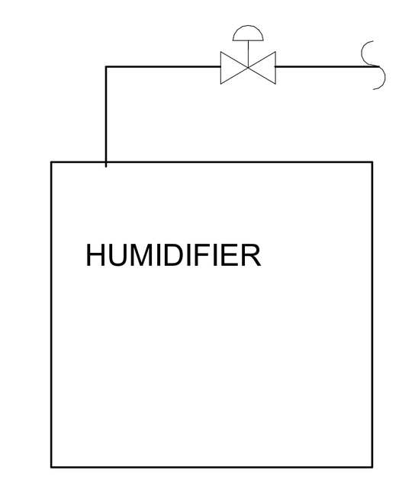


ALARMS
FREEZER HIGH TEMPERATURE ALARM
FREEZER LOW TEMPERATURE ALARM
FREEZER DOOR OPEN ALARM

FREEZER

HUMIDIFIER
LOCATION:
AREA SERVED: OCCUPIED/UNOCCUPIED

OA T	OA H	DATE & TIME
°F	%RH	

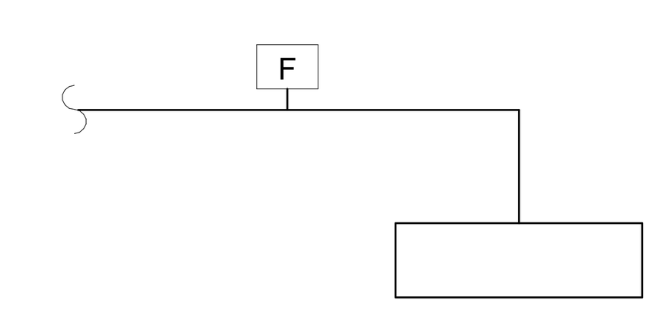


HUMIDIFIER #1 COMMAND
HUMIDIFIER #1 STATUS
HUMIDIFIER #2 COMMAND
HUMIDIFIER #2 STATUS
HUMIDIFIER VALVE % OPEN

HUMIDIFIER AHU-9

LABORATORY EMERGENCY SHOWER ALARM
LOCATION:
AREA SERVED: OCCUPIED/UNOCCUPIED

OA T	OA H	DATE & TIME
°F	%RH	



LAB SHOWER ALARM

LABORATORY EMERGENCY SHOWER ALARM

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CMTA

CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

INTEGRATED CONTROLS

IC-107

MECHANICAL GENERAL NOTES

A COORDINATE THE LOCATION OF DRAINS, THERMOSTATS, GAS OUTLETS, ETC., WITH ALL CASEWORK EQUIPMENT, MECHANICAL ROOM EQUIPMENT, ETC., PRIOR TO COMMENCING INSTALLATION. WORK NOT SO COORDINATED SHALL BE REMOVED AND PROPERLY INSTALLED AT THE EXPENSE OF THE CONTRACTOR.

B THE CONTRACTOR SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO ENSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE. FOR SAFETY PURPOSES, PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. VERIFY THE LOCATION, SIZE, TYPE, ETC., OF EACH UNDERGROUND OR OVERHEAD UTILITY. ALL WORK SHALL BE PERFORMED IN ACCORD WITH ALL FEDERAL, STATE AND/OR LOCAL RULES, REGULATIONS, STANDARD AND SAFETY REQUIREMENTS. UTILITIES SHALL BE INSTALLED IN ACCORD WITH THE APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL APPLY.

C WHERE WORK IS REQUIRED ABOVE EXISTING LAY-IN, PLASTER OR GYPSUM BOARD CEILINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND REINSTALLATION (OR REPLACEMENT, IF DAMAGED) OF ALL CEILING OR TILE AND GRID MEMBERS NECESSARY TO PERFORM HIS WORK. NEW TILE AND GRID SHALL MATCH THE SURROUNDING AREAS. ALL PATCHING WORK SHALL MATCH ADJACENT SURFACES.

D ALL NEW WORK SHALL BE HUNG FROM STRUCTURE, NOT FROM THE WORK OF OTHER TRADES, WHETHER EXISTING OR NEW.

E COORDINATE ALL WORK WITH PROJECT PHASING REQUIREMENTS.

F PATCH, REPAIR AND PAINT OR PROVIDE WALL COVERING FOR (TO OWNER'S STANDARDS) EXISTING WALLS, CEILINGS, ETC., THAT ARE TO REMAIN IF DAMAGED DURING CONSTRUCTION. REPAIRS SHALL MATCH ADJACENT SURFACES TO THE SATISFACTION OF THE ARCHITECT AND OWNER.

G OBSERVE ALL APPLICABLE CODES, RULES AND REGULATIONS THAT MAY APPLY TO THE WORK UNDER THIS CONTRACT. (CITY, COUNTY, LOCAL, FEDERAL, MUNICIPALITY, UTILITY COMPANY, COMMONWEALTH OF KENTUCKY, ETC.)

H CONTRACTOR SHALL BE AWARE OF UNSEEN PLUMBING, HVAC AND ELECTRICAL WORK DURING DEMOLITION. IF ITEMS ARE UNCOVERED DURING DEMOLITION THEN FIELD VERIFY THE USE OF THE ITEMS AND PLAN AN ALTERNATE ROUTE TO RUN THESE ITEMS. THEN CONTACT THE ENGINEERS TO REVIEW THE ROUTING.

I IF AREA OF CONSTRUCTION HAS A POST TENSION FLOOR SLAB. CONTRACTOR SHALL USE ULTRA SOUND OR OTHER APPROVED METHODS TO SURVEY THE EXISTING FLOOR STRUCTURE BEFORE MAKING ANY AND ALL FLOOR PENETRATIONS.

J WHERE FIRE PROOFING IS SPRAYED ON EXISTING STRUCTURE ALL EXISTING CONDUITS, WATER, HYDRONIC, STEAM, CHILLED WATER, FIRE PROTECTION LINES, MED GAS, ETC. SHALL BE LOWERED TO BE BELOW FULL THICKNESS OF FIRE PROOFING WITH NO INTERFERENCE.

K ALL PENETRATIONS OF FIRE AND SMOKE RATED ASSEMBLIES SHALL BE APPROPRIATELY FIRE STOPPED PER AN APPROVED U.L. LISTED STANDARD. CONTRACTOR SHALL PAY PARTICULAR ATTENTION TO INSULATED PIPING PENETRATIONS.

L ALL WORK REQUIRING DOWNTIME OF ANY AREA IN THE BUILDING SHALL BE SCHEDULED 2 WEEKS IN ADVANCE, AND SHALL COMPLY WITH INTERIM LIFE SAFETY MEASURES.

M ALL DUCTWORK, PIPING, CONDUITS, ETC. IN ROOMS WITH CEILINGS SHALL BE ABOVE CEILING EXCEPT AS NOTED.

N INSTALL AIR VENTS AT HIGH POINTS IN PIPING AND DRAINS IN LOW POINTS. USE CARE TO AVOID FREEZING OF EXTERIOR VENTS.

O LOCATIONS OF PIPING, DUCTS AND EQUIPMENT ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD. DO NOT SCALE THE DRAWINGS.

P ALL OFFSETS IN DUCTS AND PIPING ARE NOT NECESSARILY SHOWN. PROVIDE ADDITIONAL OFFSETS WHERE NECESSARY.

Q COORDINATE ALL HVAC WORK WITH ELECTRICAL, PLUMBING AND OTHER TRADES TO AVOID INTERFERENCE WITH PIPING, DUCTS, CONDUIT AND OTHER EQUIPMENT.

R INSTALL ALL PIPING, DUCTWORK AND EQUIPMENT IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTION. IF IN CONFLICT WITH THE DESIGN INDICATED IN CONTRACT DOCUMENTS, ADVISE THE ENGINEERS PRIOR TO INSTALLATION FOR CLARIFICATION. PROVIDE RECOMMENDED ACCESS AND SERVICE CLEARANCES FOR ALL EQUIPMENT.

S SEAL AIRTIGHT AROUND ALL DUCTS AND PIPING PENETRATIONS THROUGH WALLS, FLOORS AND ROOF. PROVIDE FIRE STOPPING IN FIRE PARTITION.

T SEAL ALL NEW DUCTWORK JOINTS WITH UNITED MCGILL, IRONGRIP 601 OR EQUAL WATER BASED SEALANT.

U ALL MOTOR DRIVEN EQUIPMENT SHALL BE INSTALLED WITH FLEXIBLE CONNECTIONS TO DUCTWORK, PIPING, ETC., UNLESS OTHERWISE NOTED.

V THE CONTRACTOR SHALL RELOCATE OR AVOID ANY EXISTING EQUIPMENT APPURTENANCES, ETC., THAT CONFLICT WITH NEW WORK.

W WHERE MOUNTING HEIGHTS ARE NOT INDICATED OR ARE IN CONFLICT WITH ANY OTHER BUILDING SYSTEM, CONTACT THE ENGINEERS BEFORE INSTALLATION. REFER ALSO TO ARCHITECTURAL WALL INTERIOR AND EXTERIOR WALL ELEVATIONS, CEILING HEIGHTS AND OTHER DETAIL OF THESE DOCUMENTS.

X DOUBLE WIDTH TURNING VANES SHALL BE INSTALLED IN ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK ELBOWS. TURNING VANES NOT REQUIRED FOR KITCHEN EXHAUSTS.

Y ANY VIBRATING, OSCILLATING OR OTHER NOISE OR MOTION PRODUCING EQUIPMENT SHALL BE ISOLATED FROM SURROUNDING SYSTEMS IN AN APPROVED MANNER. NOISY OR STRUCTURALLY DAMAGING INSTALLATIONS SHALL BE SATISFACTORILY REPLACED OR REPAIRED AT THE INSTALLING CONTRACTOR'S EXPENSE. THE FINAL DECISION ON THE SUITABILITY OF A PARTICULAR INSTALLATION'S ACCEPTABILITY SHALL BE THAT OF THE ENGINEER.

Z DEVIATIONS IN SIZE, CAPACITIES, FIT, FINISH, ETC. FOR EQUIPMENT FROM THAT USED AS BASIS OF DESIGN SHALL BE THE RESPONSIBILITY OF THE PURCHASER OF THAT EQUIPMENT. ANY PROVISIONS REQUIRED TO ACCOMMODATE A DEVIATION, WHETHER APPROVED BY THE ENGINEERS OR NOT, SHALL BE THE RESPONSIBILITY OF THE PURCHASER.

AA VALVES, BALANCING DAMPERS OR ANY MECHANICAL/ELECTRICAL ITEM REQUIRING ACCESS SHALL NOT BE LOCATED ABOVE A HARD CEILING. IF THIS IS NOT POSSIBLE, THEN AN APPROPRIATELY SIZED ACCESS DOOR SHALL BE PLACED UNDER THE ITEM TO ALLOW EASY MAINTENANCE AND ADJUSTMENT. ADDITIONALLY ALL SUCH ITEMS SHALL NOT BE LOCATED AN UNREASONABLE DISTANCE ABOVE THE CEILINGS. IN GENERAL ALL SUCH ITEMS UNLESS INDICATED OTHERWISE SHALL BE MOUNTED SIX TO TWELVE INCHES ABOVE THE CEILING. IF IN DOUBT, CONTACT ENGINEER PRIOR TO INSTALLING.

AB WORK IN CONFINED AREAS SHALL BE IN ACCORDANCE WITH THE OWNER'S SAFETY POLICY REQUIREMENTS.

AC ALL DUCTWORK, PIPING, CONDUIT, ETC. SHALL BE INSTALLED A MINIMUM OF 4" ABOVE THE TOP OF THE CEILING GRID PER UK STANDARDS.

MECHANICAL PHASING NOTES

A THIS PROJECT INTERFACES EXTENSIVELY WITH EXISTING BUILDING SERVICES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND PHASE ALL TIE-INS AND INTERRUPTIONS OF EXISTING SERVICES TO MINIMIZE OR ELIMINATE DOWNTIME. AS AN EXAMPLE, MAIN GAS SERVICE, WATER SERVICE, ELECTRICAL SERVICE, HVAC SERVICES, STEAM GENERATION, ETC., WILL BE AFFECTED AND REPLACED OR MOVED DURING THIS PROJECT. THE CONTRACTOR SHALL INSTALL ALL NEW SERVICES AND EQUIPMENT AND HAVE THEM TESTED AND FULLY AND RELIABLY FUNCTIONAL PRIOR TO INTERRUPTING, RELOCATING OR REMOVING ANY EXISTING SERVICES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO BARE ANY AND ALL COSTS ASSOCIATED WITH THIS PHASING, INCLUDING TEMPORARY SERVICES, TEMPORARY RELOCATION, PREMIUM TIME WORK, ETC. CONTRACTOR SHALL COORDINATE ALL SAID WORK WITH THE OWNER AND APPLICABLE UTILITIES PER THE CONTRACT DOCUMENTS.

MECHANICAL HAZARDOUS MATERIALS NOTES

A THE CONTRACTOR IT IS HEREBY ADVISED THAT IS POSSIBLE THAT ASBESTOS AND/OR OTHER HAZARDOUS MATERIALS ARE OR WERE PRESENT IN THIS BUILDING(S). ANY WORKER, OCCUPANT, VISITOR, ETC., WHO ENCOUNTERS ANY MATERIAL OF WHOSE CONTENT THEY ARE NOT CERTAIN SHALL PROMPTLY REPORT THE EXISTENCE AND LOCATION OF THAT MATERIAL TO THE OWNER. FURTHERMORE, THE CONTRACTOR SHALL INSURE THAT NO ONE COMES NEAR TO OR IN CONTACT WITH ANY SUCH MATERIAL OR FUMES THEREFROM UNTIL ITS CONTENT CAN BE ASCERTAINED TO BE NON-HAZARDOUS.

B CMTA, INC. HAS NO EXPERTISE IN THE DETERMINATION OF THE PRESENCE OF ANY HAZARDOUS MATERIAL. THEREFORE, NO ATTEMPT HAS BEEN MADE BY CMTA TO IDENTIFY THE EXISTENCE OR LOCATION OF ANY SUCH HAZARDOUS MATERIAL. FURTHERMORE, CMTA NOR ANY AFFILIATE HEREOF WILL NOT OFFER OR MAKE ANY RECOMMENDATIONS RELATIVE TO THE REMOVAL, HANDLING OR DISPOSAL OF SUCH MATERIAL.

C IF THE WORK WHICH IS TO BE PERFORMED INTERFACES, CONNECTS OR RELATES IN ANY PHYSICAL WAY WITH OR TO EXISTING COMPONENTS WHICH CONTAIN OR BEAR ANY HAZARDOUS MATERIAL, ASBESTOS BEING ONE, THEN IT SHALL BE THE CONTRACTOR'S SOLE RESPONSIBILITY TO CONTACT THE OWNER AND SO ADVISE HIM IMMEDIATELY.

D THE CONTRACTOR BY EXECUTION OF THE CONTRACT FOR ANY WORK AND/OR BY THE ACCOMPLISHMENT OF ANY WORK THEREBY AGREE TO BRING NO CLAIM RELATIVE TO HAZARDOUS MATERIALS FOR NEGLIGENCE, BREACH OF CONTRACT, INDEMNITY, OR ANY OTHER SUCH ITEM AGAINST CMTA, ITS PRINCIPALS, EMPLOYEES, AGENTS OR CONSULTANTS. ALSO, THE CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD CMTA, ITS PRINCIPALS, EMPLOYEES, AGENTS AND CONSULTANTS HARMLESS FROM ANY SUCH RELATED CLAIMS WHICH MAY BE BROUGHT BY ANY SUBCONTRACTORS, SUPPLIERS OR ANY OTHER THIRD PARTIES.

E THE CONTRACTOR IS DIRECTED TO THE SPECIFICATIONS FOR FURTHER INFORMATION.

MECHANICAL DEMOLITION NOTES

A THE CONTRACTOR SHALL REFER TO THE ARCHITECTURAL PLANS FOR AREAS IN WHICH THE CEILING IS REMAINING. THE CONTRACTOR IS RESPONSIBLE FOR REMOVING THE EXISTING CEILING AS REQUIRED AND REINSTALLATION. TEMPORARILY SUPPORT LIGHTS, DIFFUSERS, CEILING ETC. REPLACE BROKEN CEILING TILES WITH NEW AT NO ADDITIONAL COST TO OWNER. FIELED VERIFY EXACT REQUIREMENTS.

B DURING SPRINKLER SYSTEM OUTAGES THE CONTRACTORS SHALL PROVIDE FIRE WATCH OF AREAS WITH OUTAGES.

C ALL WALLS AND FLOOR SLABS SHALL BE REPAIRED TO MATCH EXISTING AND TO A LIKE NEW CONDITION. ALL RATED WALLS AND FLOOR SLABS SHALL BE PATCHED AND REPAIRED TO MAINTAIN RATING.

D ALL EXISTING BUILDING FINISHES SHALL BE PROTECTED DURING THE DEMOLITION PHASE.

E HEAVY DASHED LINES INDICATE ITEMS FOR REMOVAL (UON) AND LIGHT SOLID LINES INDICATE EXISTING ITEMS TO REMAIN.

F COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH THE OWNER.

G ALL OUTAGES SHALL BE SCHEDULED THROUGH THE UK CPMD PROJECT REPRESENTATIVE FOR PROPER COORDINATION. A REQUEST FOR AN OUTAGE SHALL BE SUBMITTED IN WRITING A MINIMUM OF TWO WEEKS IN ADVANCE.

ABBREVIATIONS

AC	ALTERNATING CURRENT
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AFR	ABOVE FINISHED ROOF
AFUE	ANNUAL FUEL UTILIZATION EFFICIENCY
AHJ	AUTHORITY HAVING JURISDICTION
AMP	AMPERE (AMP, AMPS)
ANSI	AMERICAN NATIONAL STANDARD INSTITUTE
APD	AIR PRESSURE DROP
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR-CONDITIONING ENGINEERS
ATU	AIR TERMINAL UNIT
AVG	AVERAGE
BAS	BUILDING AUTOMATION SYSTEM
BHP	BREAK HORSEPOWER
BTU	BRITISH THERMAL UNIT
CAP	CAPACITY
CAV	CONSTANT AIR VOLUME
CD	CONDENSATE DRAIN
CFM	CUBIC FEET PER MINUTE
C.I.	CAST IRON
CLG	CEILING
CLR	CLEAR
CO	CARBON MONOXIDE
CO2	CARBON DIOXIDE
COND	CONDENS (-ER, -ING, -ATION, -ATE)
CONT	CONTINU (-ED, -OUS)
CU FT	CUBIC FEET
CU IN	CUBIC INCHES
CV	VALVE FLOW COEFFICIENT
dB	DECIBEL
DB	DRY BULB
DBT	DRY BULB TEMPERATURE
DC	DIRECT CURRENT
DD	DUCT SMOKE DETECTOR
DDC	DIRECT DIGITAL CONTROLS
DEG	DEGREE (-S)
DIA	DIAMETER (-S)
DIST.	DISTRIBUTION
DN	DOWN
DWG	DRAWING
EAT	ENTERING AIR TEMPERATURE
EC	ELECTRICAL CONTRACTOR
ELEV	ELEVA (-TION, -TOR)
ENGR	ENGINEER
EQ	EQUAL
ESP	EXTERNAL STATIC PRESSURE
ETR	EXISTING TO REMAIN
EVAP	EVAPORAT (-E, -ING, -ED, -OR, -ION)
EWT	ENTERING WATER TEMPERATURE
EXP	EXPANSION
EXT	EXTERIOR

ABBREVIATIONS (CONTINUED)

FA	FREE AREA
FD	FIRE DAMPER
FL	FLOOR
FLA	FULL LOAD AMPS
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPC	FIRE PROTECTION CONTRACTOR
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FEET **OR** FOOT
FUT	FUTURE
FV	FACE VELOCITY
GA	GAGE/GAUGE
GAL	GALLON (-S)
GC	GENERAL CONTRACTOR
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GR	GRAINS
H	HUMIDITY
HD	HEAD
HG	MERCURY
HORIZ	HORIZONTAL
HP	H (-ORSEPOWER, -EAT PUMP)
HR	HOUR (-S)
HVAC	HEATING, VENTILATING, & AIR-CONDITIONING
Hz	HERTZ
ID	I (-DENTIFICATION, -NSIDE DIAMETER, -NSIDE DIMENSION)
IN	INCH (-ES)
INSUL	INSULAT (-ED, -ION)
INT	INTER (-IOR, -ERVAL)
IPS	IRON PIPE SIZE
kW	KILOWATT
kWh	KILOWATT HOUR
LAT	LEAVING AIR TEMPERATURE
LBS	POUNDS
LF	LINEAR FEET/FOOT
LRA	LOCKED ROTOR AMPS
LWT	LEAVING WATER TEMPERATURE
MAX	MAXIMUM
MBH	BTU PER HOUR [THOUSANDS]
MCA	MINIMUM CIRCUIT AMPS
MFG	MANUFACTURER
MIN	MIN (-IMUM, -UTE)
MISC	MISCELLANEOUS
MOCP	MAXIMUM OVERCURRENT PROTECTION [AMPS]
MTG	MOUNTING
N/A	NOT APPLICABLE
NC	NOISE CRITERIA **OR** NORMALLY CLOSED
NEBB	NATIONAL ENVIRONMENTAL BALANCING BUREAU
NIC	NOT IN CONTRACT

ABBREVIATIONS (CONTINUED)

NO	NORMALLY OPEN **OR** NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DI (-AMETER, -MENSION)
CFCI	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OR	OPEN RECEPTACLE
OZ	OUNCE (-S)
PC	PLUMBING CONTRACTOR
PD	PRESSURE DROP
PH	PHASE [ELECTRICAL]
PLBG	PLUMBING
PPM	PARTS PER MILLION
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE REDUCING VALVE (STEAM, WATER, GAS)
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIG	PPSI GAUGE
RH	RELATIVE HUMIDITY [%]
AV	AIR FLOW CONTROL VALVE
RPM	REVOLUTIONS PER MINUTE
SD	SMOKE DAMPER
SP	STATIC PRESSURE
VAV	VARIABLE AIR VOLUME
SQ FT	SQUARE FEET **OR** FOOT
SQ IN	SQUARE INCH **OR** INCHES
TAB	TESTING AND BALANCING
TBD	TO BE DETERMINED
TE	TOP ELEVATION
TEMP	TEMPERATURE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
V	VOLT (-AGE, -S)
VAR	VARI (-ABLE, -IES)
VAV	VARIABLE AIR VOLUME
VEL	VELOCITY
VFD	VARIABLE FREQUENCY DRIVE
W	WATT (-AGE, -S)
WB	WET BULB
WBT	WET BULB TEMPERATURE
WPD	WATER PRESSURE DROP
WT	WEIGHT
W/	WITH
W/O	WITHOUT
%	PERCENT
ΔP	DIFFERENTIAL PRESSURE
ΔT	TEMPERATURE DIFFERENCE
℄	CENTERLINE

GENERAL SYMBOLS

#	TAGGED NOTE DESIGNATOR
△	REVISION TRIANGLE
ROOM NAME ## #	ROOM TAG
TAG XXX-# INSTANCE XXXX	EQUIPMENT TAG
	POINT OF CONNECTION / CONNECT TO EXISTING
	POINT OF DEMOLITION

HVAC LEGEND

	SUPPLY AIR DIFFUSER
	RETURN AIR DIFFUSER
	EXHAUST AIR DIFFUSER
	TRANSFER AIR DIFFUSER W/ SOUND ATTENUATING BOOT
	SIDEWALL DIFFUSER/GRILLE
	SIDEWALL DIFFUSER/GRILLE
TAG XXXX AIRFLOW #,###	AIR DEVICE TAG (REGISTER, GRILLE, DIFFUSER,LOUVER)
##x##	RECTANGULAR DUCT
#ø	ROUND/SPIRAL DUCT
##/##	FLAT OVAL DUCT
SA	SUPPLY AIR DUCT
RA	RETURN AIR DUCT
EA	EXHAUST AIR DUCT
OA	OUTSIDE AIR DUCT
TA	TRANSFER AIR DUCT
CAE	COMBUSTION AIR EXHAUST DUCT
CAI	COMBUSTION AIR INTAKE DUCT
SA	SA AIR DUCT TURNING UP
SA	SA AIR DUCT TURNING DOWN
RA	RA AIR DUCT TURNING UP
RA	RA AIR DUCT TURNING DOWN
EA	EA AIR DUCT TURNING UP
EA	EA AIR DUCT TURNING DOWN
E(XXX)	EXISTING DUCT - (XXX) DENOTES SYSTEM
D(XXX)	DUCT TO BE DEMOLISHED - (XXX) DENOTES SYSTEM
A(XXX)	DUCT TO BE ABANDONED IN PLACE - (XXX) DENOTES SYSTEM
	MITERED ELBOW WITH TURNING VANES
	FLEXIBLE DUCT
T	THERMOSTAT
T	TEMPERATURE SENSOR
H	HUMIDITY SENSOR
C	CARBON DIOXIDE SENSOR
TC	TEMPERATURE & CARBON DIOXIDE SENSOR
VERT. HORIZ.	MANUAL BALANCING/VOLUME DAMPER
VERT. HORIZ.	MOTORIZED DAMPER
VERT. HORIZ.	FIRE DAMPER
VERT. HORIZ.	SMOKE DAMPER
VERT. HORIZ.	COMBINATION FIRE & SMOKE DAMPER

MECHANICAL PIPING LEGEND

	PIPE ELBOW TURNING UP
	PIPE ELBOW TURNING DOWN
	PIPE TEE; CONNECTION ON TOP
	PIPE TEE; CONNECTION ON BOTTOM
	PIPE CAP
BFW	BOILER FEEDWATER
CAI/E	COMBUSTION AIR INTAKE/EXHAUST
CBS/R	CHILLED BEAM SUPPLY/RETURN
CD	CONDENSATE DRAIN
CHWS/R	CHILLED WATER SUPPLY/RETURN
CST	CLEAN STEAM PIPING
CWS/R	CONDENSER WATER SUPPLY/RETURN
DTS/R	DUAL TEMP. WATER SUPPLY/RETURN
GS/R	GEOTHERMAL WATER SUPPLY/RETURN
HPC	HIGH PRESSURE STEAM CONDENSATE
HPS(#)	HIGH PRESSURE STEAM; (#) DENOTES PRESSURE
HPS/R	HEAT PUMP WATER SUPPLY/RETURN
HRS/R	HEAT RECOVERY SUPPLY/RETURN PIPING
HWS/R	HEATING WATER SUPPLY/RETURN
LPC	LOW PRESSURE STEAM CONDENSATE
LPS(#)	LOW PRESSURE STEAM; (#) DENOTES PRESSURE
MPC	MEDIUM PRESSURE STEAM RETURN
MPS(#)	MEDIUM PRESSURE STEAM; (#) DENOTES PRESSURE
SPD	STEAM CONDENSATE PUMPED DISCHARGE
SVT	STEAM VENT PIPING
D(XXX)	PIPING TO BE DEMOLISHED - (XXX) DENOTES SYSTEM
E(XXX)	EXISTING PIPING - (XXX) DENOTES SYSTEM
A(XXX)	ABANDONED IN PLACE PIPING - (XXX) DENOTES SYSTEM
	TWO-WAY CONTROL VALVE
	THREE-WAY CONTROL VALVE
	AUTOMATIC AIR VENT (AAV)
	MANUAL AIR VENT (MAV)
	MANUAL BALANCING VALVE (BV)
	BALL VALVE
	BUTTERFLY VALVE
	TRIPLE DUTY VALVE (TDV)
	STRAINER
	MANUAL ISOLATION VALVE
	GLOBE VALVE
	OS&Y (GATE) VALVE
	PRESSURE REDUCING VALVE (STEAM, GAS, WATER, ETC.)
	AUTO-FLOW CONTROL VALVE
	CHECK VALVE
	DOUBLE CHECK VALVE ASSEMBLY
	FLEXIBLE PIPE CONNECTION
	FLOW METER (VENTURI)
	PIPING UNION
	FLOW SWITCH
	PRESSURE SWITCH
	TAMPER SWITCH
	THERMOMETER
	PETE'S PLUG; TEMPERATURE/PRESSURE PORT

APPLICABLE BUILDING CODES

APPLICABLE BUILDING CODES	DOCUMENT	YEAR
ACCESSIBLE AND USEABLE BUILDINGS AND FACILITIES	ANSI A117.1	2009
FIRE SPRINKLER CODE	NFPA 13	2013
INTERNATIONAL BUILDING CODE (IBC)	STATE EDITION	2015
INTERNATIONAL ENERGY CONSERVATION CODE (IECC)	STATE EDITION	2012
INTERNATIONAL FIRE CODE (IFC)	STATE EDITION	2015
INTERNATIONAL FUEL GAS CODE (IFGC)	STATE EDITION	2015
INTERNATIONAL MECHANICAL CODE (IMC)	STATE EDITION	2015
INTERNATIONAL PLUMBING CODE (IPC)	STATE EDITION	2015
INTERNATIONAL EXISTING BUILDING CODE (IEBC)	STATE EDITION	2009
NATIONAL ELECTRIC CODE (NEC)	NFPA 70	2017
NATIONAL FIRE ALARM & SIGNALING CODE	NFPA 72	2013
UNIFORM STATEWIDE BUILDING CODE		2018

Sheet List - Mechanical

SHEET #	SHEET NAME
IC-001	CONTROLS ARCHITECTURE
IC-101	INTEGRATED CONTROLS
IC-102	INTEGRATED CONTROLS
IC-103	INTEGRATED CONTROLS
IC-104	INTEGRATED CONTROLS
IC-105	INTEGRATED CONTROLS
IC-106	INTEGRATED CONTROLS
IC-107	INTEGRATED CONTROLS
M-001	MECHANICAL LEGEND
M-103C	AIR DIST. THIRD FLOOR - DEMO. PLAN - AREA 'C'
M-103D	AIR DIST. THIRD FLOOR - DEMO. PLAN - AREA 'D'
M-104C	AIR DIST. FOURTH FLOOR- DEMO. PLAN - AREA 'C'
M-111C	HYDRONIC FIRST FLOOR - DEMO. PLAN - AREA 'C'
M-111D	HYDRONIC FIRST FLOOR - DEMO. PLAN - AREA 'D'
M-112C	HYDRONIC SECOND FLOOR - DEMO. PLAN - AREA 'C'
M-112D	HYDRONIC SECOND FLOOR - DEMO. PLAN - AREA 'D'
M-113C	HYDRONIC THIRD FLOOR - DEMO. PLAN - AREA 'C'
M-113D	HYDRONIC THIRD FLOOR - DEMO. PLAN - AREA 'D'
M-121C	AIR DIST. FIRST FLOOR - NEW WORK PLAN - AREA 'C'
M-121D	AIR DIST. FIRST FLOOR - NEW WORK PLAN - AREA 'D'
M-122C	AIR DIST. SECOND FLOOR - NEW WORK PLAN - AREA 'C'
M-122D	AIR DIST. SECOND FLOOR - NEW WORK PLAN - AREA 'D'
M-123C	AIR DIST. THIRD FLOOR - NEW WORK PLAN - AREA 'C'

Sheet List - Mechanical

SHEET #	SHEET NAME
M-123D	AIR DIST. THIRD FLOOR - NEW WORK PLAN - AREA 'D'
M-124C	AIR DIST. FOURTH FLOOR - NEW WORK PLAN - AREA 'C'
M-124D	AIR DIST. FOURTH FLOOR - NEW WORK PLAN - AREA 'D'
M-130D	HYDRONIC BASEMENT - NEW WORK PLAN - AREA 'D'
M-131C	HYDRONIC FIRST FLOOR - NEW WORK PLAN - AREA 'C'
M-131D	HYDRONIC FIRST FLOOR - NEW WORK PLAN - AREA 'D'
M-132C	HYDRONIC SECOND FLOOR - NEW WORK PLAN - AREA 'C'
M-132D	HYDRONIC SECOND FLOOR - NEW WORK PLAN - AREA 'D'
M-133C	HYDRONIC THIRD FLOOR - NEW WORK PLAN - AREA 'C'
M-133D	HYDRONIC THIRD FLOOR - NEW WORK PLAN - AREA 'D'
M-134C	HYDRONIC FOURTH FLOOR - NEW WORK PLAN - AREA 'C'
M-134D	HYDRONIC FOURTH FLOOR - NEW WORK PLAN - AREA 'D'
M-201	MECHANICAL SECTIONS
M-202	MECHANICAL SECTIONS
M-301	MECHANICAL DETAILS
M-302	MECHANICAL DETAILS
M-303	MECHANICAL DETAILS
M-304	MECHANICAL DETAILS
M-500	MECHANICAL PIPING SCHEMATICS
M-501	MECHANICAL PIPING SCHEMATICS
M-502	MECHANICAL PIPING SCHEMATICS
M-503	MECHANICAL PIPING SCHEMATICS
M-601	MECHANICAL SCHEDULES

NOTE: NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED ON THIS PROJECT

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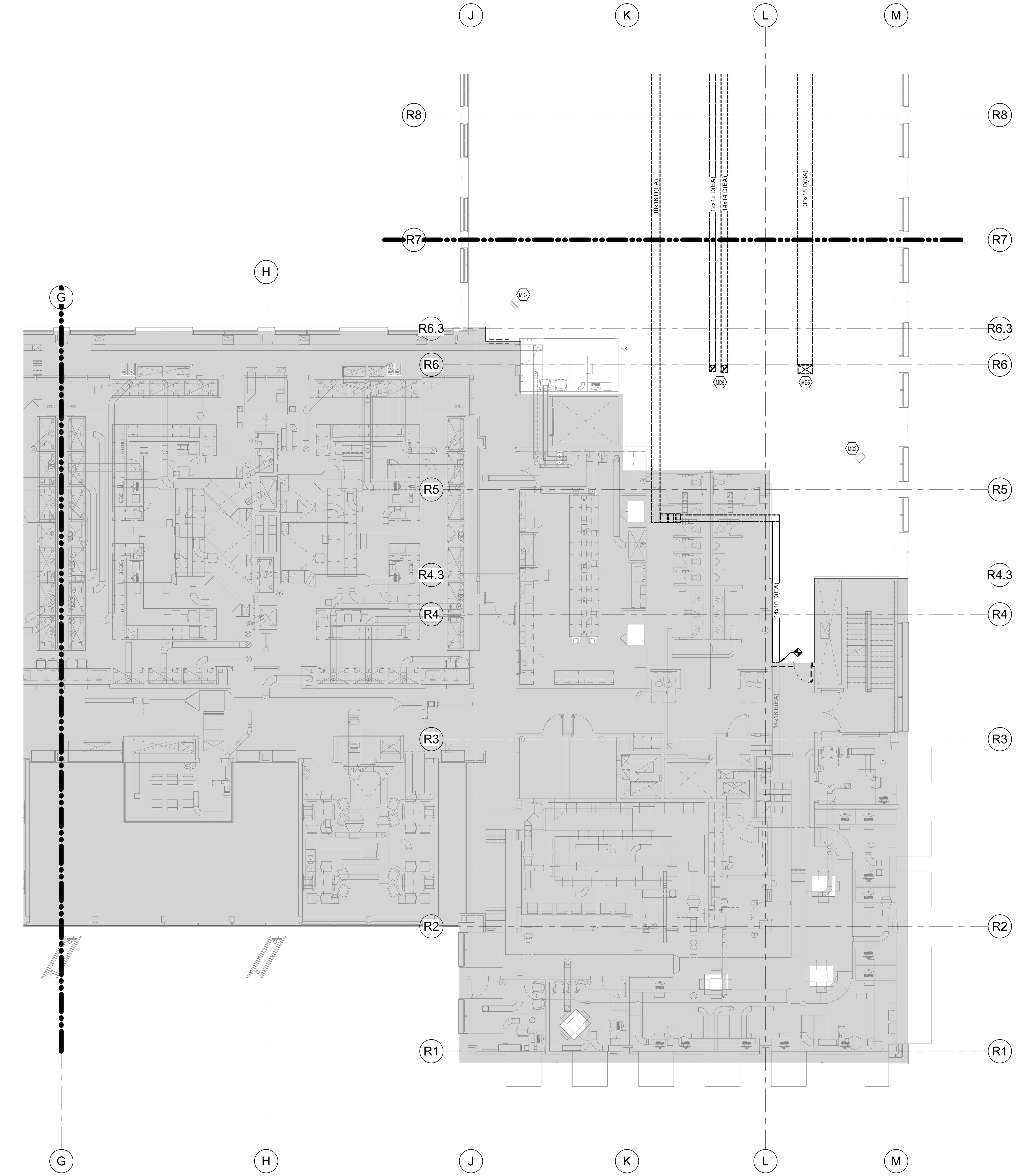
No.	Description	Date

MECHANICAL LEGEND

M-001

TAGGED NOTES

- MD2 REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.
- MD5 REMOVE EXHAUST DUCTWORK UP TO FOURTH FLOOR MECHANICAL PENTHOUSE. REFER TO FOURTH FLOOR PLANS FOR CONTINUATION.



1 AIR DISTRIBUTION - THIRD FLOOR AREA 'C' DEMOLITION PLAN
1/8" = 1'-0"

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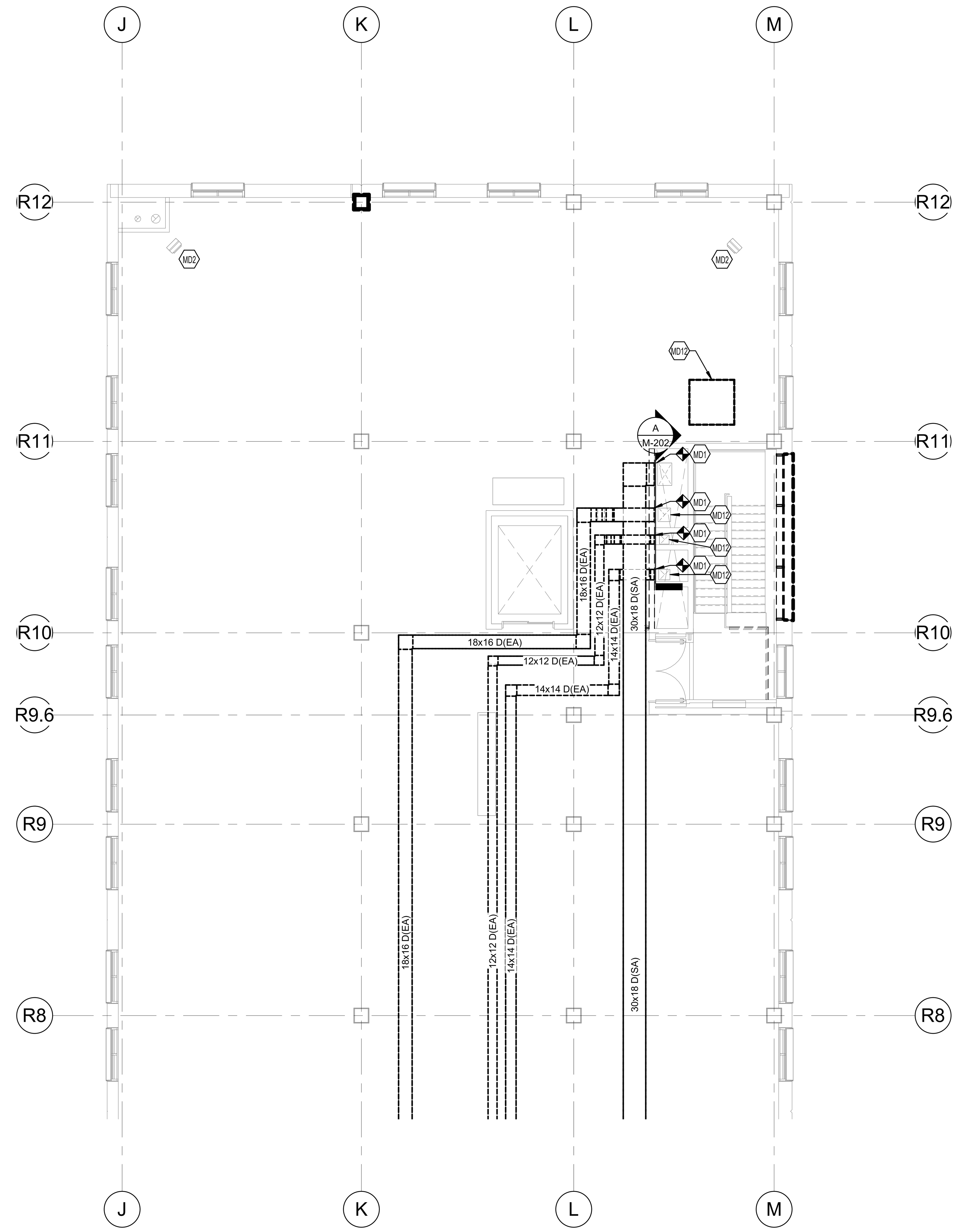
AIR DIST. THIRD FLOOR - DEMO. PLAN - AREA 'C'

M-103C

TAGGED NOTES

##

- MD1 REMOVE SUPPLY DUCTWORK TO VERTICAL RISER AND CAP.
- MD2 REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.
- MD12 PROVIDE TEMPORARY EXHAUST FAN. PROVIDE TEMPORARY DUCTWORK FROM 14"X14" EA DUCT IN SHAFT, 12"X12" EA DUCT IN SHAFT, AND 18"X16" EA DUCT IN SHAFT. MANIFOLD ALL THREE EXHAUST DUCTS FROM SHAFT TOGETHER INTO 20"X18" EXHAUST DUCT AND ROUTE TO TEMPORARY FAN. COORDINATE WITH CONSTRUCTION MANAGER. TEMPORARY EXHAUST FAN SHALL BE CAPABLE OF MINIMUM OF 2500 CFM AND 2" E.S.P. EXHAUST AIRFLOW OUT WINDOW ON THIRD FLOOR NEAR COLUMN LINES M/R11.



A **AIR DISTRIBUTION - THIRD FLOOR AREA 'D' DEMOLITION PLAN**
1/8" = 1'-0"

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AIR DIST. THIRD FLOOR - DEMO. PLAN - AREA 'D'

M-103D

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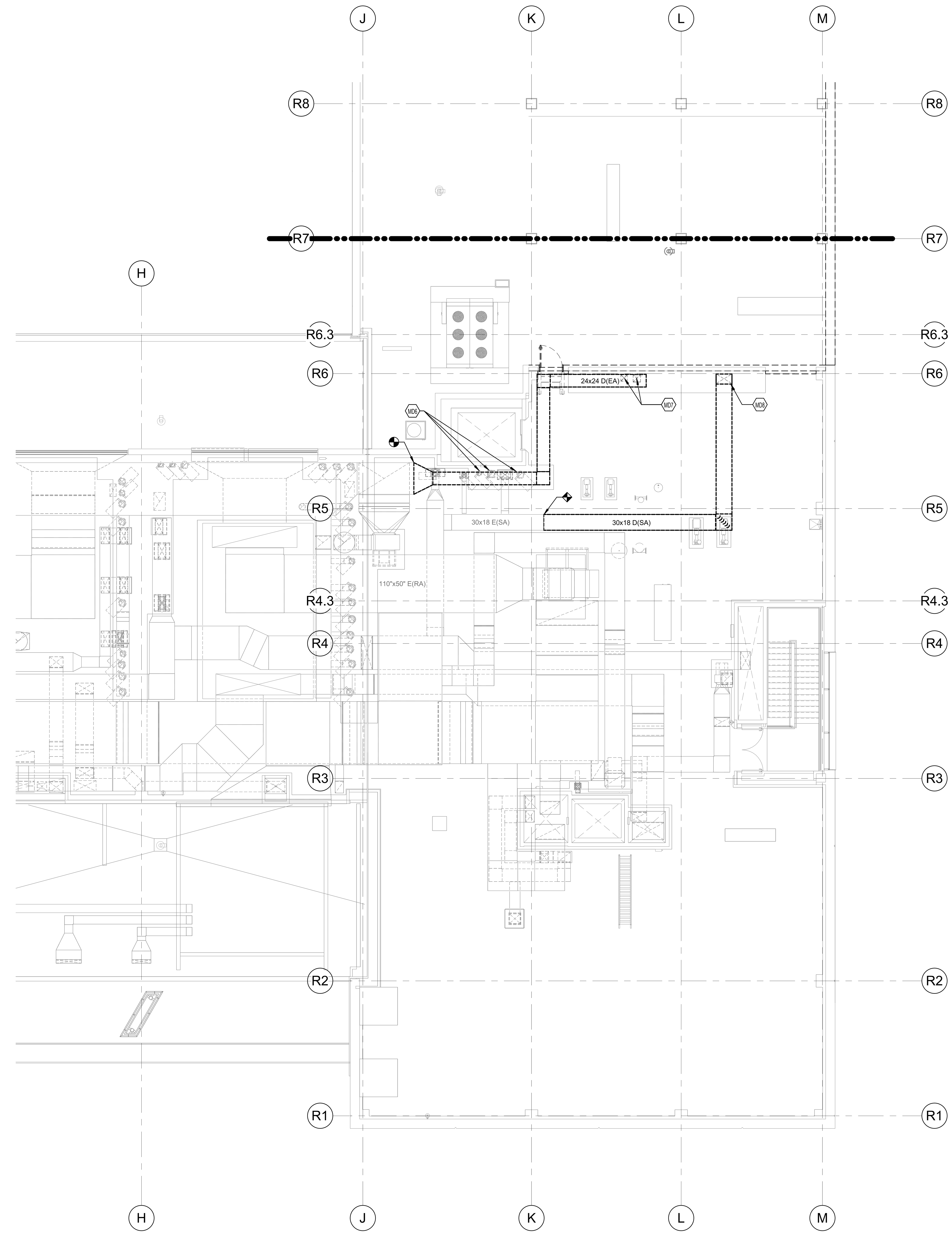
TAGGED NOTES

MD6	EXHAUST DUCTWORK SERVING EXHAUST AIR VALVES TO REMAIN AND BE REUSED.
MD7	REMOVE EXHAUST DUCTWORK DOWN TO THE THIRD FLOOR. REFER TO THIRD FLOOR PLANS FOR CONTINUATION.
MD8	REMOVE SUPPLY DUCTWORK DOWN TO THIRD FLOOR. REFER TO THIRD FLOOR PLANS FOR CONTINUATION.



AIR DISTRIBUTION - FOURTH FLOOR AREA 'C' DEMOLITION PLAN

A — 1/8" = 1'-0"

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AIR DIST. FOURTH FLOOR- DEMO. PLAN - AREA 'C'

M-104C

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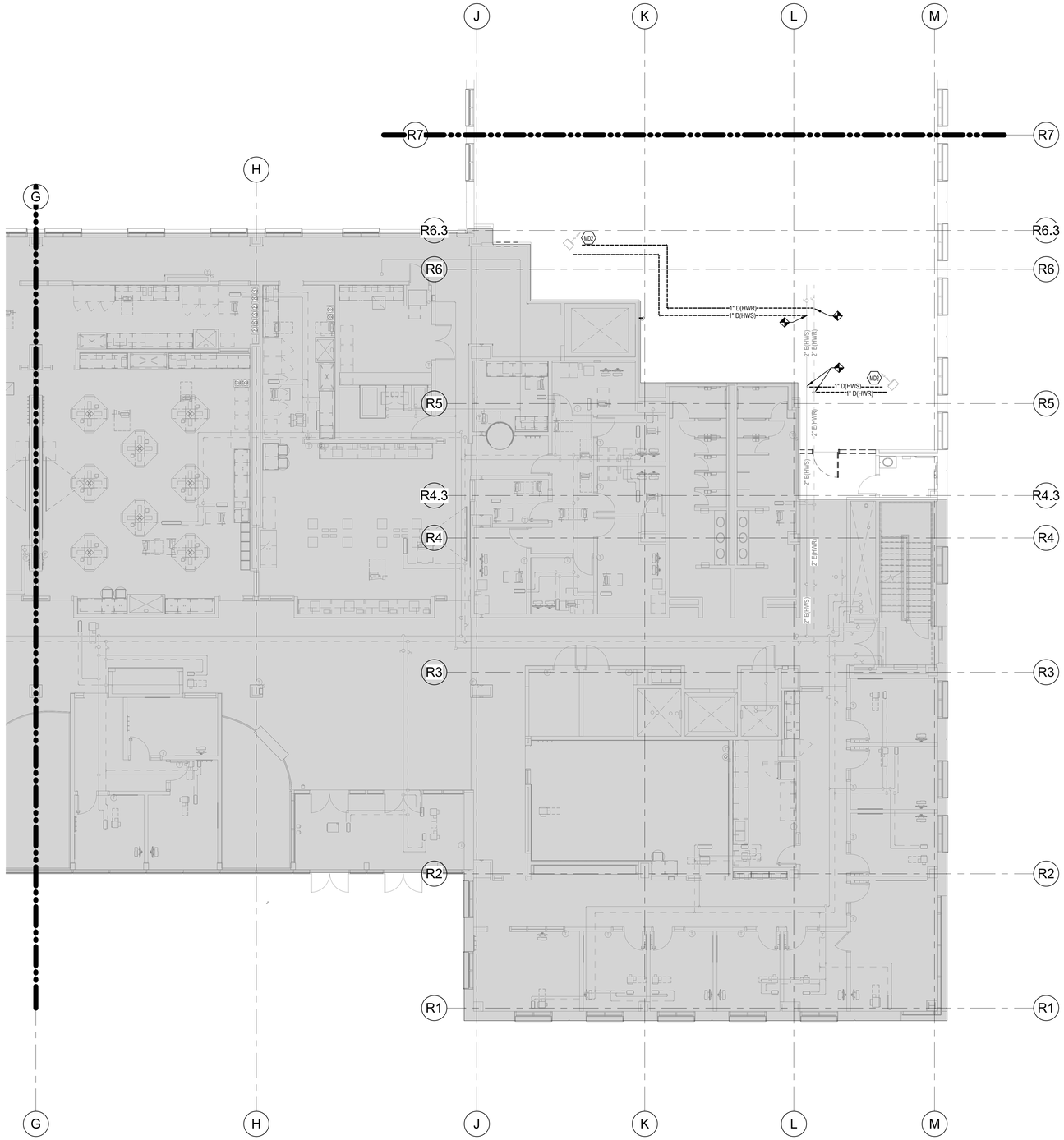
TAGGED NOTES

MD2. REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.



A HYDRONICS - FIRST FLOOR AREA 'C' DEMOLITION PLAN
1/8" = 1'-0"

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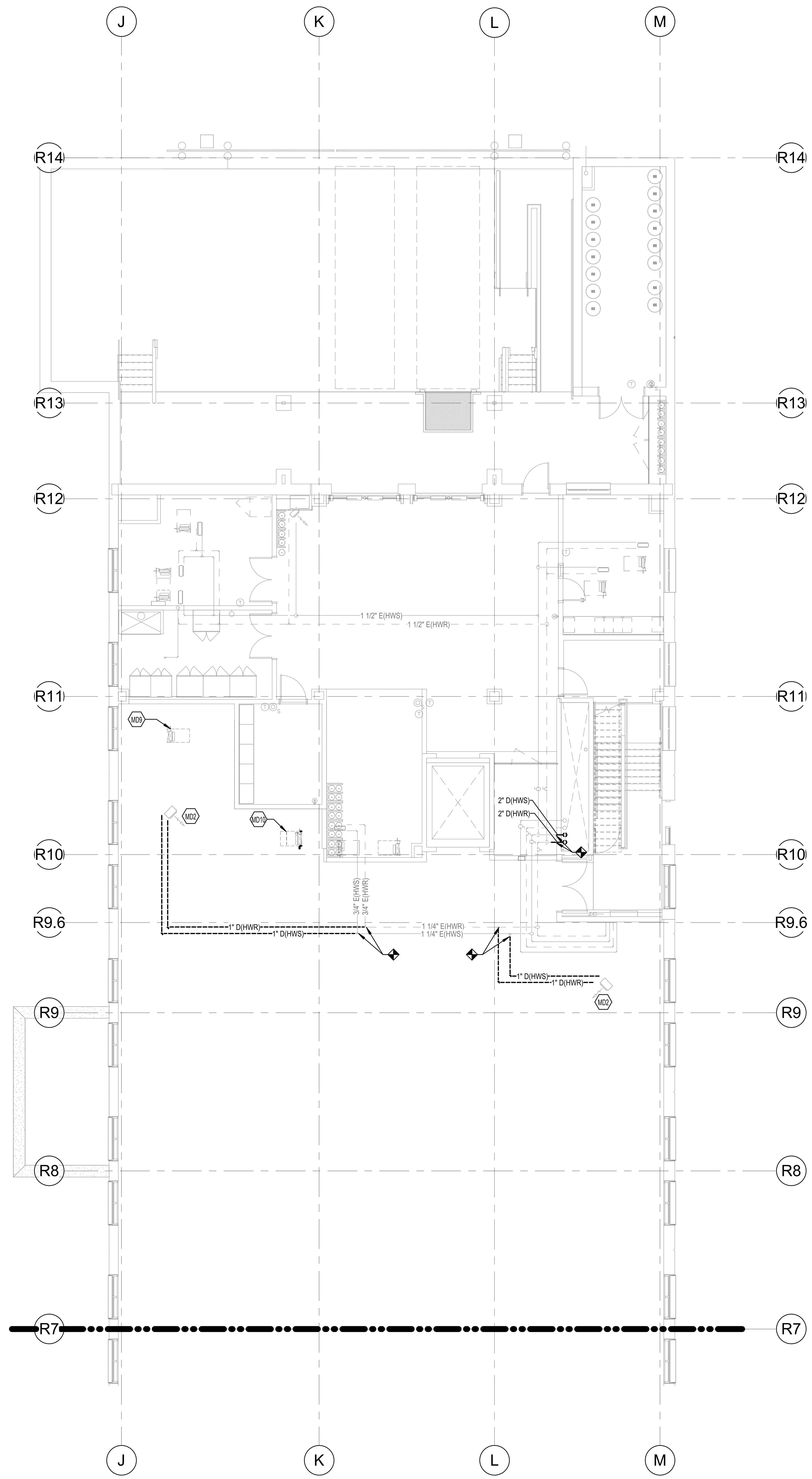
HYDRONIC FIRST FLOOR - DEMO. PLAN - AREA 'C'

M-111C

TAGGED NOTES

Tag	Note
MD2	REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.
MD3	CONTRACTOR SHALL PROVIDE TEMPORARY CONDITIONING OF THE LOADING DOCK DURING CONTRUCTION FOR THE DURATION OF SUPPLY DUCTS BEING INTERUPTED. EXHAUST DUCTS SHALL REMAIN IN OPERATION. PROVIDE TEMPORARY CONNECTIONS AS NECESSARY. SCHEDULE THE OUTAGE FOR THE FINAL SWITCHOVER TO THE NEW LAB EXHAUST MANIFOLD.
MD9	EXISTING PHOENIX VALVES TO REMAIN. TYPICAL.
MD10	EXISTING PHOENIX VALVE TO BE RELOCATED. SEE SHEET M-121D FOR NEW LOCATION.



(A) HYDRONICS - FIRST FLOOR AREA 'D' DEMOLITION PLAN
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HYDRONIC FIRST FLOOR - DEMO. PLAN - AREA 'D'

M-111D

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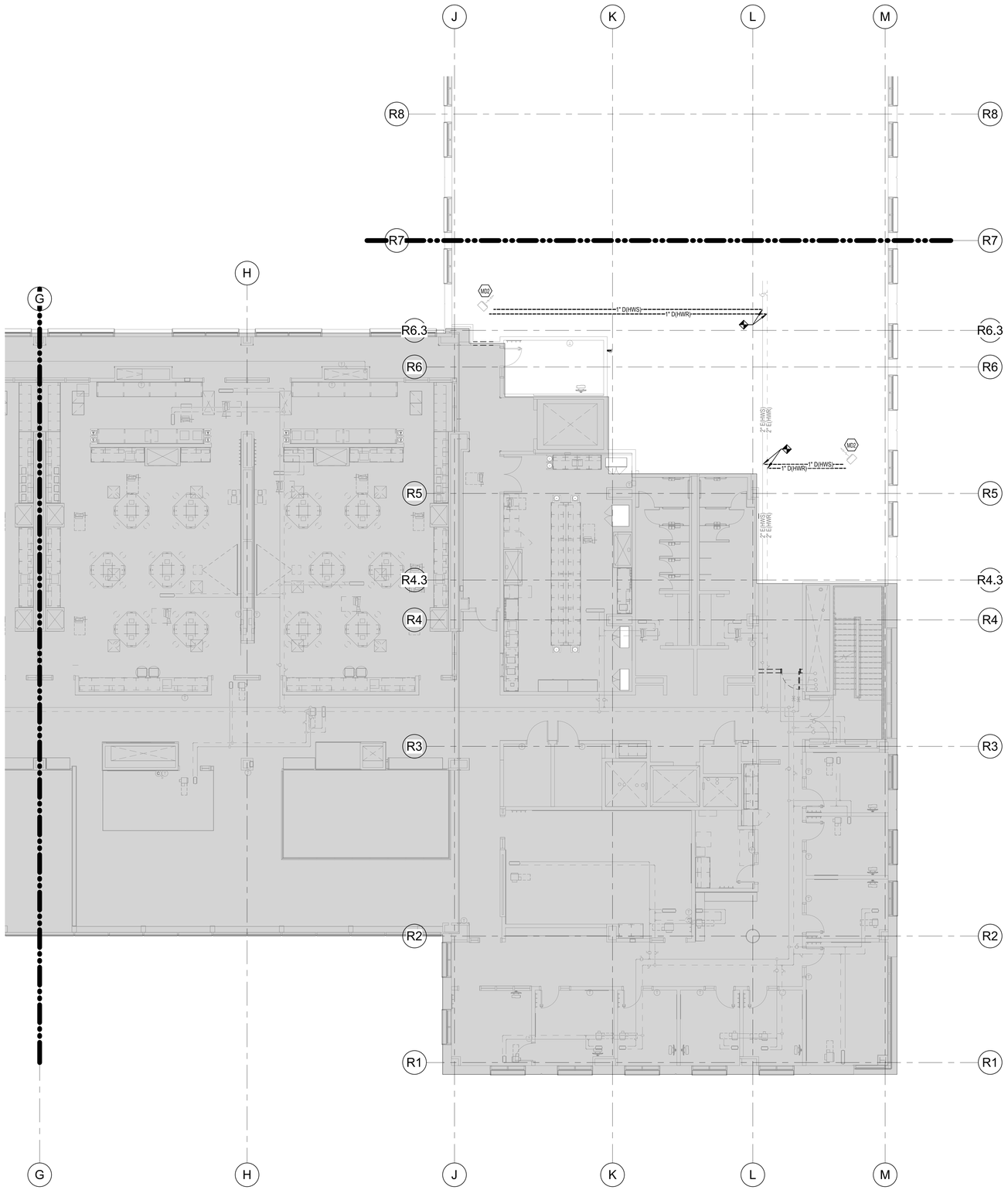
3/13/2023 4:23:09 PM

TAGGED NOTES

MD2. REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.



A **HYDRONICS - SECOND FLOOR AREA 'C' DEMOLITION PLAN**
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HYDRONIC SECOND FLOOR - DEMO. PLAN - AREA 'C'

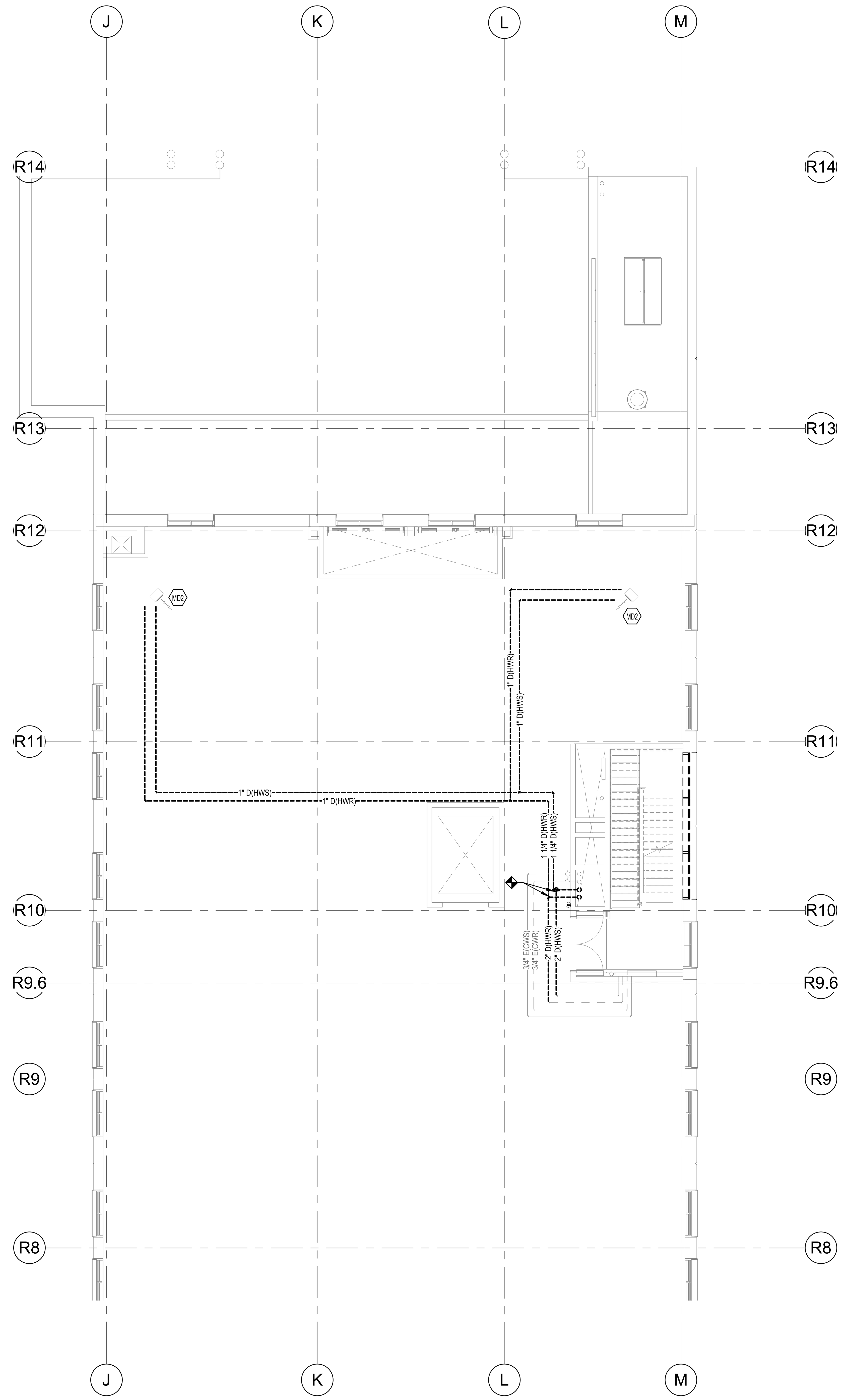
M-112C

Autodesk Docs://202277 - UK JSB Improvements/2022.XKJS22 MEP.rvt

TAGGED NOTES

##

MD2 REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.



A HYDRONICS - SECOND FLOOR AREA 'D' DEMOLITION PLAN

1/8" = 1'-0"

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No.	Description	Date

HYDRONIC SECOND FLOOR - DEMO. PLAN - AREA 'D'

M-112D

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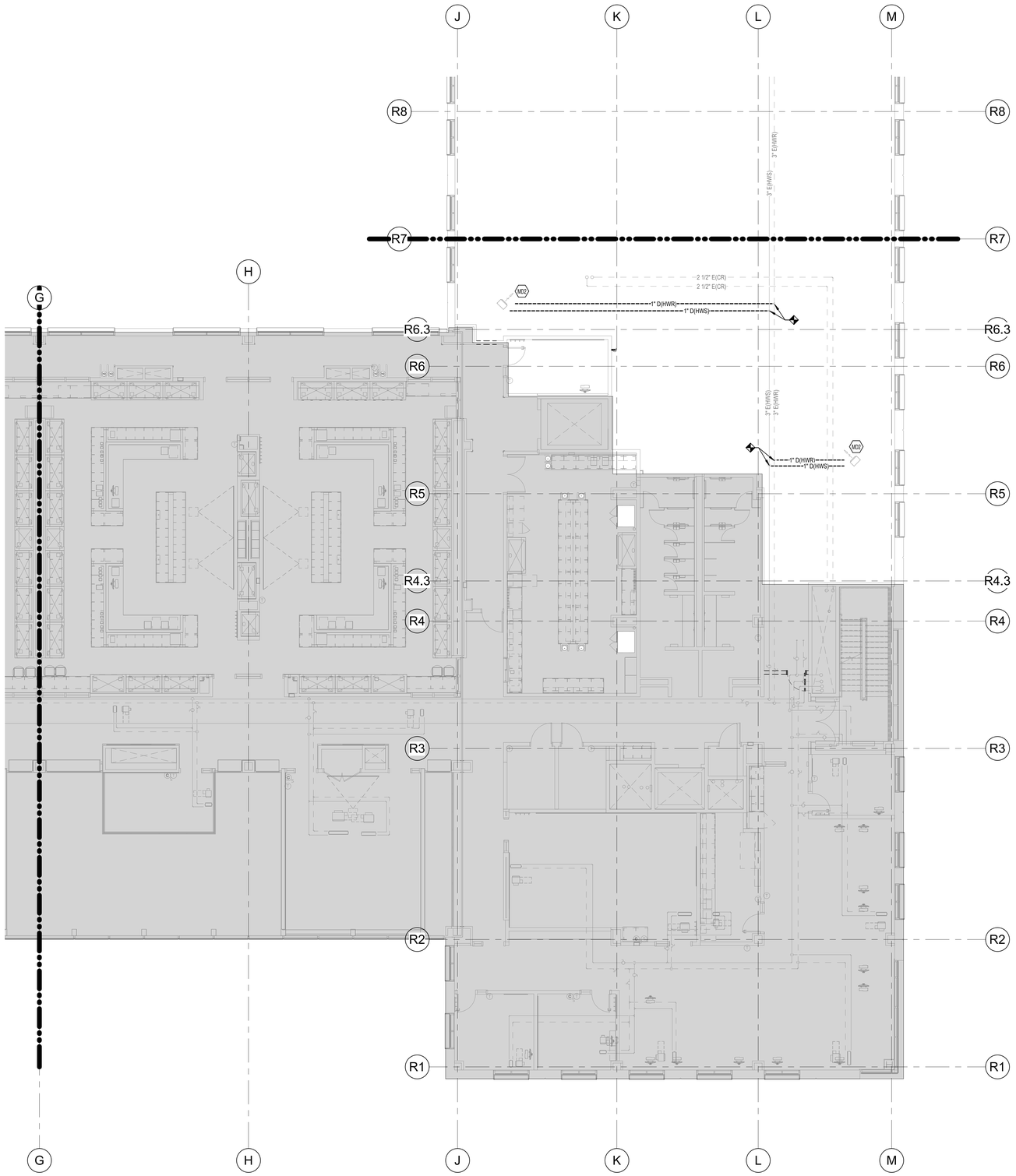
TAGGED NOTES

MD2 REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.



A **HYDRONICS - THIRD FLOOR AREA 'C' DEMOLITION PLAN**
1/8" = 1'-0"

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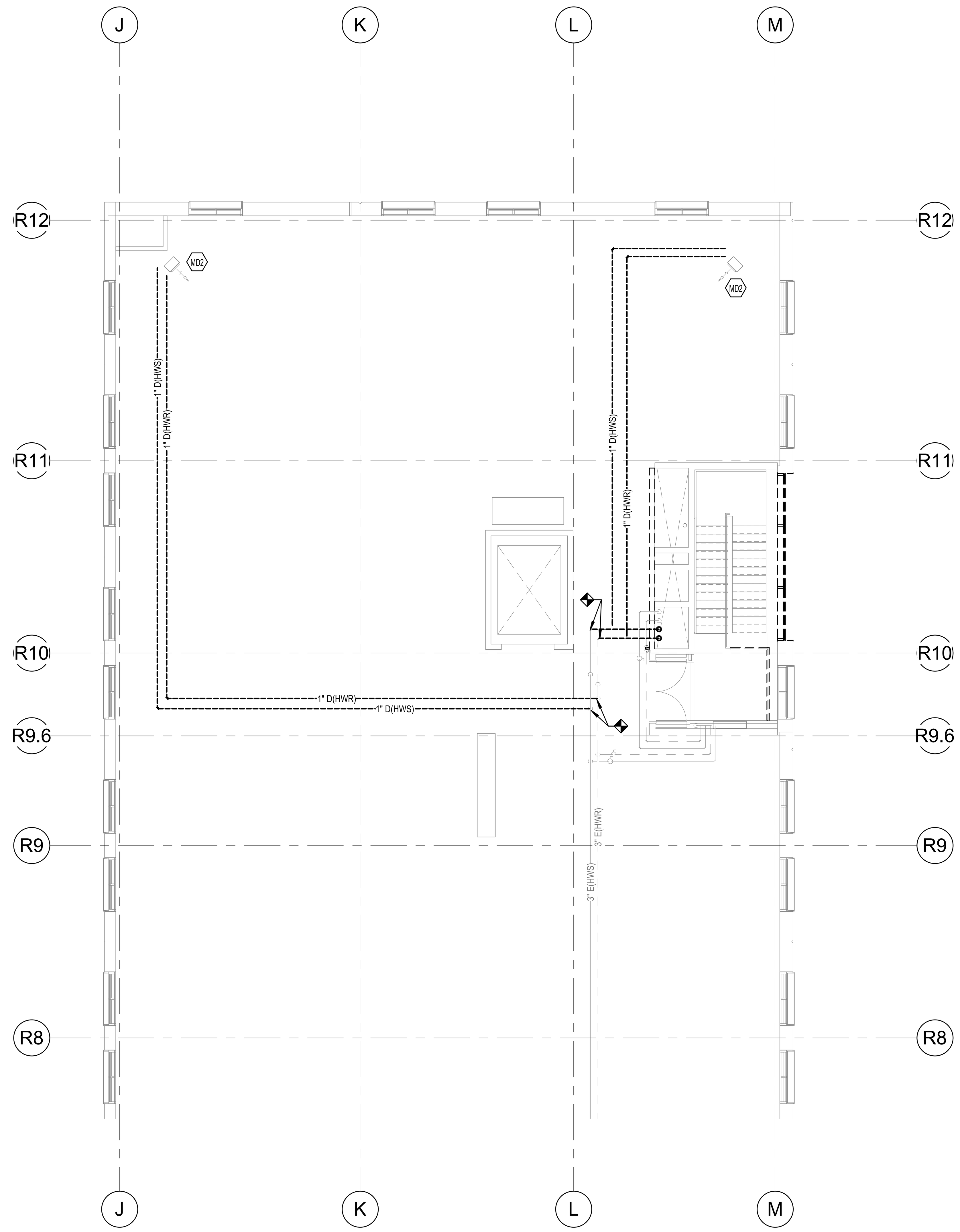
HYDRONIC THIRD FLOOR - DEMO. PLAN - AREA 'C'

M-113C

TAGGED NOTES

MD2 REMOVE EXISTING UNIT HEATERS AND ASSOCIATED PIPING, HANGERS, AND SUPPORTS. REMOVED UNIT HEATERS ARE TO BE SALVAGED AND TURNED OVER TO UNIVERSITY OF KENTUCKY.



A **HYDRONICS - THIRD FLOOR AREA 'D' DEMOLITION PLAN**
1/8" = 1'-0"

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HYDRONIC THIRD FLOOR - DEMO. PLAN - AREA 'D'

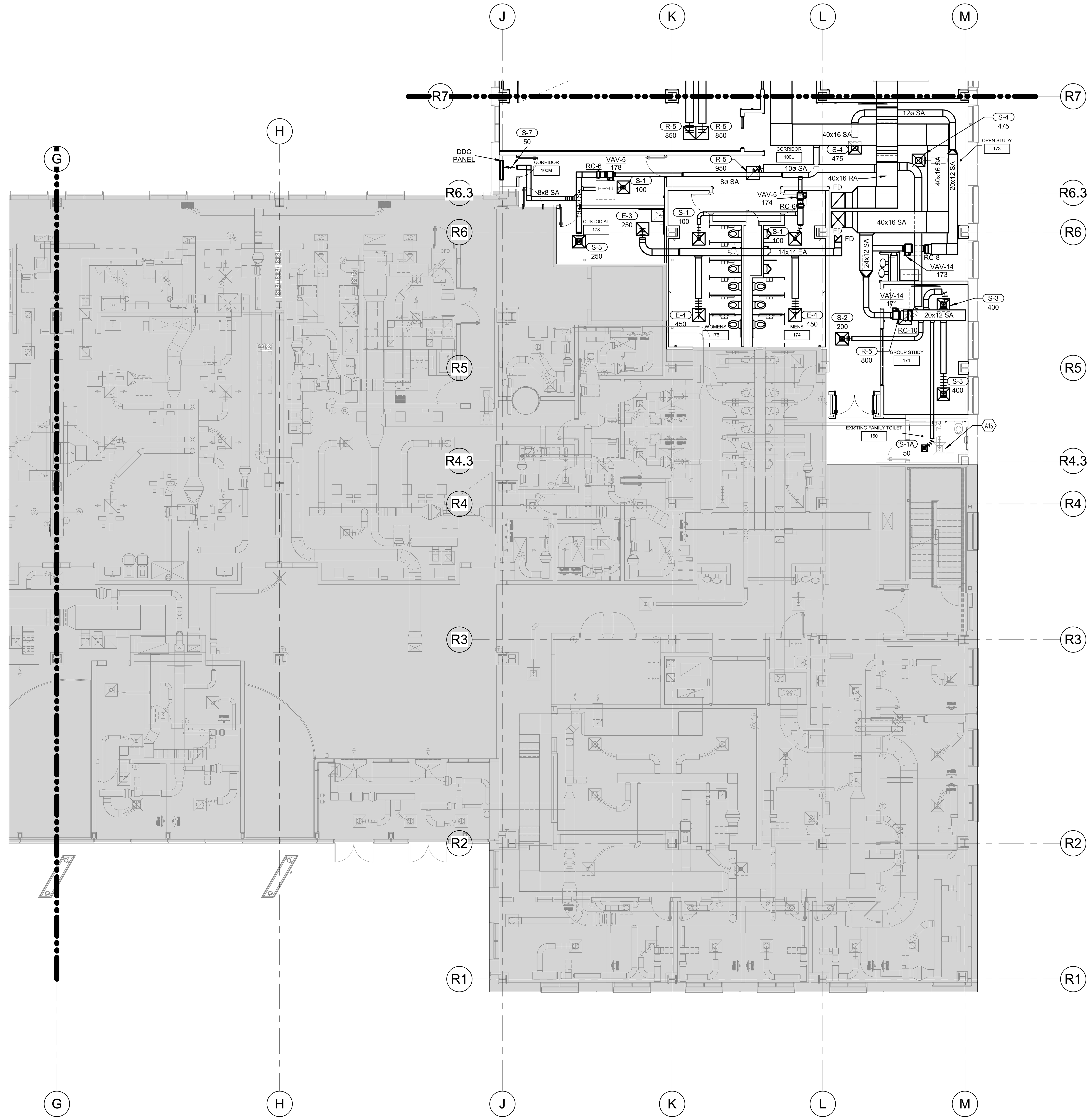
M-113D

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

A15 BALANCE EXHAUST DIFFUSER TO 100 CFM.



A AIR DISTRIBUTION - FIRST FLOOR AREA 'C'
1/8" = 1'-0"

VAV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
VAV-14	171	75	875
VAV-14	173	75	950
VAV-5	174	100	100
VAV-5	178	300	300
VAV-20	181	200	1150
VAV-30	182	600	1800
VAV-14	183	225	950
VAV-14	184	325	1000
VAV-9	188	50	650
VAV-30	273	100	1875
VAV-5	276	150	150
VAV-20	281	200	1425
VAV-30	282	600	2000
VAV-14	283	225	1125
VAV-30	284	600	2000
VAV-20	286	350	1400
VAV-5	288	50	50
VAV-5	291	75	75
VAV-20	294	200	1200
VAV-5	371	25	100
VAV-14	373	50	750
VAV-14	375	50	750
VAV-14	381	50	750
VAV-5	383	25	375
VAV-5	385	25	375
VAV-14	387	50	750
VAV-5	393	375	375
VAV-14	395	50	750

VAV BOX RUNOUT SCHEDULE

MARK	VAV INLET DUCT INLET SIZE	VAV DUCT OUTLET SIZE
VAV-5	6"	10"x10"
VAV-9	8"	16"x10"
VAV-14	10"	20"x12"
VAV-20	12"	22"x14"
VAV-30	16"	26"x16"

REMARKS:
1. VAV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF VAV BOX AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

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No.	Description	Date

AIR DIST. FIRST FLOOR - NEW WORK PLAN - AREA 'C'

M-121C

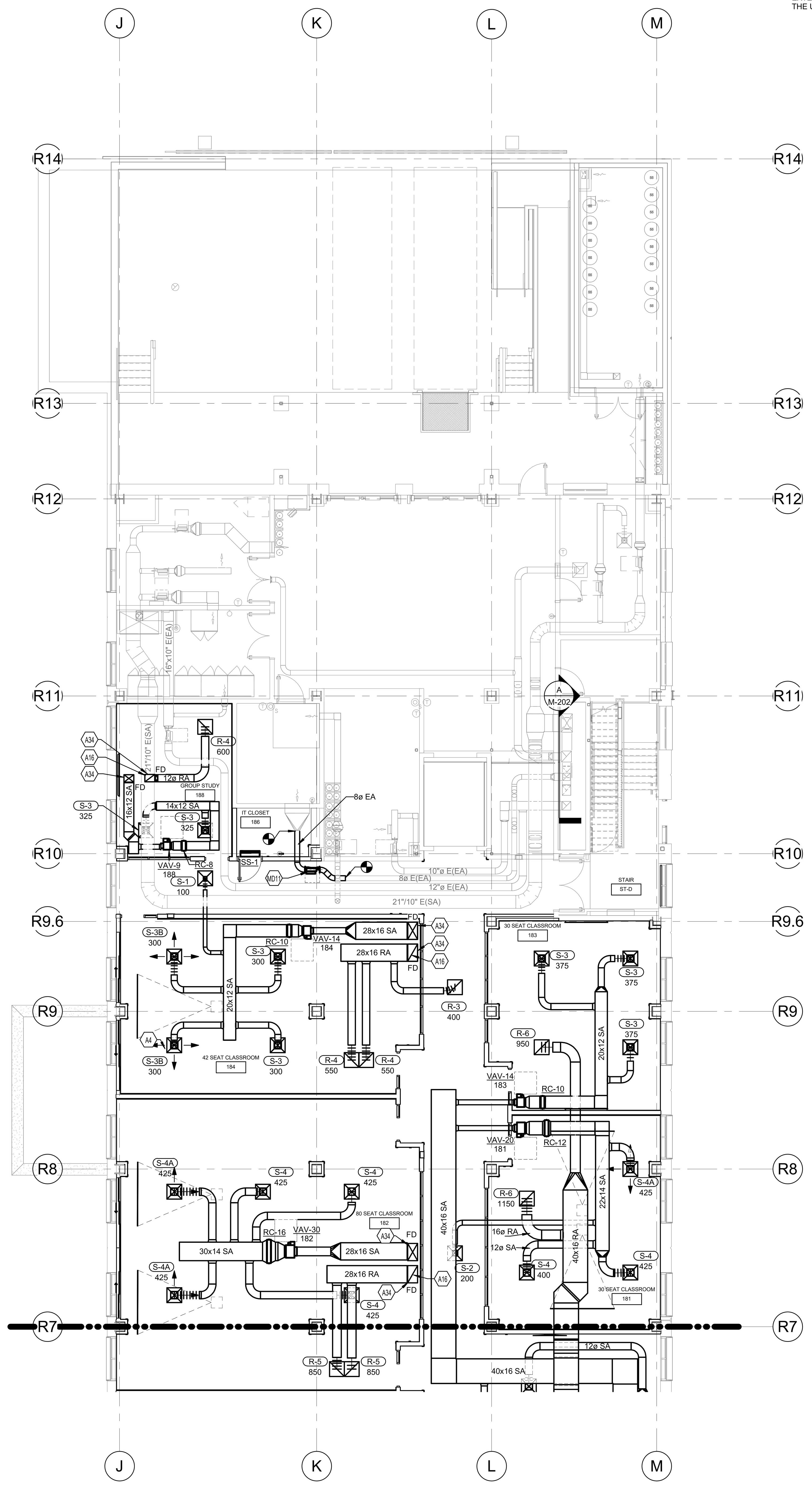
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- A4 THROW PATTERN OF DIFFUSER. TYPICAL. REFER TO REGISTERS, GRILLES, DIFFUSERS SCHEDULE.
- A16 RETURN DUCTWORK UP TO SECOND FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHUAST DUCT. REFER TO SPECIFICATIONS SECTION 231200. RETURN DUCTWORK ON FIRST FLOOR SHALL BE RETURN DUCTWORK ACCORDING TO DUCT SCHEDULE IN SPECIFICATION SECTION 231200.
- A34 FIRE DAMPER AT FLOOR ABOVE.
- MD11 EXISTING PHOENIX VALVE THAT WAS RELOCATED FROM SHEET M-111D.



A AIR DISTRIBUTION - FIRST FLOOR AREA 'D'
1/8" = 1'-0"

AV RUNOUT SCHEDULE

MARK	DUCT INLET SIZE	DUCT OUTLET SIZE
AVE-7	8" Ø	14"x10"
AVE-10	10" Ø	16"x12"
AVE-15	12" Ø	20"x12"
AVE-25	14" Ø	26"x14"
AVS-7	8" Ø	14"x10"
AVS-10	10" Ø	16"x12"
AVS-30	24"x12"	26"x16"

VAV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
VAV-14	171	75	875
VAV-14	173	75	950
VAV-5	174	100	100
VAV-5	178	300	300
VAV-20	181	200	1150
VAV-30	182	600	1800
VAV-14	183	225	950
VAV-14	184	325	1000
VAV-9	188	50	650
VAV-30	273	100	1875
VAV-5	276	150	150
VAV-20	281	200	1425
VAV-30	282	600	2000
VAV-14	283	225	1125
VAV-30	284	600	2000
VAV-20	286	350	1400
VAV-5	288	50	50
VAV-5	291	75	75
VAV-20	294	200	1200
VAV-5	371	25	100
VAV-14	373	50	750
VAV-14	375	50	750
VAV-14	381	50	750
VAV-5	383	25	375
VAV-5	385	25	375
VAV-14	387	50	750
VAV-5	393	375	375
VAV-14	395	50	750

VAV BOX RUNOUT SCHEDULE

MARK	VAV INLET DUCT INLET SIZE	VAV DUCT OUTLET SIZE
VAV-5	6"	10"x10"
VAV-9	8"	16"x10"
VAV-14	10"	20"x12"
VAV-20	12"	22"x14"
VAV-30	16"	26"x16"

REMARKS:
1. VAV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF VAV BOX AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

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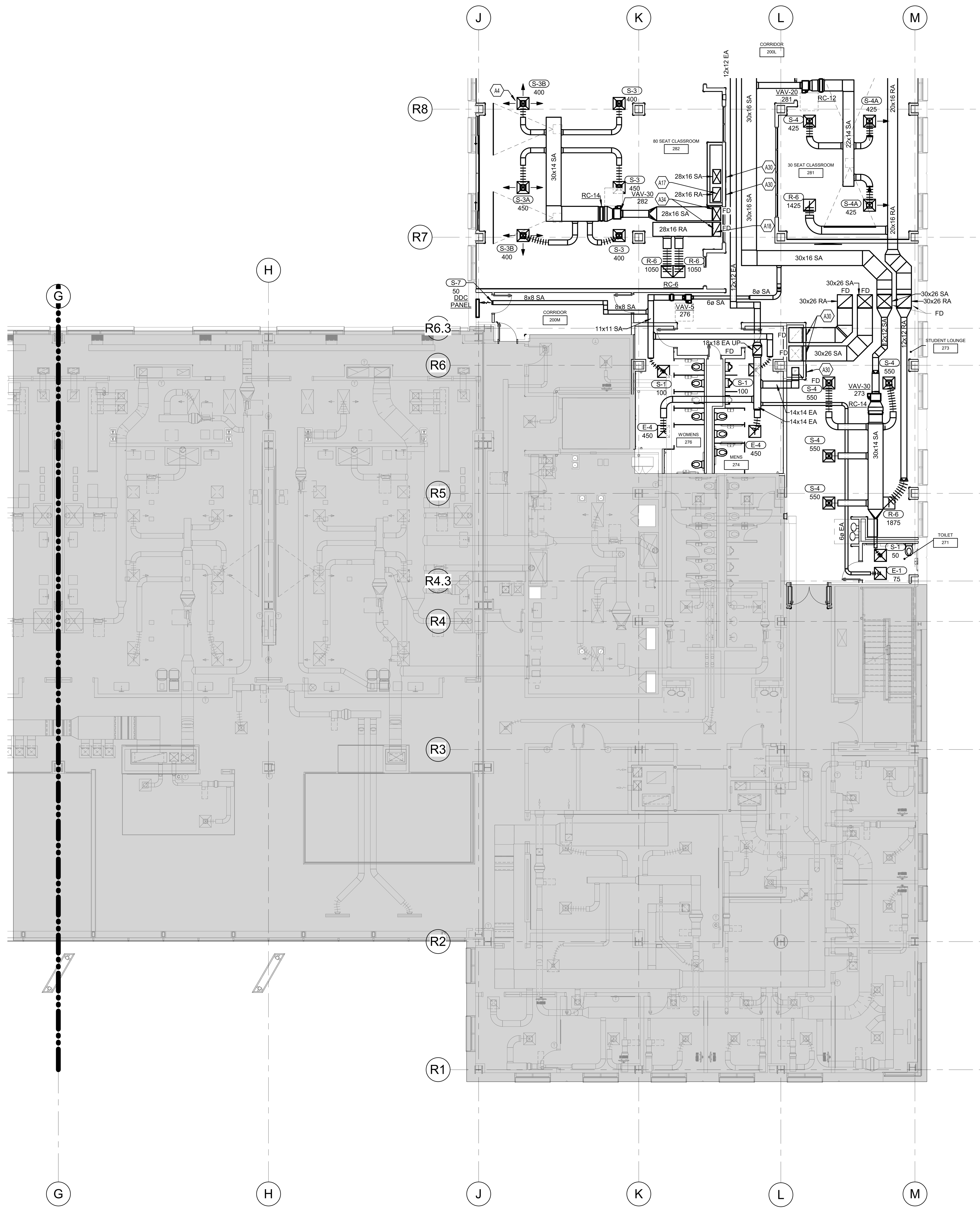
PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

AIR DIST. FIRST FLOOR - NEW WORK PLAN - AREA 'D'

M-121D



A AIR DISTRIBUTION - SECOND FLOOR AREA 'C'

1/8" = 1'-0"

TAGGED NOTES

- A4 THROW PATTERN OF DIFFUSER. TYPICAL. REFER TO REGISTERS, GRILLES, DIFFUSERS SCHEDULE.
- A17 RETURN DUCTWORK UP TO THIRD FLOOR AND DOWN TO FIRST FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200.
- A18 RETURN DUCTWORK UP TO THIRD FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200. RETURN DUCTWORK ON SECOND FLOOR SHALL BE RETURN DUCTWORK ACCORDING TO DUCT SCHEDULE IN SPECIFICATION SECTION 231200.
- A30 PROVIDE LOCKABLE 24"X24"FIRE DAMPER ACCESS DOOR.
- A34 FIRE DAMPER AT FLOOR ABOVE.

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

VAV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
VAV-14	171	75	875
VAV-14	173	75	950
VAV-5	174	100	100
VAV-5	178	300	300
VAV-20	181	200	1150
VAV-30	182	600	1800
VAV-14	183	225	950
VAV-14	184	325	1000
VAV-9	188	50	650
VAV-30	273	100	1875
VAV-5	276	150	150
VAV-20	281	200	1425
VAV-30	282	600	2000
VAV-14	283	225	1125
VAV-30	284	600	2000
VAV-20	286	350	1400
VAV-5	288	50	50
VAV-5	291	75	75
VAV-20	294	200	1200
VAV-5	371	25	100
VAV-14	373	50	750
VAV-14	375	50	750
VAV-14	381	50	750
VAV-5	383	25	375
VAV-5	385	25	375
VAV-14	387	50	750
VAV-5	393	375	375
VAV-14	395	50	750

VAV BOX RUNOUT SCHEDULE

MARK	VAV INLET DUCT INLET SIZE	VAV DUCT OUTLET SIZE
VAV-5	6"	10"x10"
VAV-9	8"	16"x10"
VAV-14	10"	20"x12"
VAV-20	12"	22"x14"
VAV-30	16"	26"x16"

REMARKS:
1. VAV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF VAV BOX AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

JRA architects
3225 Summit Square Place, Suite 200
Lexington, Kentucky 40509
859.252.6781

RESERVED FOR AHJ STAMP

CMTA

CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

AIR DIST. SECOND FLOOR - NEW WORK PLAN - AREA 'C'

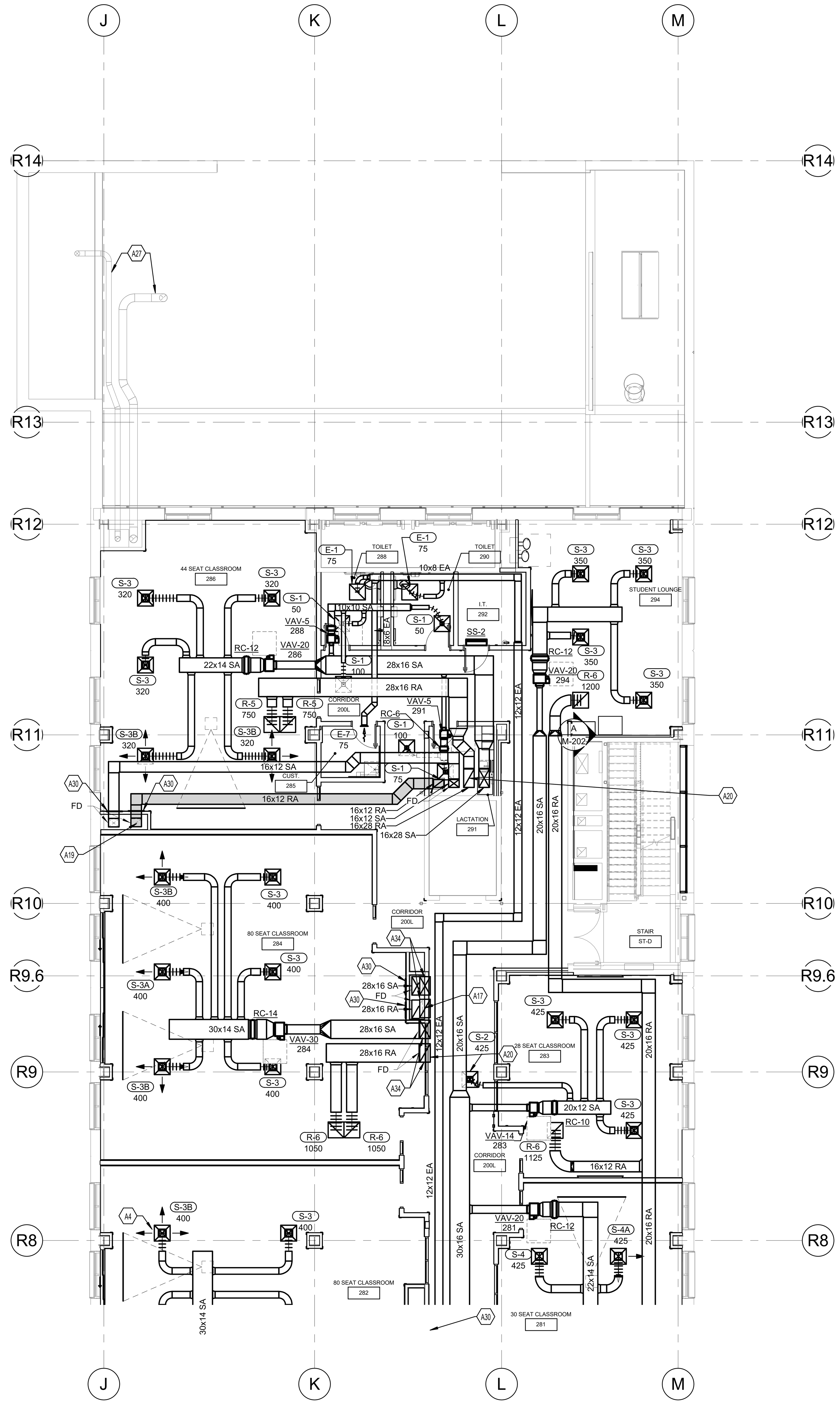
M-122C

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

- A4 THROW PATTERN OF DIFFUSER. TYPICAL. REFER TO REGISTERS, GRILLES, DIFFUSERS SCHEDULE.
- A17 RETURN DUCTWORK UP TO THIRD FLOOR AND DOWN TO FIRST FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200.
- A19 RETURN DUCTWORK SHOWN WITH HATCHING SHALL BE PVC COATED GALVANIZED STEEL EXHUAST DUCT UP TO THIRD FLOOR AND DOWN TO FIRST FLOOR. REFER TO SPECIFICATIONS SECTION 231200.
- A20 RETURN DUCTWORK UP TO THIRD FLOOR SHALL BE PVC COATED GALVANZED STEEL EXHUAST DUCT. REFER TO SPECIFICATIONS SECTION 231200. RETURN DUCTWORK SHALL BE RETURN DUCTWORK ACCORDING TO DUCT SCHEDULE IN SPECIFICATION SECTION 231200.
- A27 CONTRACTOR SHALL REPLACE 30FT OF INSULATION AND ALUMINUM WRAP ON THE NORTH GENERATOR AND 10 FEET ON THE SOUTH GENERATOR EXHAUST.
- A30 PROVIDE LOCKABLE 24"X24"FIRE DAMPER ACCESS DOOR.
- A34 FIRE DAMPER AT FLOOR ABOVE.



A AIR DISTRIBUTION - SECOND FLOOR AREA 'D'
1/8" = 1'-0"

VAV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
VAV-14	171	75	875
VAV-14	173	75	950
VAV-5	174	100	100
VAV-5	178	300	300
VAV-20	181	200	1150
VAV-30	182	600	1800
VAV-14	183	225	950
VAV-14	184	325	1000
VAV-9	188	50	650
VAV-30	273	100	1875
VAV-5	276	150	150
VAV-20	281	200	1425
VAV-30	282	600	2000
VAV-14	283	225	1125
VAV-30	284	600	2000
VAV-20	286	350	1400
VAV-5	288	50	50
VAV-5	291	75	75
VAV-20	294	200	1200
VAV-5	371	25	100
VAV-14	373	50	750
VAV-14	375	50	750
VAV-14	381	50	750
VAV-5	383	25	375
VAV-5	385	25	375
VAV-14	387	50	750
VAV-5	393	375	375
VAV-14	395	50	750

VAV BOX RUNOUT SCHEDULE

MARK	VAV INLET DUCT INLET SIZE	VAV DUCT OUTLET SIZE
VAV-5	6"	10"x10"
VAV-9	8"	16"x10"
VAV-14	10"	20"x12"
VAV-20	12"	22"x14"
VAV-30	16"	26"x16"

REMARKS:
1. VAV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF VAV BOX AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

JRA architects
3225 Summit Square Place, Suite 200
Lexington, Kentucky 40509
859.252.6781

STATE OF KENTUCKY — CHRISTOPHER J. REEVES — 25045 — LICENSED PROFESSIONAL ENGINEER

RESERVED FOR AHJ STAMP

CMTA

CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

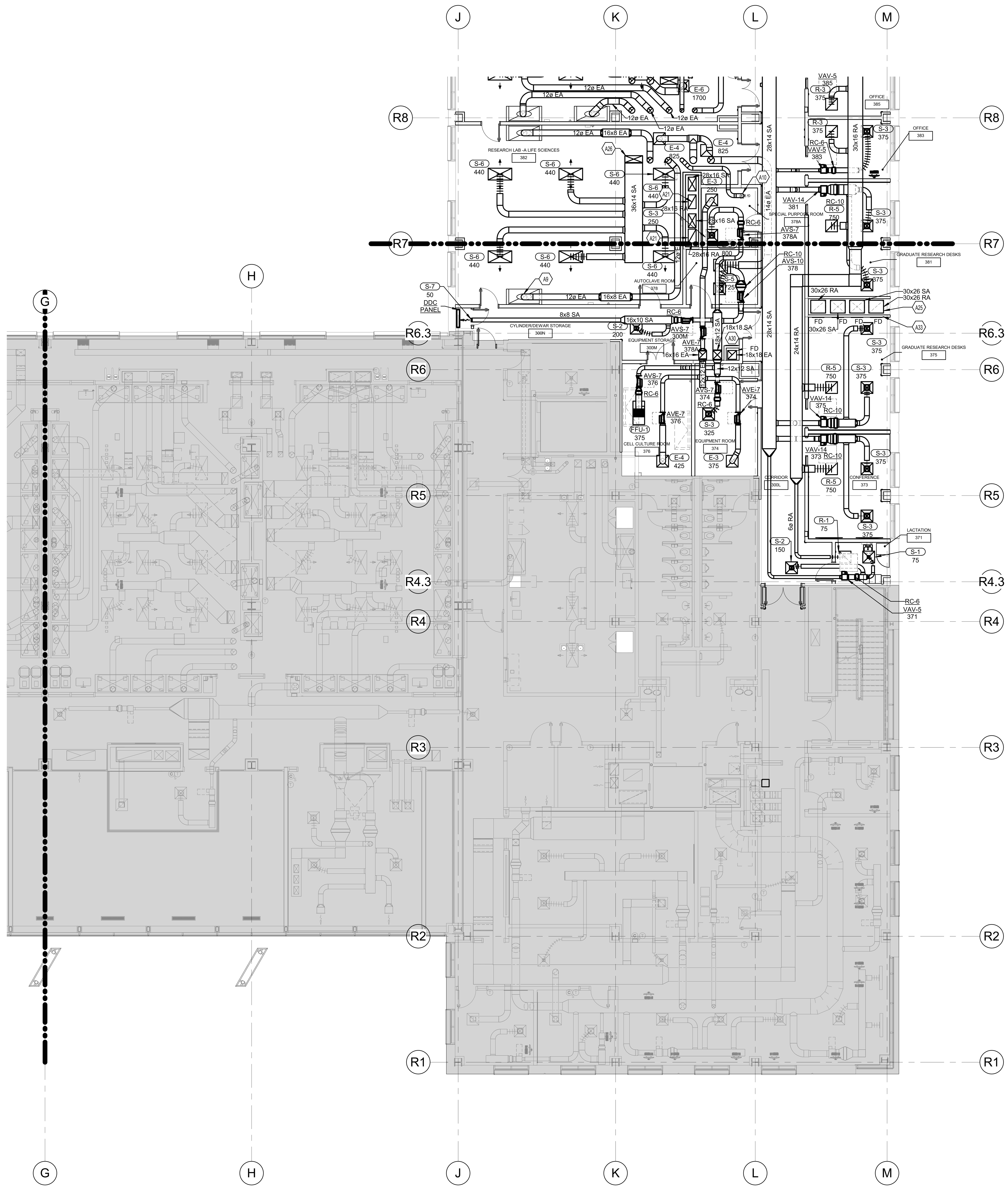
No.	Description	Date

AIR DIST. SECOND FLOOR - NEW WORK PLAN - AREA 'D'

M-122D

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.



A AIR DISTRIBUTION - THIRD FLOOR AREA 'C'
1/8" = 1'-0"

TAGGED NOTES

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- A9 EXHAUST DUCTWORK TO CHEMICAL FUME HOOD. PROVIDE DUCTWORK TRANSITION. TYPICAL.
- A10 EXHAUST DUCTWORK DOWN TO SNORKEL.
- A21 RETURN DUCTWORK UP TO PENTHOUSE AND DOWN TO SECOND FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200
- A25 DUCT UP TO PENTHOUSE AND DOWN TO FLOOR BELOW.
- A26 DUCT UP TO PENTHOUSE.
- A30 PROVIDE LOCKABLE 24"X24"FIRE DAMPER ACCESS DOOR.
- A33 PROVIDE LOCKABLE 24"X24"FIRE DAMPER ACCESS DOOR. PROVIDE ONE LOCKABLE ACCESS DOOR FOR EACH OF THE FOUR DUCTS WITHIN SHAFT. ACCESS DOOR SHALL BE INSTALLED EQUIDISTANCE TO EACH OTHER IN WALL ENSURING ACCESS TO FIRE DAMPER IN FLOOR.

AV RUNOUT SCHEDULE

MARK	DUCT INLET SIZE	DUCT OUTLET SIZE
AVE-7	8" Ø	14"x10"
AVE-10	10" Ø	16"x12"
AVE-15	12" Ø	20"x12"
AVE-25	14" Ø	26"x14"
AVS-7	8" Ø	14"x10"
AVS-10	10" Ø	16"x12"
AVS-30	24"x12"	26"x16"

REMARKS:
1. AV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF AIRFLOW CONTROL VALVE AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

AV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
AVS-7	300M	250	250
AVS-7	374	325	325
AVE-7	374	375	375
AVS-7	376	375	375
AVE-7	376	425	425
AVE-7	378	80	80
AVS-10	378	725	725
AVS-7	378A	250	250
AVE-7	378A	250	250
AVE-10	382A	300	800
AVE-10	382B	300	800
AVE-25	382C	1240	2240
AVE-10	382D	300	800
AVS-30	382E	2640	2640
AVE-7	384A	80	80
AVS-7	384A	80	80
AVS-7	384A	80	80
AVE-10	384B	300	800
AVE-10	384C	300	800
AVE-15	384D	0	1700
AVE-10	384E	300	800
AVE-10	384F	300	800
AVS-30	384G	2700	2700
AVE-7	388	80	80
AVE-7	388	80	80
AVS-7	388	80	80
AVE-10	390A	300	800
AVE-10	390B	300	800
AVE-15	390C	0	1550
AVE-10	390D	300	800
AVE-10	390E	300	800
AVS-30	390F	2550	2550
AVE-7	392	80	80
AVS-7	392	250	250
AVE-7	392	250	250
AVE-25	394A	2000	2500
AVS-7	394A	250	250
AVE-7	394A	250	250
AVE-7	394B	80	80
AVE-10	394C	300	800
AVS-30	394D	2610	2610

VAV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
VAV-14	171	75	875
VAV-14	173	75	950
VAV-5	174	100	100
VAV-5	178	300	300
VAV-20	181	200	1150
VAV-30	182	600	1800
VAV-14	183	225	950
VAV-14	184	325	1000
VAV-9	188	50	650
VAV-30	273	100	1875
VAV-5	276	150	150
VAV-20	281	200	1425
VAV-30	282	600	2000
VAV-14	283	225	1125
VAV-30	284	600	2000
VAV-20	286	350	1400
VAV-5	288	50	50
VAV-5	291	75	75
VAV-20	294	200	1200
VAV-5	371	25	100
VAV-14	373	50	750
VAV-14	375	50	750
VAV-14	381	50	750
VAV-5	383	25	375
VAV-5	385	25	375
VAV-14	387	50	750
VAV-5	393	375	375
VAV-14	395	50	750

VAV BOX RUNOUT SCHEDULE

MARK	VAV INLET DUCT INLET SIZE	VAV DUCT OUTLET SIZE
VAV-5	6"	10"x10"
VAV-9	8"	16"x10"
VAV-14	10"	20"x12"
VAV-20	12"	22"x14"
VAV-30	16"	26"x16"

REMARKS:
1. VAV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF VAV BOX AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

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LICENSED PROFESSIONAL ENGINEER

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220 Lexington Green Circle, Suite 600
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859.253.0892 cmta.com

CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

AIR DIST. THIRD FLOOR - NEW WORK PLAN - AREA 'C'

M-123C

Autodesk Docs://202277 - UK JSB Improvements/2022 XKJS22 MEP.rvt

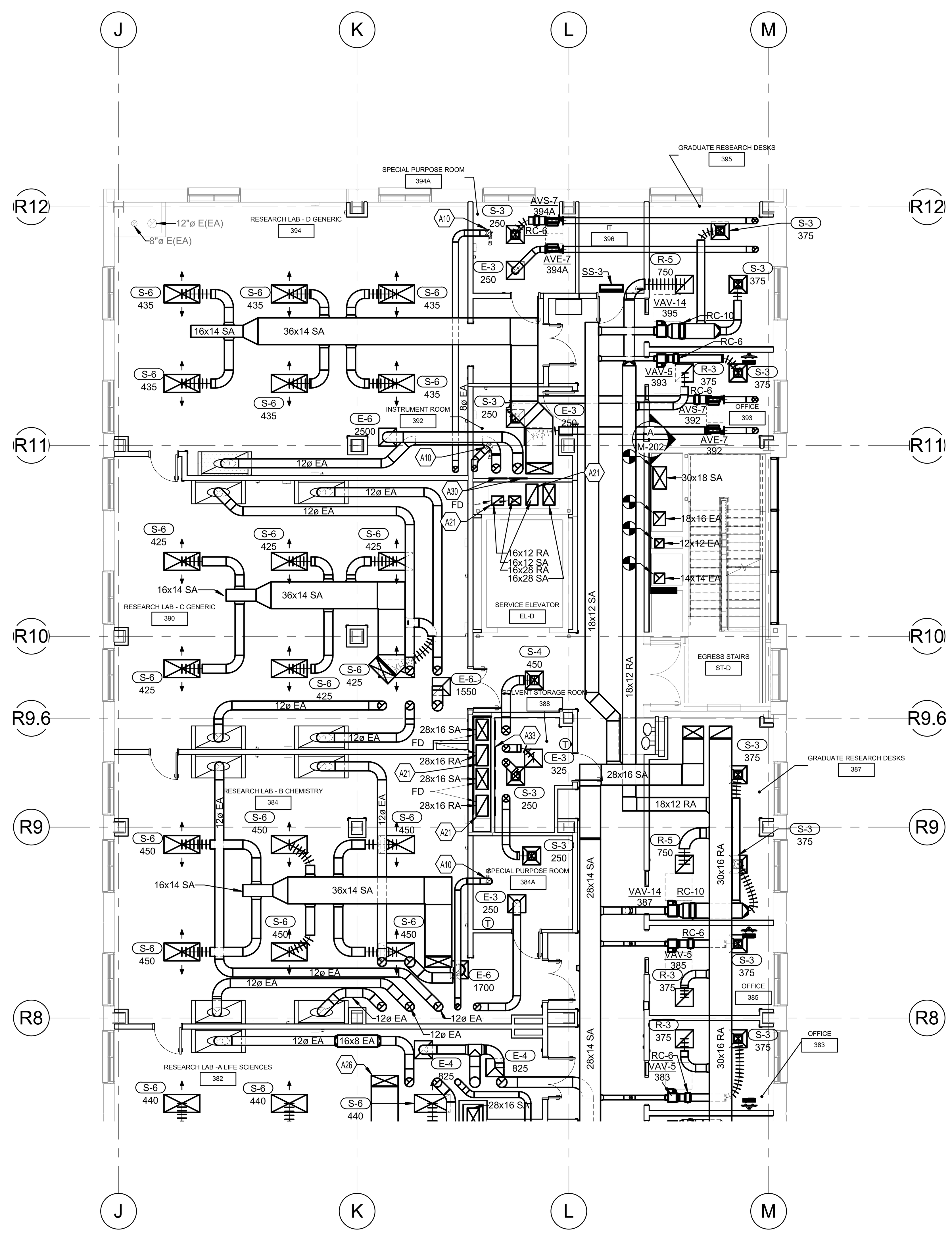
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- A10 EXHAUST DUCTWORK DOWN TO SNORKEL.
- A21 RETURN DUCTWORK UP TO PENTHOUSE AND DOWN TO SECOND FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200
- A26 DUCT UP TO PENTHOUSE.
- A30 PROVIDE LOCKABLE 24"X24"FIRE DAMPER ACCESS DOOR.
- A33 PROVIDE LOCKABLE 24"X24"FIRE DAMPER ACCESS DOOR. PROVIDE ONE LOCKABLE ACCESS DOOR FOR EACH OF THE FOUR DUCTS WITHIN SHAFT. ACCESS DOOR SHALL BE INSTALLED EQUIDISTANCE TO EACH OTHER IN WALL ENSURING ACCESS TO FIRE DAMPER IN FLOOR.



A AIR DISTRIBUTION - THIRD FLOOR AREA 'D'
1/8" = 1'-0"

AV RUNOUT SCHEDULE

MARK	DUCT INLET SIZE	DUCT OUTLET SIZE
AVE-7	8" Ø	14"x10"
AVE-10	10" Ø	16"x12"
AVE-15	12" Ø	20"x12"
AVE-25	14" Ø	26"x14"
AVS-7	8" Ø	14"x10"
AVS-10	10" Ø	16"x12"
AVS-30	24"x12"	26"x16"

REMARKS:
1. AV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF AIRFLOW CONTROL VALVE AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

AV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
AVS-7	300M	250	250
AVS-7	374	325	325
AVE-7	374	375	375
AVS-7	376	375	375
AVE-7	376	425	425
AVE-7	378	80	80
AVS-10	378	725	725
AVS-7	378A	250	250
AVE-7	378A	250	250
AVE-10	382A	300	800
AVE-10	382B	300	800
AVE-25	382C	1240	2240
AVE-10	382D	300	800
AVS-30	382E	2640	2640
AVE-7	384A	80	80
AVS-7	384A	80	80
AVS-7	384A	80	80
AVE-10	384B	300	800
AVE-10	384C	300	800
AVE-15	384D	0	1700
AVE-10	384E	300	800
AVE-10	384F	300	800
AVS-30	384G	2700	2700
AVE-7	388	80	80
AVE-7	388	80	80
AVS-7	388	80	80
AVE-10	390A	300	800
AVE-10	390B	300	800
AVE-15	390C	0	1550
AVE-10	390D	300	800
AVE-10	390E	300	800
AVS-30	390F	2550	2550
AVE-7	392	80	80
AVS-7	392	250	250
AVE-7	392	250	250
AVE-25	394A	2000	2500
AVS-7	394A	250	250
AVE-7	394A	250	250
AVE-7	394B	80	80
AVE-10	394C	300	800
AVS-30	394D	2610	2610

VAV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
VAV-14	171	75	875
VAV-14	173	75	950
VAV-5	174	100	100
VAV-5	178	300	300
VAV-20	181	200	1150
VAV-30	182	600	1800
VAV-14	183	225	950
VAV-14	184	325	1000
VAV-9	188	50	650
VAV-30	273	100	1875
VAV-5	276	150	150
VAV-20	281	200	1425
VAV-30	282	600	2000
VAV-14	283	225	1125
VAV-30	284	600	2000
VAV-20	286	350	1400
VAV-5	288	50	50
VAV-5	291	75	75
VAV-20	294	200	1200
VAV-5	371	25	100
VAV-14	373	50	750
VAV-14	375	50	750
VAV-14	381	50	750
VAV-5	383	25	375
VAV-5	385	25	375
VAV-14	387	50	750
VAV-5	393	375	375
VAV-14	395	50	750

VAV BOX RUNOUT SCHEDULE

MARK	VAV INLET DUCT INLET SIZE	VAV DUCT OUTLET SIZE
VAV-5	6"	10"x10"
VAV-9	8"	16"x10"
VAV-14	10"	20"x12"
VAV-20	12"	22"x14"
VAV-30	16"	26"x16"

REMARKS:
1. VAV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF VAV BOX AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

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CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

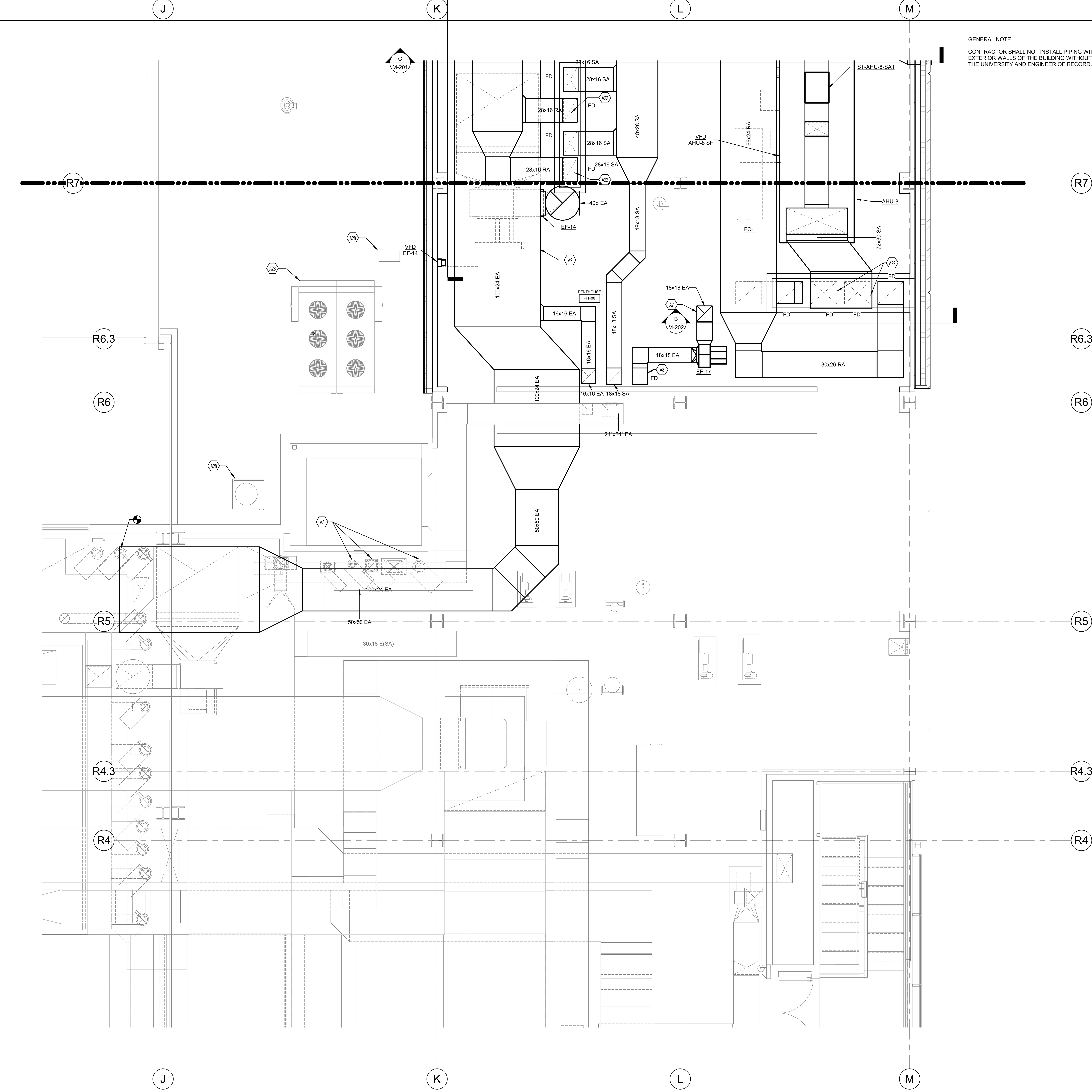
REVISIONS

No.	Description	Date

AIR DIST. THIRD FLOOR - NEW WORK PLAN - AREA 'D'

M-123D

3/13/2023 4:25:23 PM



A AIR DISTRIBUTION - FOURTH FLOOR AREA 'C'

1/4" = 1'-0"

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- A2 PROVIDE PRESSURE RELIEF DOOR SET TO 1" STATIC PRESSURE BELOW DUCT CLASS. REFER TO SPECIFICATIONS.
- A3 RECONNECT EXHAUST DUCTWORK FROM EXISTING AIR VALVE.
- A7 EXHAUST DUCTWORK UP TO GRAVITY VENTILATOR GH-1 LOCATED ON ROOF. REFER TO GRAVITY HOOD SCHEDULE. PROVIDE WITH DUCT TRANSITION AND ROOF CURB.
- A8 EXHAUST DUCTWORK DOWN TO THIRD FLOOR. REFER TO THIRD FLOOR FOR CONTINUATION.
- A22 RETURN DUCTWORK DOWN TO THE THIRD FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200. RETURN DUCTWORK WITHIN THE PENTHOUSE SHALL BE RETURN DUCTWORK ACCORDING TO DUCT SCHEDULE IN SPECIFICATION SECTION 231200.
- A28 EXISTING MECHANICAL EQUIPMENT.
- A29 SOUND ATTENUATORS ST-AHU-8-SA2 AND ST-AHU-8-SA3. REFER TO SECTION B SHOWN ON SHEET M-202 AND MECHANICAL SCHEDULES.

AV RUNOUT SCHEDULE

MARK	DUCT INLET SIZE	DUCT OUTLET SIZE
AVE-7	8" Ø	14"x10"
AVE-10	10" Ø	16"x12"
AVE-15	12" Ø	20"x12"
AVE-25	14" Ø	26"x14"
AVS-7	8" Ø	14"x10"
AVS-10	10" Ø	16"x12"
AVS-30	24"x12"	26"x16"

REMARKS:

1. AV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF AIRFLOW CONTROL VALVE AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

AV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
AVS-7	300M	250	250
AVS-7	374	325	325
AVE-7	374	375	375
AVS-7	376	375	375
AVE-7	376	425	425
AVE-7	378	80	80
AVS-10	378	725	725
AVS-7	378A	250	250
AVE-7	378A	250	250
AVE-10	382A	300	800
AVE-10	382B	300	800
AVE-25	382C	1240	2240
AVE-10	382D	300	800
AVS-30	382E	2640	2640
AVE-7	384A	80	80
AVS-7	384A	80	80
AVS-7	384A	80	80
AVE-10	384B	300	800
AVE-10	384C	300	800
AVE-15	384D	0	1700
AVE-10	384E	300	800
AVE-10	384F	300	800
AVS-30	384G	2700	2700
AVE-7	388	80	80
AVE-7	388	80	80
AVS-7	388	80	80
AVE-10	390A	300	800
AVE-10	390B	300	800
AVE-15	390C	0	1550
AVE-10	390D	300	800
AVE-10	390E	300	800
AVS-30	390F	2550	2550
AVE-7	392	80	80
AVS-7	392	250	250
AVE-7	392	250	250
AVE-25	394A	2000	2500
AVS-7	394A	250	250
AVE-7	394A	250	250
AVE-7	394B	80	80
AVE-10	394C	300	800
AVS-30	394D	2610	2610

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

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CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

AIR DIST. FOURTH FLOOR - NEW WORK PLAN - AREA 'C'

M-124C

Autodesk Docs://202277 - UK JSB Improvements/2022 XKJS22 MEP.rvt
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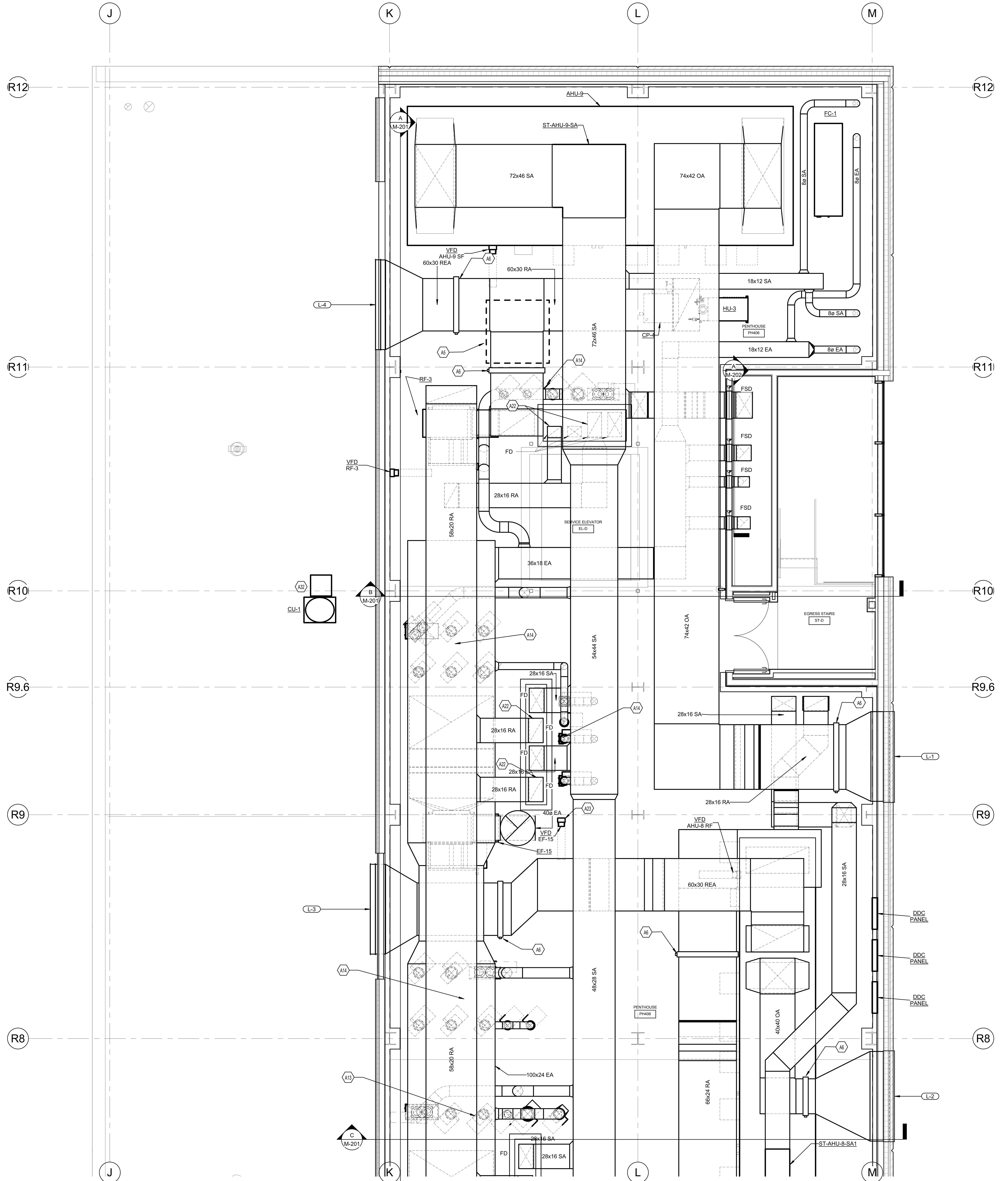

A **AIR DISTRIBUTION - FOURTH FLOOR AREA 'D'**
1/4" = 1'-0"

TAGGED NOTES

- A5 NO PIPING OR ELECTRICAL ITEMS IN OUTLINED AREA. THE REA AND RA DUCTWORK ARE THE ONLY ITEMS ALLOWED IN THE OUTLINED AREA. FUTURE LOCATION OF EXHAUST FLUE. REFER TO ARCHITECTURAL PLANS FOR EXHAUST STACK ON ROOF.
- A6 MOTORIZED DAMPER.
- A13 REFER TO SHEET M-134C FOR MECHANICAL EQUIPMENT INFORMATION
- A14 REFER TO SHEET M-134D FOR MECHANICAL EQUIPMENT INFORMATION
- A22 RETURN DUCTWORK DOWN TO THE THIRD FLOOR SHALL BE PVC COATED GALVANIZED STEEL EXHAUST DUCT. REFER TO SPECIFICATIONS SECTION 231200. RETURN DUCTWORK WITHIN THE PENTHOUSE SHALL BE RETURN DUCTWORK ACCORDING TO DUCT SCHEDULE IN SPECIFICATION SECTION 231200.
- A23 VFD TO BE MOUNTED ON UNISTRUT.
- A32 REFER TO PIPE/CHASE ROOF CURB DETAIL. PROVIDE PILLOWBLOCK SUPPORT SIMILAR TO MIRO 1.5.

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

AV MIN/MAX CFM SCHEDULE

MARK	INSTANCE MARK	MIN AIR CFM	MAX AIR CFM
AVS-7	300M	250	250
AVS-7	374	325	325
AVE-7	374	375	375
AVS-7	376	375	375
AVE-7	376	425	425
AVE-7	378	80	80
AVS-10	378	725	725
AVS-7	378A	250	250
AVE-7	378A	250	250
AVE-10	382A	300	800
AVE-10	382B	300	800
AVE-25	382C	1240	2240
AVE-10	382D	300	800
AVS-30	382E	2640	2640
AVE-7	384A	80	80
AVS-7	384A	80	80
AVS-7	384A	80	80
AVE-10	384B	300	800
AVE-10	384C	300	800
AVE-15	384D	0	1700
AVE-10	384E	300	800
AVE-10	384F	300	800
AVS-30	384G	2700	2700
AVE-7	388	80	80
AVE-7	388	80	80
AVS-7	388	80	80
AVE-10	390A	300	800
AVE-10	390B	300	800
AVE-15	390C	0	1550
AVE-10	390D	300	800
AVE-10	390E	300	800
AVS-30	390F	2550	2550
AVE-7	392	80	80
AVS-7	392	250	250
AVE-7	392	250	250
AVE-25	394A	2000	2500
AVS-7	394A	250	250
AVE-7	394A	250	250
AVE-7	394B	80	80
AVE-10	394C	300	800
AVS-30	394D	2610	2610

AV RUNOUT SCHEDULE

MARK	DUCT INLET SIZE	DUCT OUTLET SIZE
AVE-7	8" Ø	14"x10"
AVE-10	10" Ø	16"x12"
AVE-15	12" Ø	20"x12"
AVE-25	14" Ø	26"x14"
AVS-7	8" Ø	14"x10"
AVS-10	10" Ø	16"x12"
AVS-30	24"x12"	26"x16"

REMARKS:
1. AV DUCT OUTLET SIZE IS LOW VELOCITY DUCTWORK DOWNSTREAM OF AIRFLOW CONTROL VALVE AND REHEAT COIL UNLESS OTHERWISE NOTED ON THE PLANS.

DUCT RUNOUT SCHEDULE

MARK	DUCT BRANCH SIZE
E-1	6"
E-3	10"
E-4	12"
E-5	14"
E-6	16"
E-7	16"
FFU-1	10"
R-1	6"
R-3	10"
R-4	12"
R-5	14"
R-6	16"
S-1	6"
S-1A	6"
S-2	8"
S-3	10"
S-3A	10"
S-3B	10"
S-4	12"
S-4A	12"
S-5	14"
S-6	12"
S-7	SEE PLANS

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AIR DIST. FOURTH FLOOR - NEW WORK PLAN - AREA 'D'

M-124D

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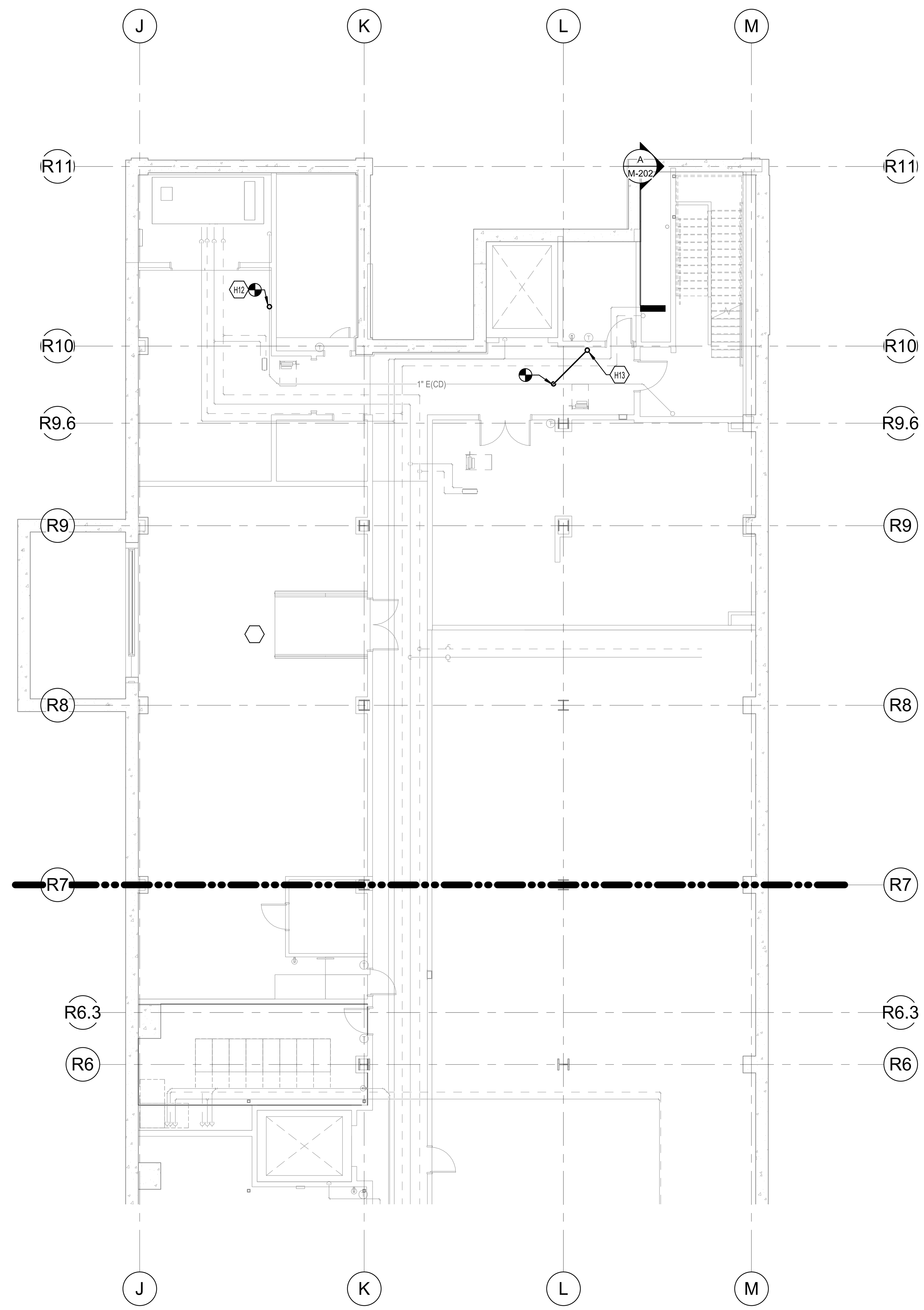
TAGGED NOTES

H12 CONDENSATE PIPING FROM FIRST FLOOR.

H13 CONDENSATE PIPING UP TO FIRST FLOOR. SEE FIRST FLOOR HYDRONICS SHEET FOR CONTINUATION.



A HYDRONICS - BASEMENT AREA 'D'
1/8" = 1'-0"

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No.	Description	Date

HYDRONIC BASEMENT - NEW WORK PLAN - AREA 'D'

M-130D

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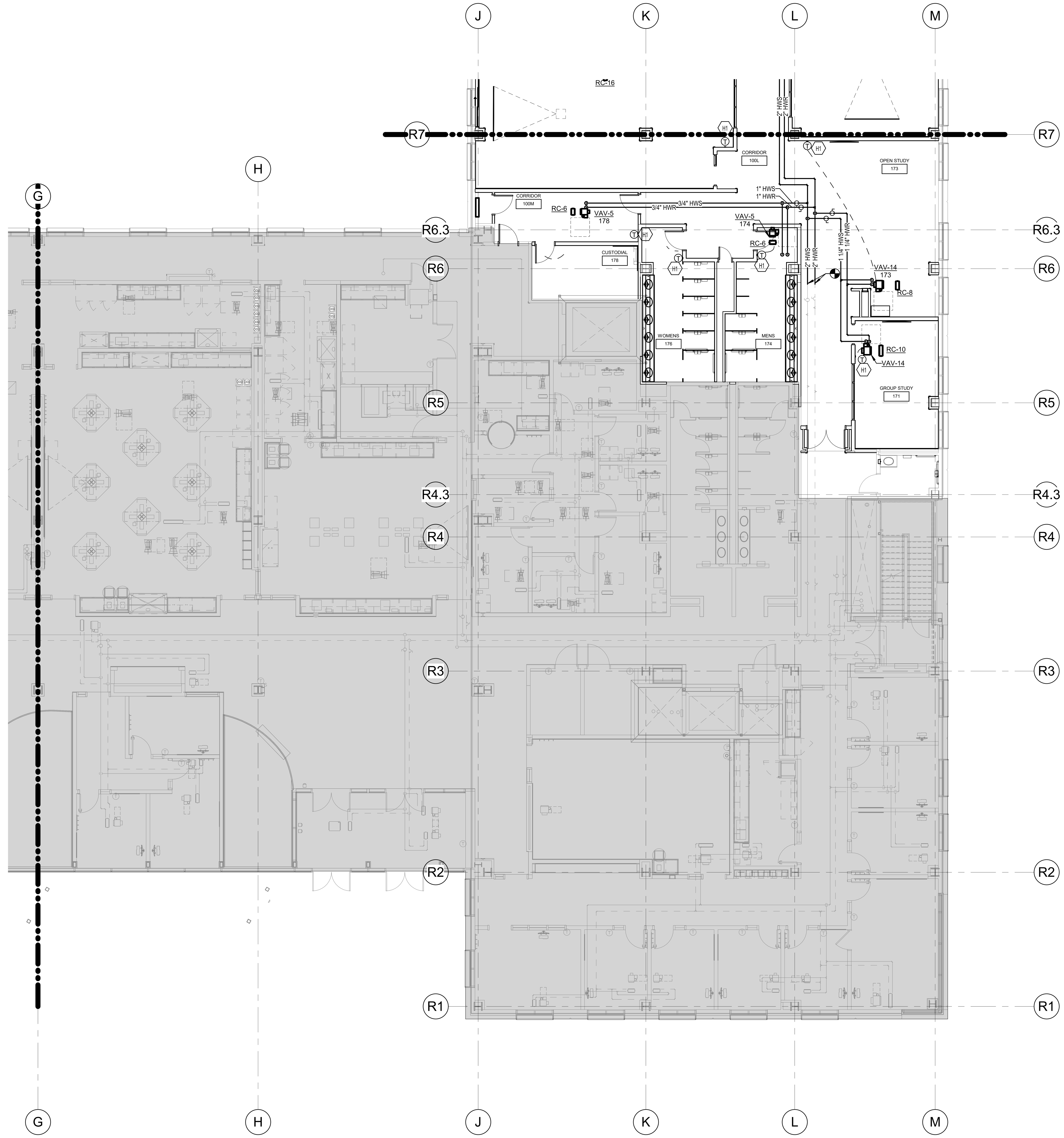
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

H1 COORDINATE LOCATION OF THERMOSTATS WITH LIGHT SWITCHES AND OTHER DEVICES. TYPICAL.



A HYDRONICS - FIRST FLOOR AREA 'C'
1/8" = 1'-0"

REHEAT COIL RUNOUT SCHEDULE	
MARK	RUNOUT PIPE SIZE (IN)
RC-6	3/4
RC-8	3/4
RC-10	1
RC-12	1
RC-14	1-1/4
RC-16	1-1/4

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No.	Description	Date

HYDRONIC FIRST FLOOR - NEW WORK PLAN - AREA 'C'

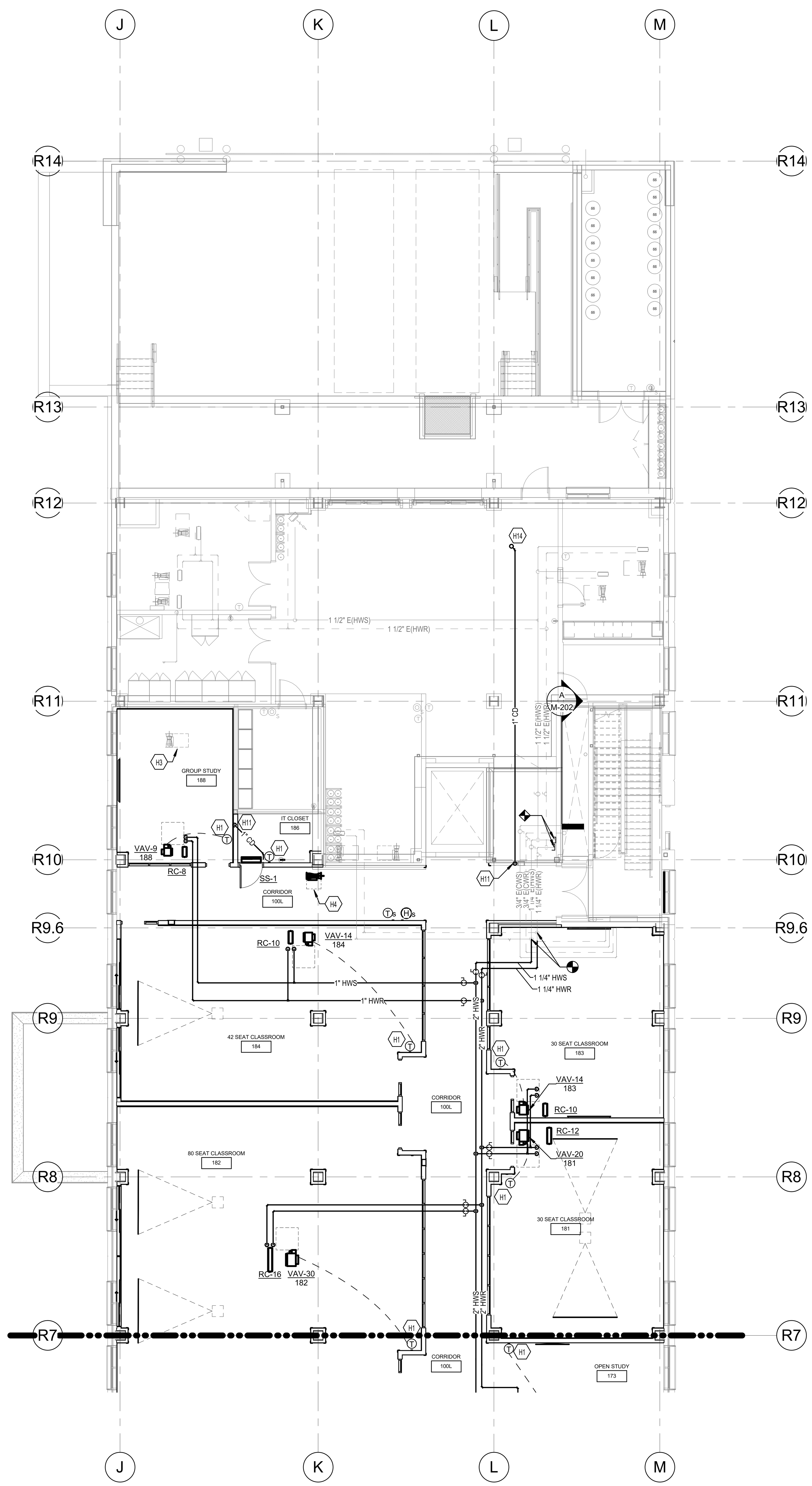
M-131C

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

- H1 COORDINATE LOCATION OF THERMOSTATS WITH LIGHT SWITCHES AND OTHER DEVICES. TYPICAL.
- H3 EXISTING PHOENIX VALVE. TYPICAL.
- H4 RELOCATED PHOENIX VALVE. REFER TO SHEET M-121D
- H11 CONDENSATE PIPING DOWN TO BASEMENT. SEE BASEMENT HYDRONICS SHEET FOR CONTINUATION.
- H14 CONDENSATE PIPING UP TO SECOND FLOOR. SEE FIRST FLOOR HYDRONICS SHEET FOR CONTINUATION.



A **HYDRONICS - FIRST FLOOR AREA 'D'**
1/8" = 1'-0"

REHEAT COIL RUNOUT SCHEDULE

MARK	RUNOUT PIPE SIZE (IN)
RC-6	3/4
RC-8	3/4
RC-10	1
RC-12	1
RC-14	1-1/4
RC-16	1-1/4

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REVISIONS

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HYDRONIC FIRST FLOOR - NEW WORK PLAN - AREA 'D'

M-131D

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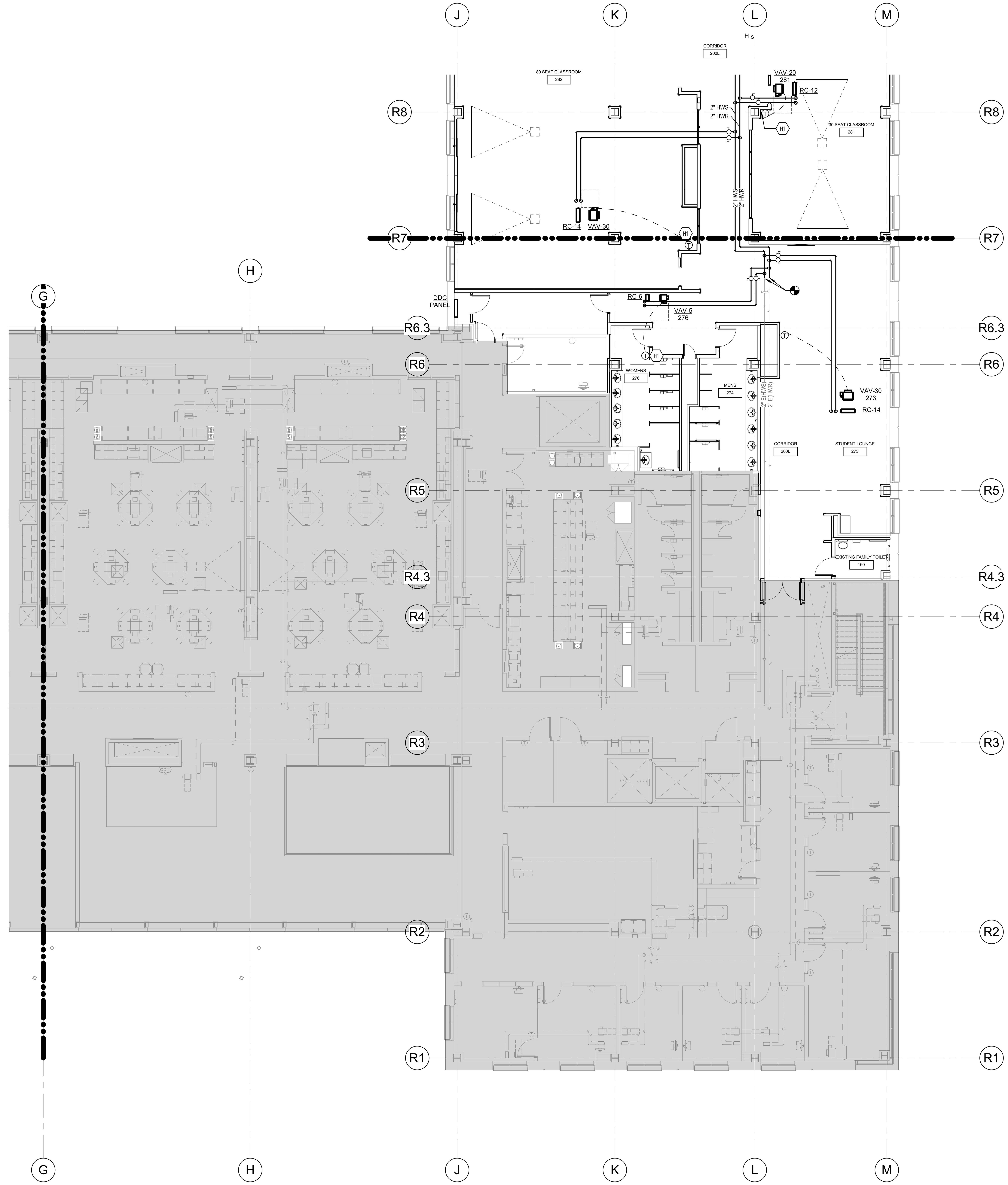
TAGGED NOTES

H1 COORDINATE LOCATION OF THERMOSTATS WITH LIGHT SWITCHES AND OTHER DEVICES, TYPICAL.



GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

A HYDRONICS - SECOND FLOOR AREA 'C'
1/8" = 1'-0"

REHEAT COIL RUNOUT SCHEDULE

MARK	RUNOUT PIPE SIZE (IN)
RC-6	3/4
RC-8	3/4
RC-10	1
RC-12	1
RC-14	1-1/4
RC-16	1-1/4

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REVISIONS

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HYDRONIC SECOND FLOOR - NEW WORK PLAN - AREA 'C'

M-132C

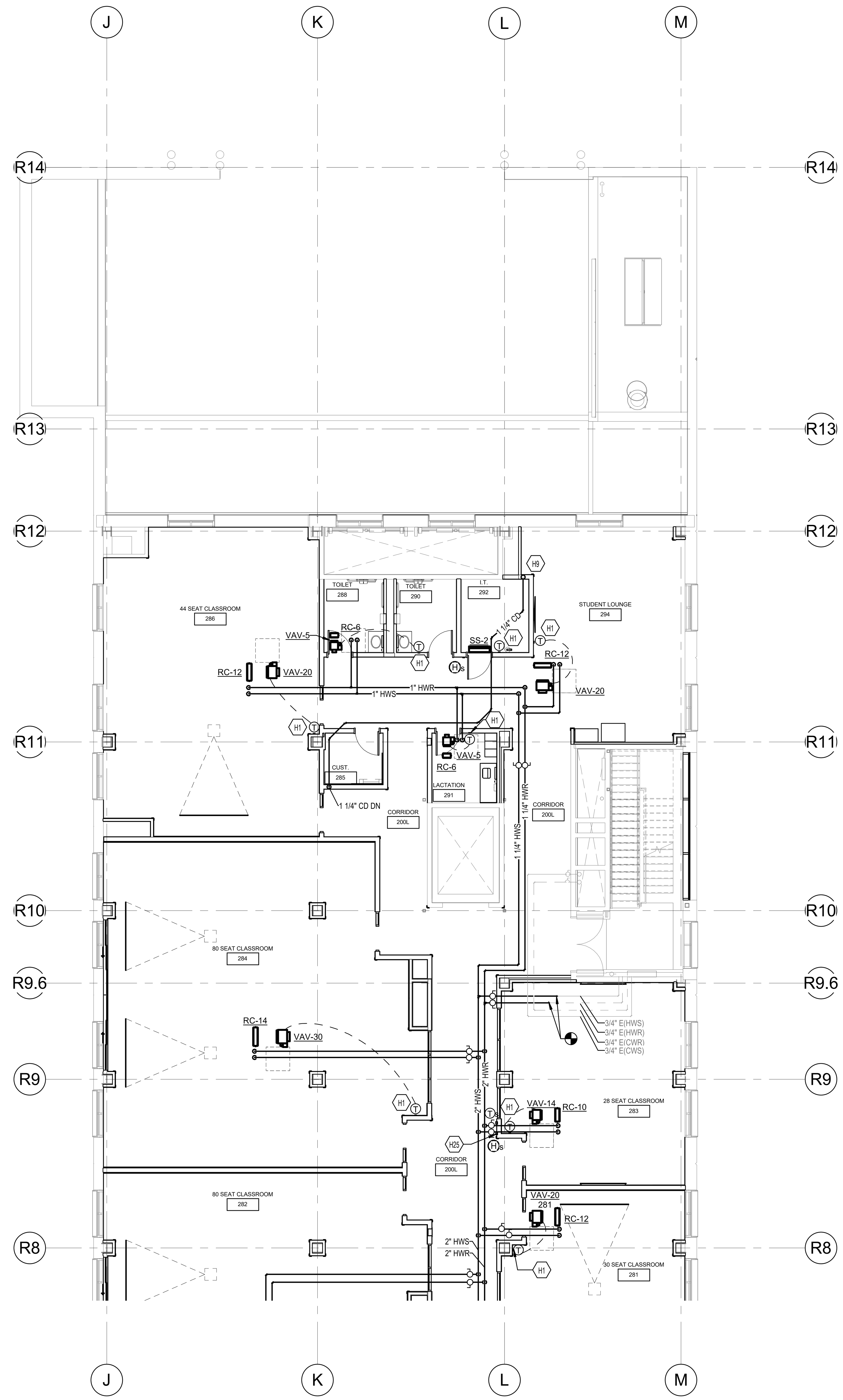
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- H1 COORDINATE LOCATION OF THERMOSTATS WITH LIGHT SWITCHES AND OTHER DEVICES. TYPICAL.
- H9 CONDENSATE PIPING DOWN TO FIRST FLOOR. SEE FIRST FLOOR HYDRONICS SHEET FOR CONTINUATION.
- H25 PROVIDE A HUMIDITY SENSOR ON EACH FLOOR.



A HYDRONICS - SECOND FLOOR AREA 'D'

1/8" = 1'-0"

REHEAT COIL RUNOUT SCHEDULE

MARK	RUNOUT PIPE SIZE (IN)
RC-6	3/4
RC-8	3/4
RC-10	1
RC-12	1
RC-14	1-1/4
RC-16	1-1/4

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HYDRONIC SECOND FLOOR - NEW WORK PLAN - AREA 'D'

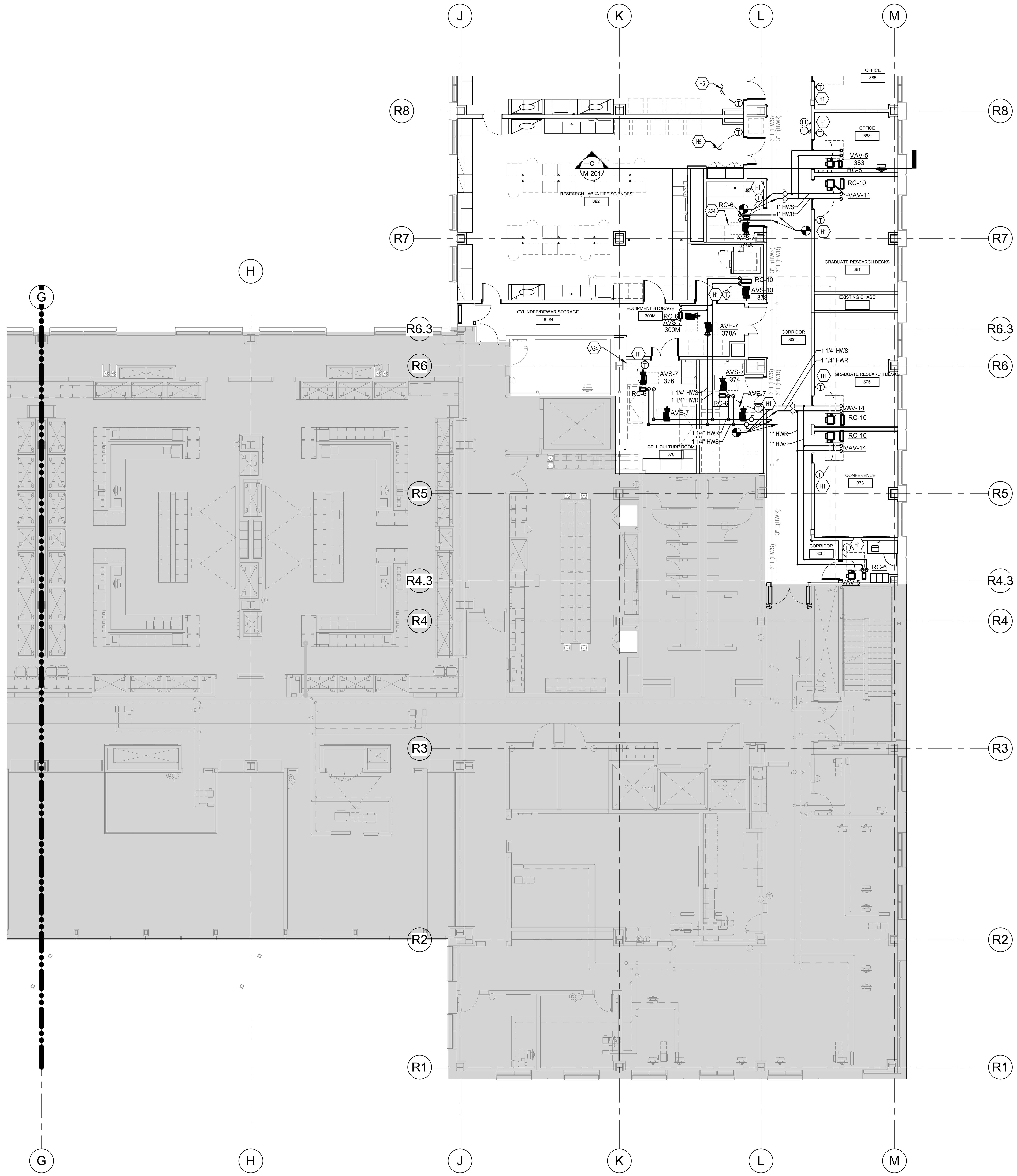
M-132D

GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

- A24 REFRIGERATOR AND/OR FREEZER TO BE MONITORED BY DDC. PROVIDE LOW TEMPERATURE ALARM, HIGH TEMPERATURE ALARM, AND DOOR OPEN ALARM.
- H1 COORDINATE LOCATION OF THERMOSTATS WITH LIGHT SWITCHES AND OTHER DEVICES. TYPICAL.
- H5 THERMOSTAT SERVES PHOENIX VALVE LOCATION IN FOURTH FLOOR. THERMOSTAT SERVES PHOENIX VALVE WITH INSTANCE MARK MATCHING THIS ROOM NUMBER. REFER TO FOURTH FLOOR PLANS FOR CONTINUATION.



A HYDRONICS - THIRD FLOOR AREA 'C'
1/8" = 1'-0"

REHEAT COIL RUNOUT SCHEDULE	
MARK	RUNOUT PIPE SIZE (IN)
RC-6	3/4
RC-8	3/4
RC-10	1
RC-12	1
RC-14	1-1/4
RC-16	1-1/4

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HYDRONIC THIRD FLOOR - NEW WORK PLAN - AREA 'C'

M-133C

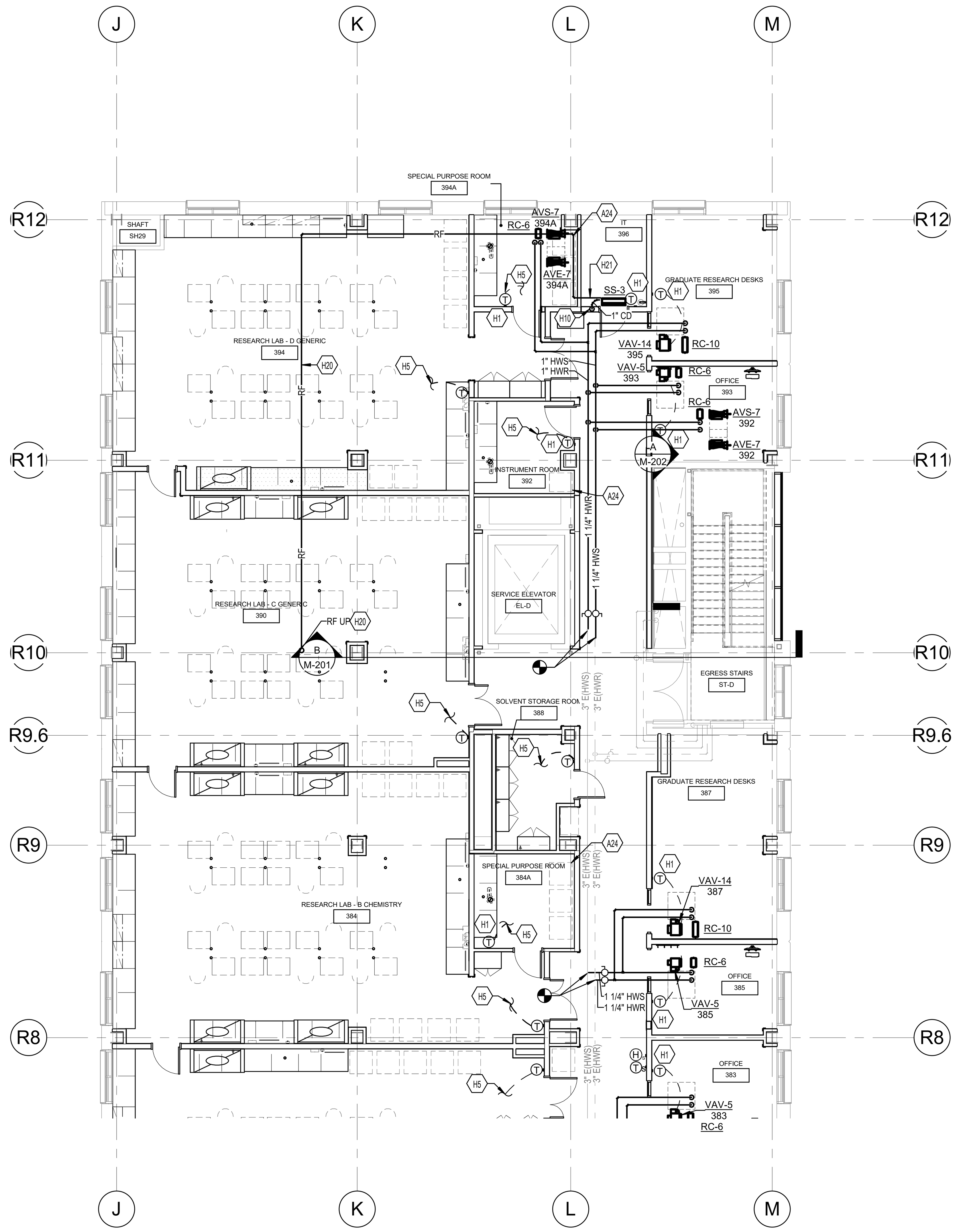
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- A24 REFRIGERATOR AND/OR FREEZER TO BE MONITORED BY DDC. PROVIDE LOW TEMPERATURE ALARM, HIGH TEMPERATURE ALARM, AND DOOR OPEN ALARM.
- H1 COORDINATE LOCATION OF THERMOSTATS WITH LIGHT SWITCHES AND OTHER DEVICES. TYPICAL.
- H5 THERMOSTAT SERVES PHOENIX VALVE LOCATION IN FOURTH FLOOR. THERMOSTAT SERVES PHOENIX VALVE WITH INSTANCE MARK MATCHING THIS ROOM NUMBER. REFER TO FOURTH FLOOR PLANS FOR CONTINUATION.
- H10 CONDENSATE PIPING DOWN TO SECOND FLOOR. SEE SECOND FLOOR HYDRONICS SHEET FOR CONTINUATION.
- H20 REFRIGERANT PIPING FROM ROOF MOUNTED CONDENSING UNIT TO INDOOR SPLIT SYSTEMS. SIZE PIPING PER MANUFACTUERS REQUIREMENTS.
- H21 ROUTE REFRIGERANT PIPING DOWN IN WALL. ALL FLOOR PENETRATIONS SHALL INCLUDE SLEEVES.



A HYDRONICS - THIRD FLOOR AREA 'D'
1/8" = 1'-0"

REHEAT COIL RUNOUT SCHEDULE

MARK	RUNOUT PIPE SIZE (IN)
RC-6	3/4
RC-8	3/4
RC-10	1
RC-12	1
RC-14	1-1/4
RC-16	1-1/4

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HYDRONIC THIRD FLOOR - NEW WORK PLAN - AREA 'D'

M-133D

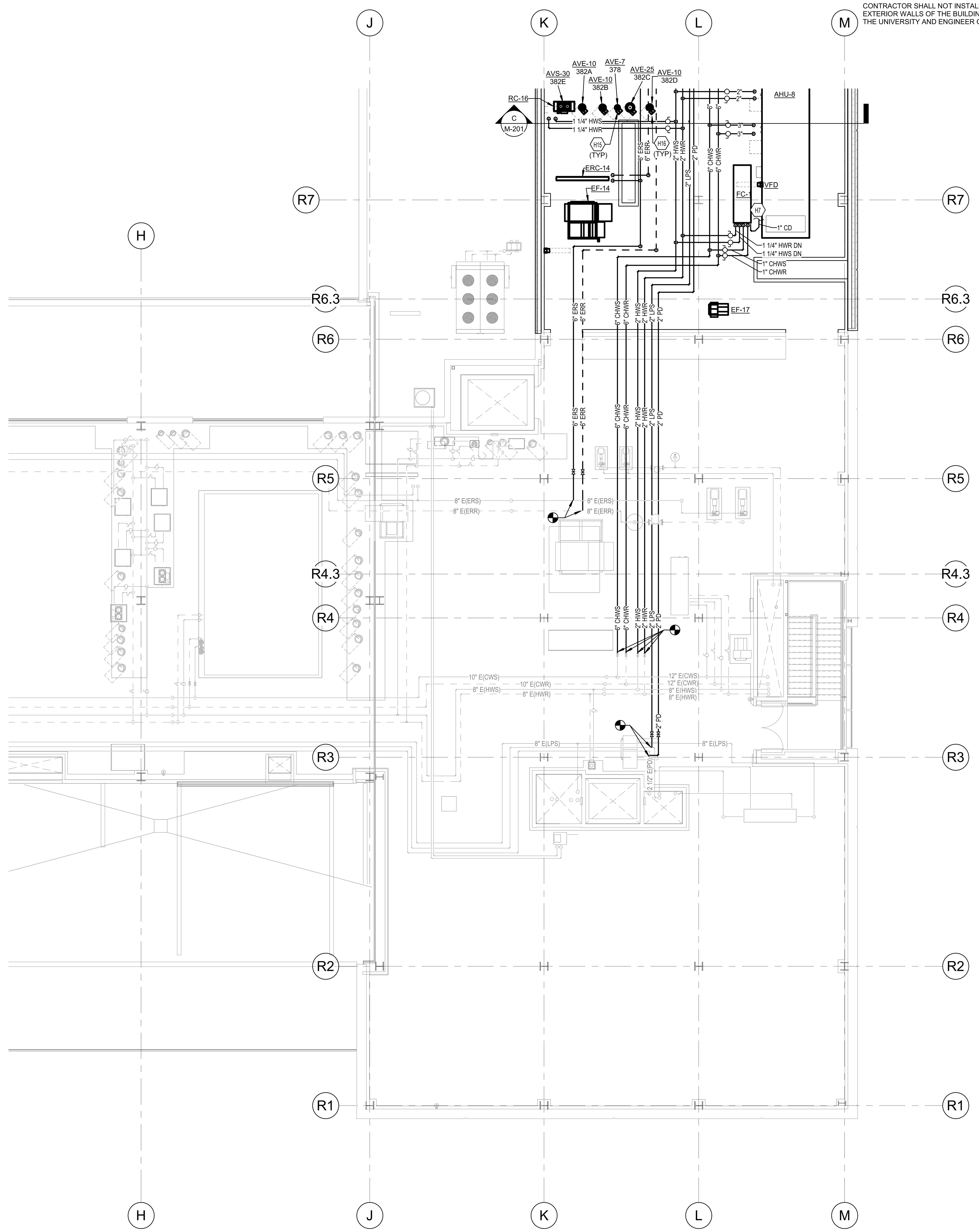
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- H7 SPILL CONDENSATE TO FLOOR DRAIN AT COOLING COIL OF AHU-8.
- H15 EACH FUME HOOD VALVE SHALL BE TAGGED WITH THE ROOM NUMBER AND A FUME HOOD DESIGNATOR. A FUMEHOOD LABEL, 2" WITH ENGRAVED LETTERS SHALL BE INSTALLED ON EACH FUME HOOD.
- H16 ALL PENETRATIONS OF THE PENTHOUSE FLOOR SLAB SHALL BE SURROUNDED BY A CONCRETE PAD. COORDINATE REQUIREMENTS WITH ARCHITECTURAL PLANS.



A HYDRONICS - FOURTH FLOOR AREA 'C'

1/8" = 1'-0"

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HYDRONIC FOURTH FLOOR - NEW WORK PLAN - AREA 'C'

M-134C

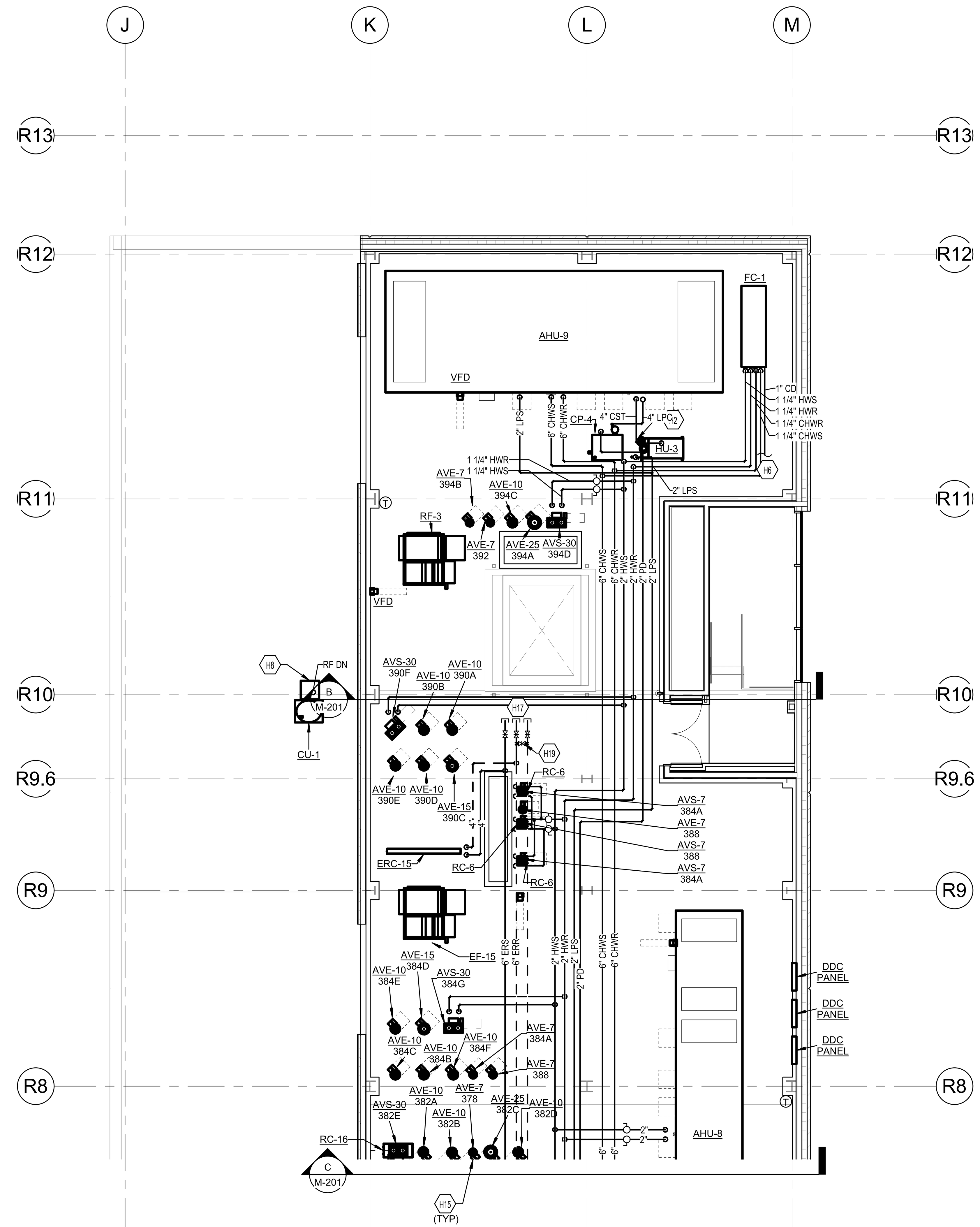
GENERAL NOTE

CONTRACTOR SHALL NOT INSTALL PIPING WITHIN 5' OF THE EXTERIOR WALLS OF THE BUILDING WITHOUT APPROVAL FROM THE UNIVERSITY AND ENGINEER OF RECORD.

TAGGED NOTES

##

- H2 REFER TO STEAM TO STEAM HUMIDIFIER DETAIL.
- H6 SPILL CONDENSATE TO FLOOR DRAIN AT COOLING COIL OF AHU-9.
- H8 REFER TO PIPE/CHASE ROOF CURB DETAIL. PROVIDE PILLOWBLOCK SUPPORT SIMILAR TO MIRO 1.5.
- H15 EACH FUME HOOD VALVE SHALL BE TAGGED WITH THE ROOM NUMBER AND A FUME HOOD DESIGNATOR. A FUMEHOOD LABEL, 2" WITH ENGRAVED LETTERS SHALL BE INSTALLED ON EACH FUME HOOD.
- H17 CAP PIPING FOR FUTURE ERC CONNECTION.
- H19 NORMALLY OPEN BYPASS VALVE.



A **HYDRONICS - FOURTH FLOOR AREA 'D'**

1/8" = 1'-0"

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HYDRONIC FOURTH FLOOR - NEW WORK PLAN - AREA 'D'

M-134D

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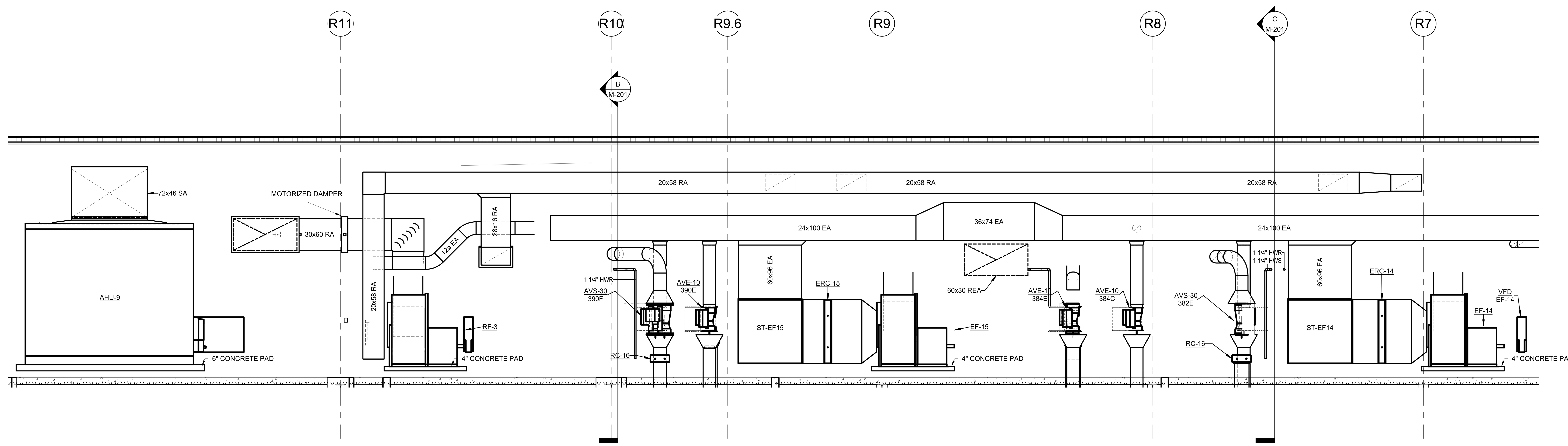
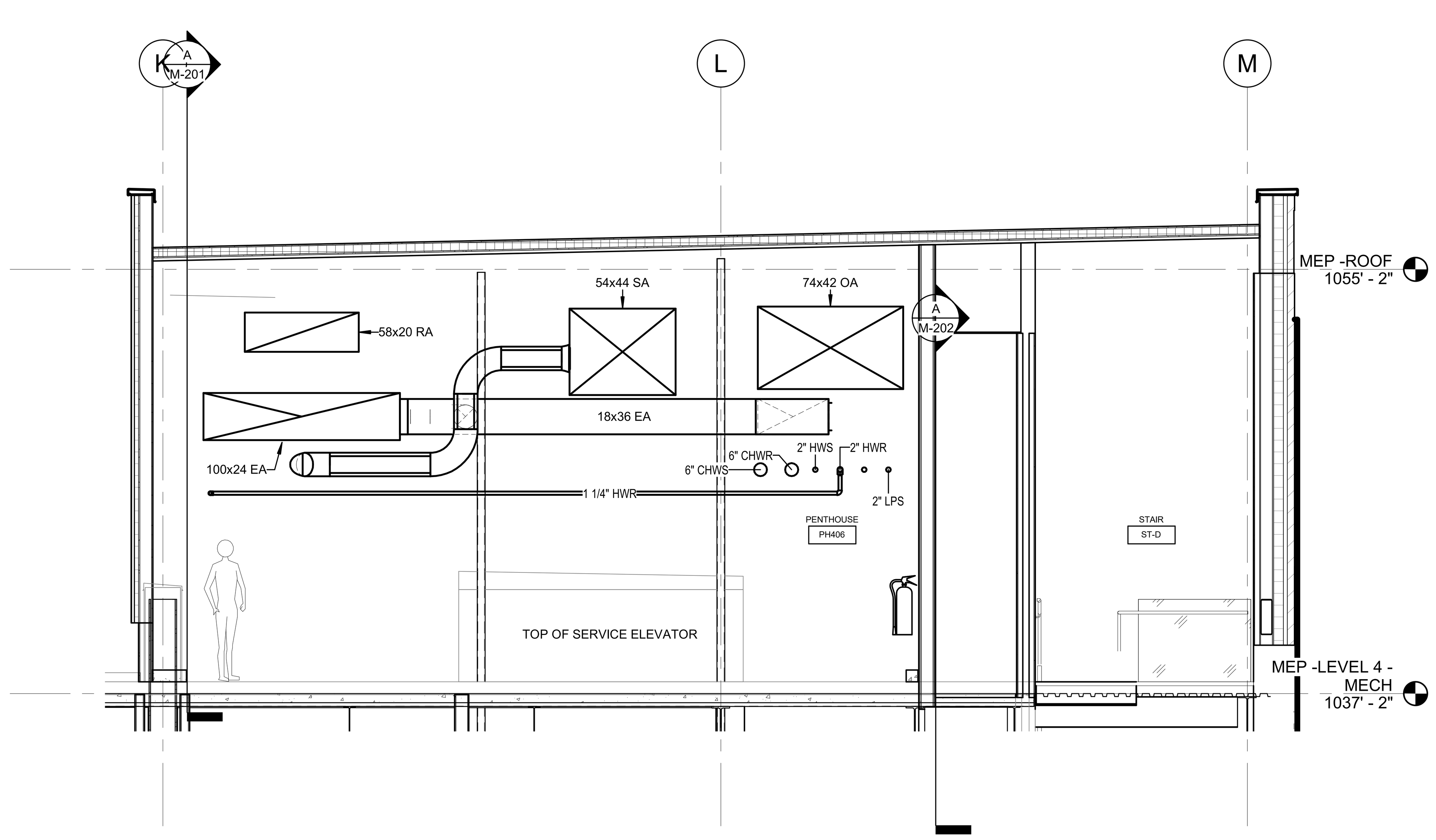
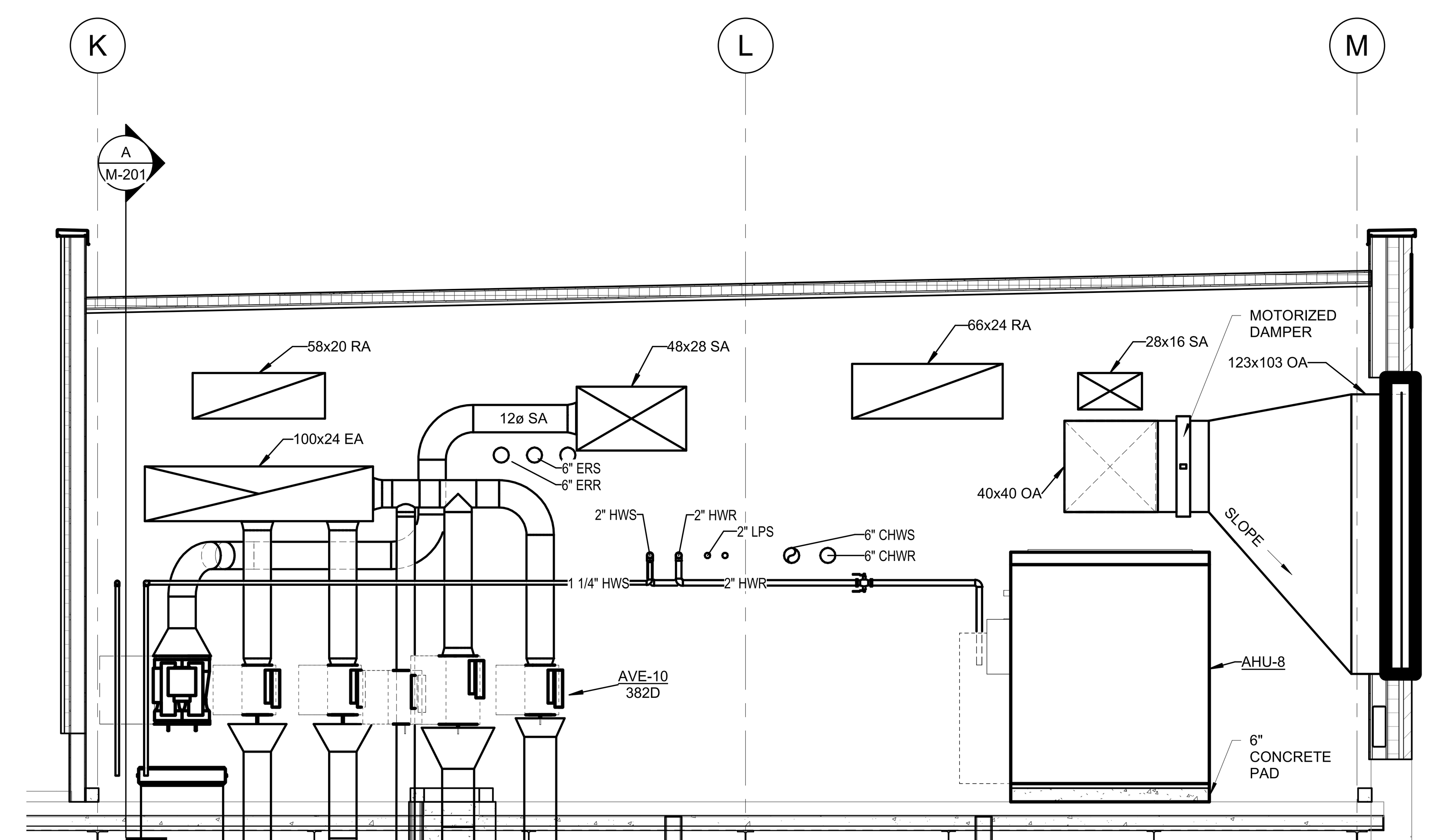
TAGGED NOTES



(A) PENTHOUSE SECTION
1/4" = 1'-0"



(B) PENTHOUSE SECTION 2
1/4" = 1'-0"



(C) PENTHOUSE SECTION 3
1/4" = 1'-0"

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MECHANICAL SECTIONS

M-201

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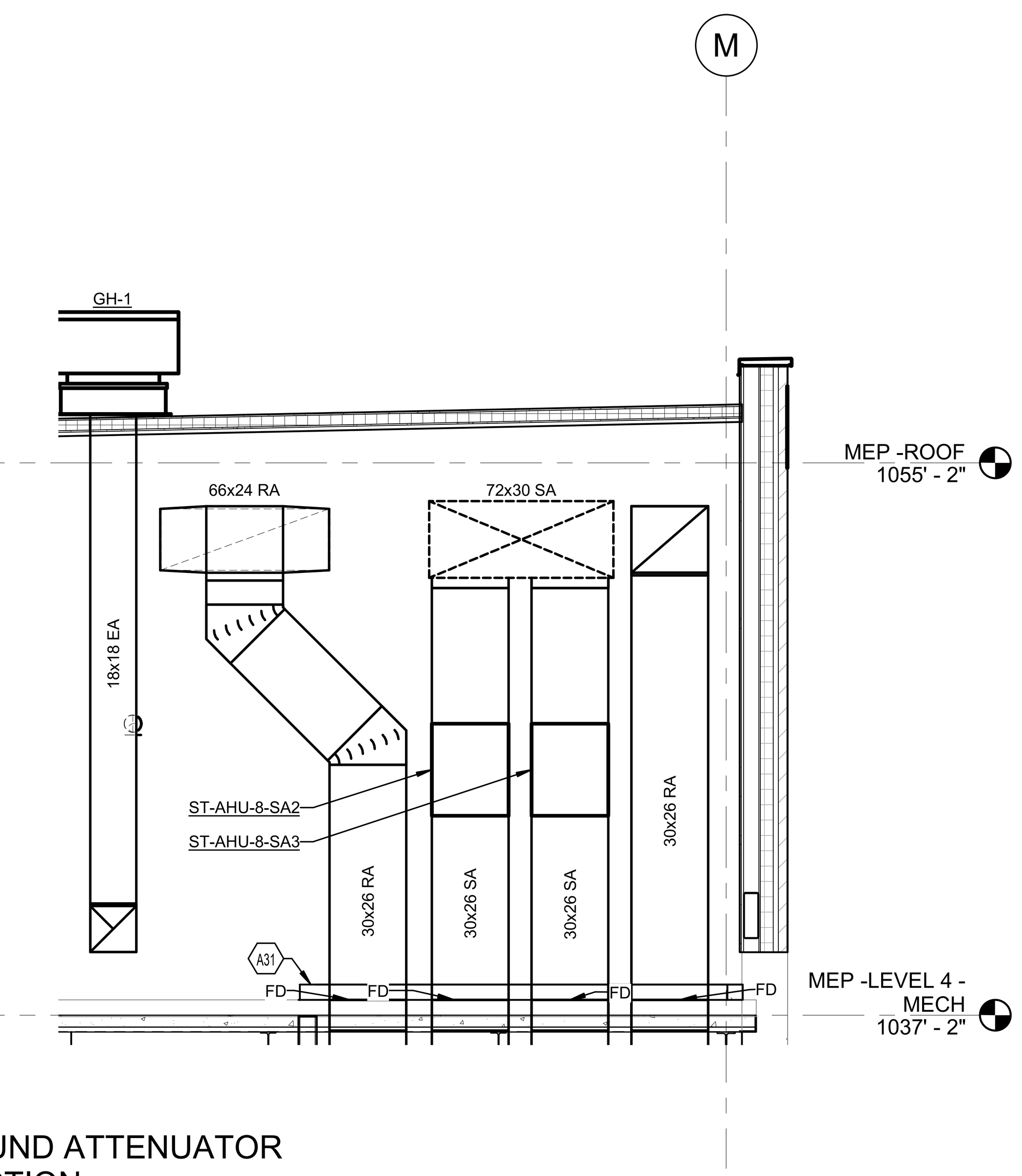
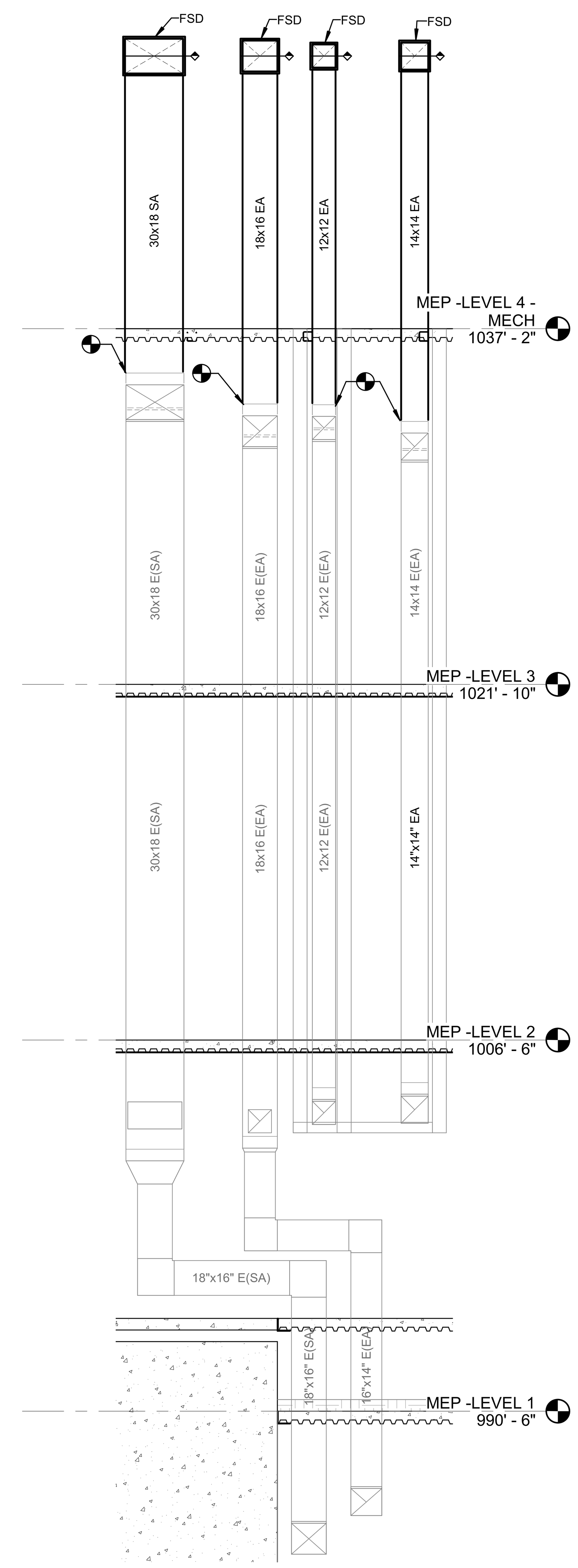
TAGGED NOTES

A31 PENTHOUSE CURB. REFER TO STRUCTURAL PLANS.



B SOUND ATTENUATOR SECTION
SCALE: NONE



A DUCT WORK CONNECTION DETAIL
SCALE: NONE

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STATE OF KENTUCKY CHRISTOPHER M. REEVES 25045 LICENSED PROFESSIONAL ENGINEER

RESERVED FOR AHJ STAMP

CMTA

CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

MECHANICAL SECTIONS

M-202

Autodesk Docs://202277 - UK JSB Improvements/2022.XKJS22 MEP.rvt
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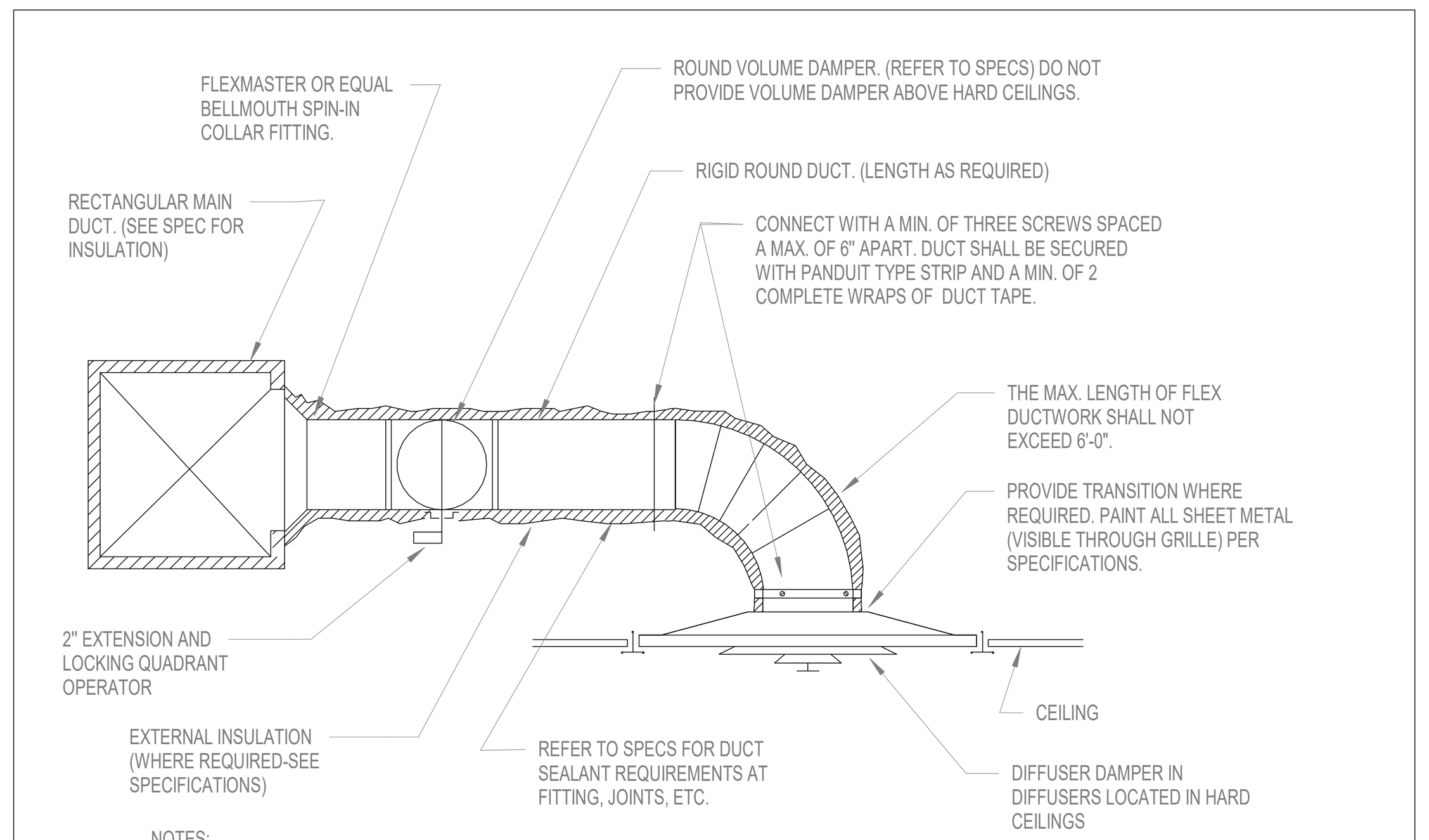
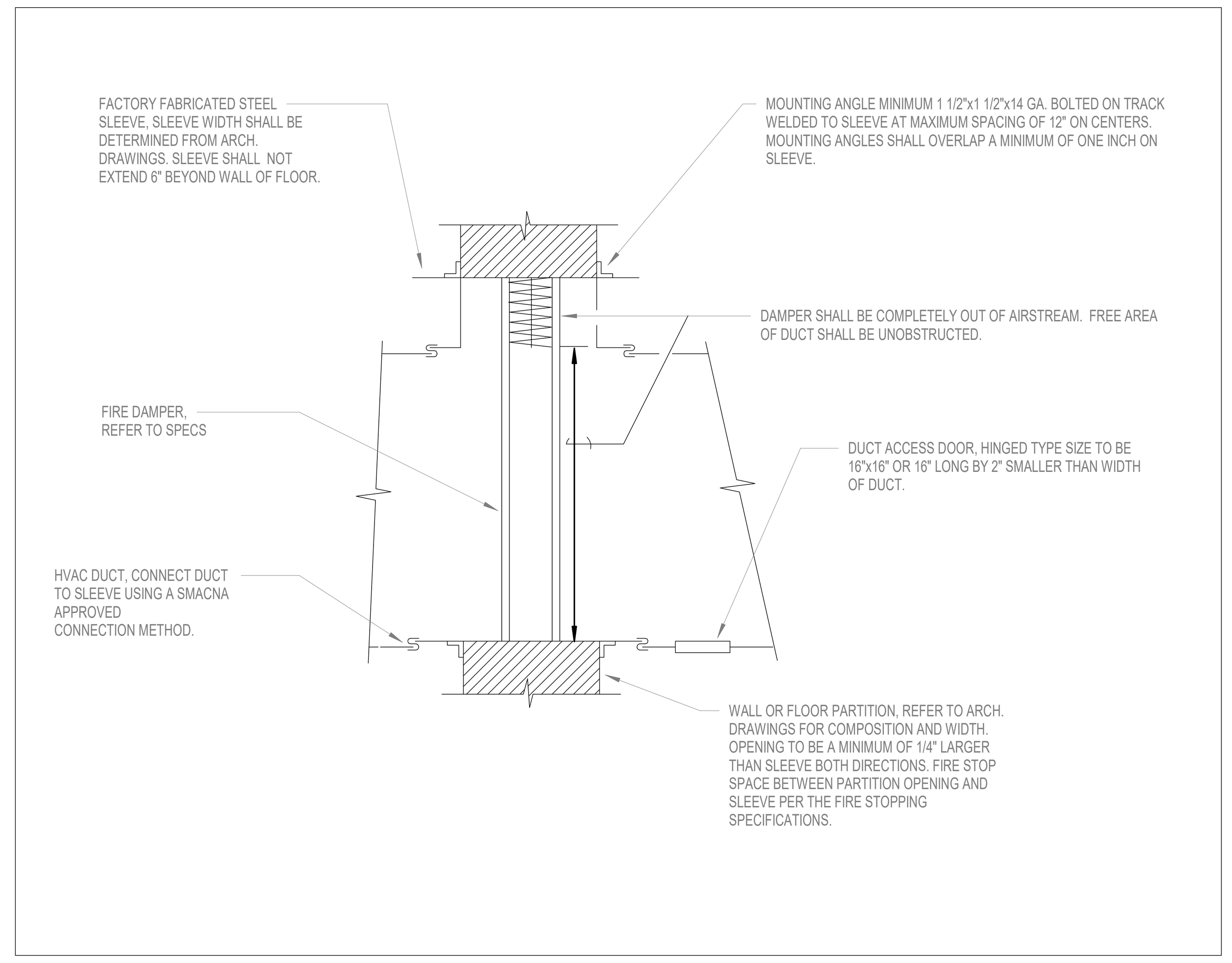


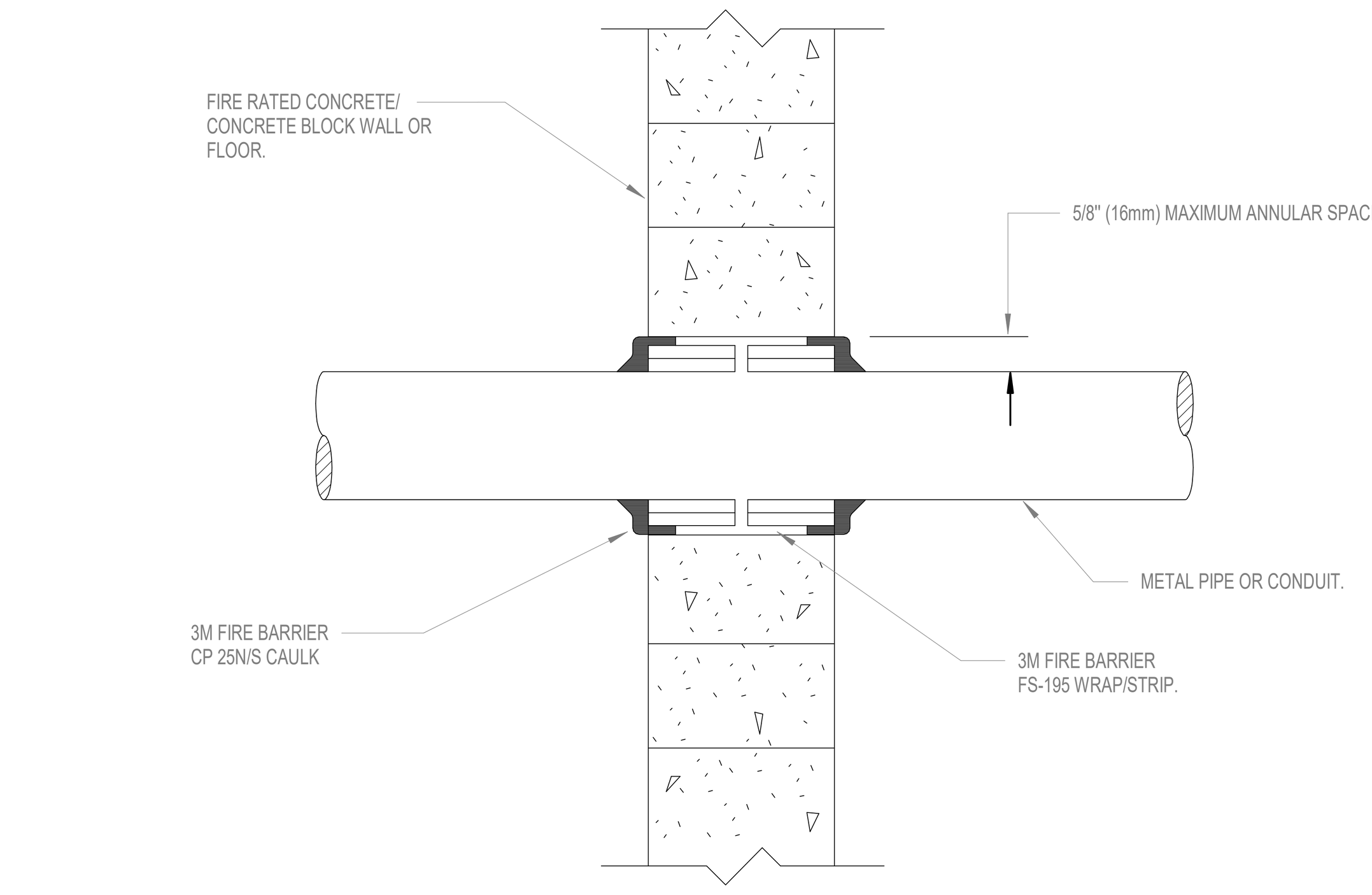
NOTES:

1. SUPPORT DUCTWORK, ETC. INDEPENDANTLY OF CEILING SYSTEM
2. PROVIDE VOLUME DAMPERS IN ALL BRANCH DUCTS TO GRILLES, REGISTERS, AND DIFFUSERS, INCLUDING RECTANGULAR BRANCH DUCTS.

A TYPICAL ROUND SUPPLY BRANCH DUCT DETAIL
SCALE: NONE



B FIRE DAMPER DETAIL
SCALE: NONE



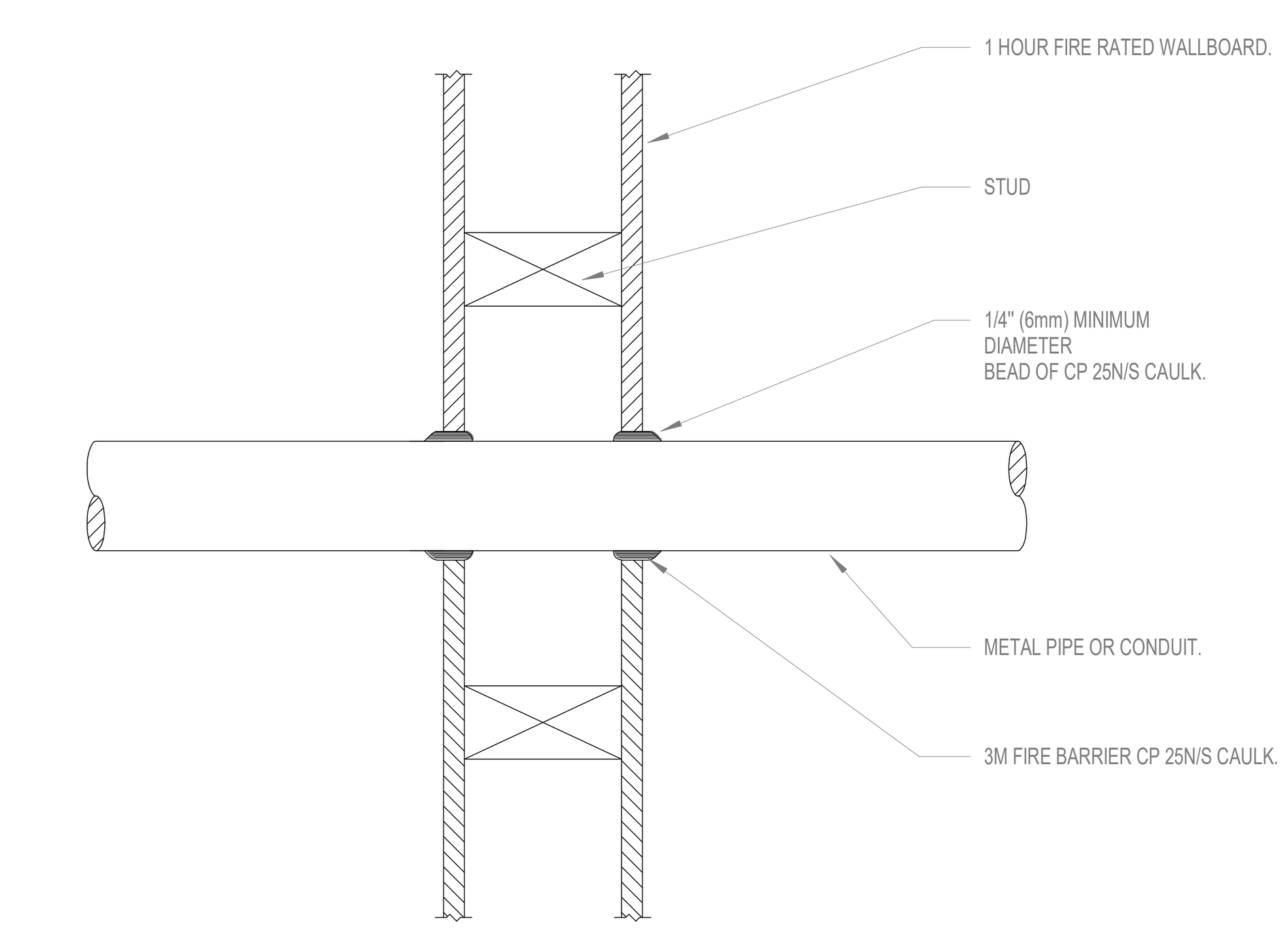
NOTES

1. THE MAXIMUM ANNULAR SPACE AROUND THE METAL PIPE OR CONDUIT IS 5/8" (16mm). (IF THE ANNULAR SPACE EXCEEDS 5/8" PATCH THE WALL AND PENETRATE WALL AT ANOTHER LOCATION).
2. WRAP THE 3M MODEL# FS-195 WRAP/STRIP AROUND THE PIPE/CONDUIT, FOIL SIDE OUT, TO FILL THE SPACE BETWEEN THE PIPE/CONDUIT AND THE WALL OPENING. THE 3M MODEL# FS-195 WRAP/STRIP SHOULD BE TIGHTLY SECURED WITH ALUMINUM FOIL TAPE OR STEEL TIE WIRE AND PUSHED INTO THE OPENING UNTIL THE TOP EDGE OF THE WRAP IS FLUSH WITH THE WALL SURFACE. THE IDENTICAL INSTALLATION SHOULD BE INSTALLED ON THE OTHER SIDE OF THE WALL.
3. USE 3M MODEL# CP 25N/S(NO SAG) CAULK TO FILL THE AREA BETWEEN THE FS-195 WRAP/STRIP AND THE EDGES OF THE OPENING AND ANY VOIDS IN THE 3M MODEL# FS-195 WRAP/STRIP. A FILLM OF CP 25 CAULK SHOULD COAT ALL EXPOSED EDGES OF THE FS-195 WRAP/STRIP AND COMPLETELY SEAL THE AREA BETWEEN THE FS-195 WRAP/STRIP, THE PIPE/CONDUIT AND THE WALL SURFACE.

PENETRATION FIRESTOP FOR METAL PIPE/CONDUIT THROUGH A CONCRETE WALL

FIRE STOPPING NOTES:

1. FIRE STOPPING IS CRITICAL AND MUST BE ACCOMPLISHED. ALL PIPES MUST BE FIRESTOPPED WHERE THEY PENETRATE FIRE RESISTIVE, FIRE RATED, AND SMOKE RESISTIVE WALLS OR FLOORS.
2. A FOUR-HOUR TRAINING SESSION SHALL BE CONDUCTED BY MANUFACTURER OF THE FIRESTOPPING MATERIAL. THIS SHALL BE DONE PRIOR TO THE INSTALLATION OF THE MATERIAL. CONTACT ENGINEER TO ADVISE OF THE DATE AND TIME OF THIS MEETING.
3. ALL PENETRATIONS WILL BE REVIEWED BY THE ENGINEER PRIOR TO INSPECTION ALL CEILING TILES BENEATH THE PENETRATIONS SHALL BE REMOVED BY THE CONTRACTOR.

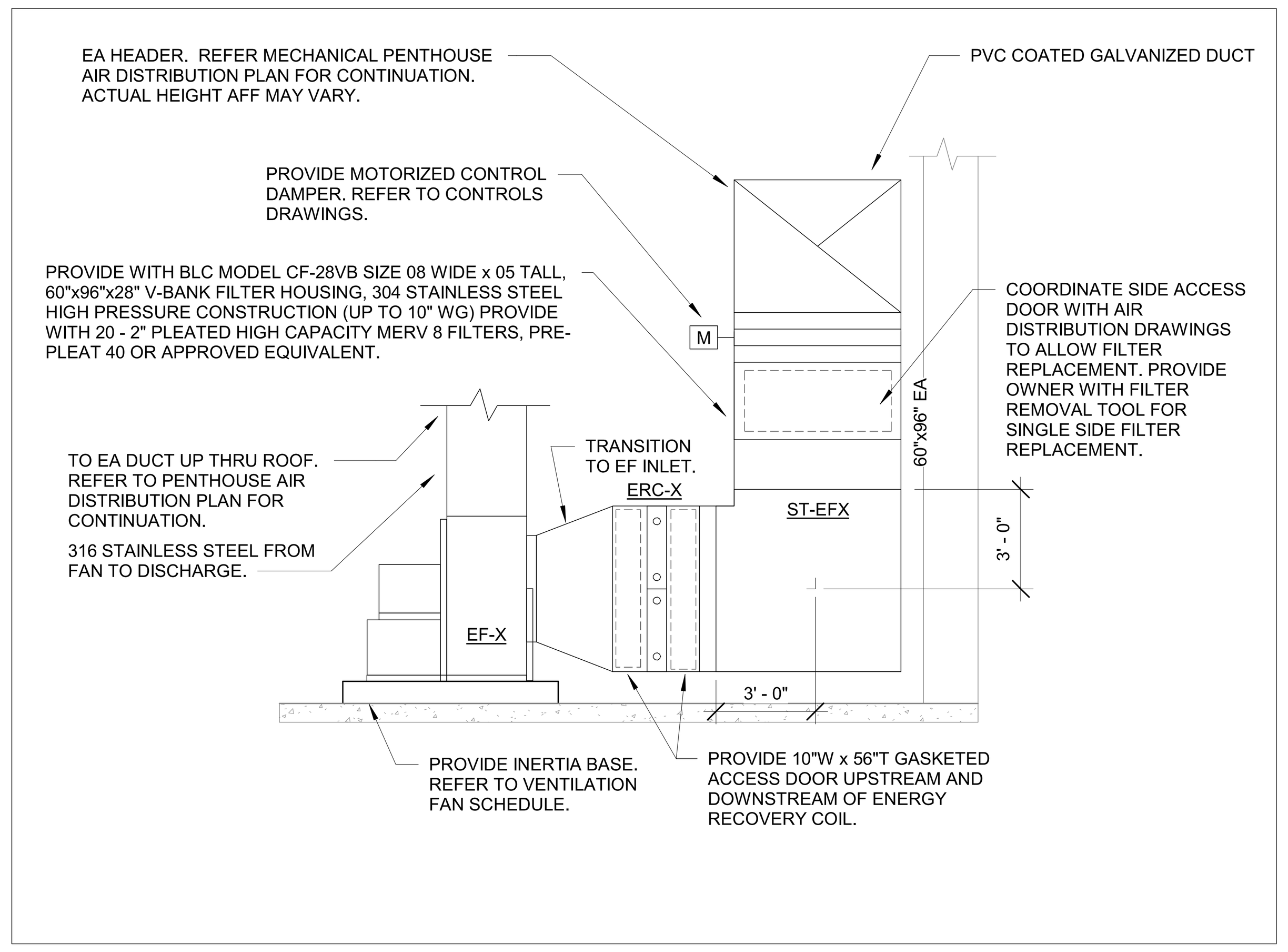


NOTES

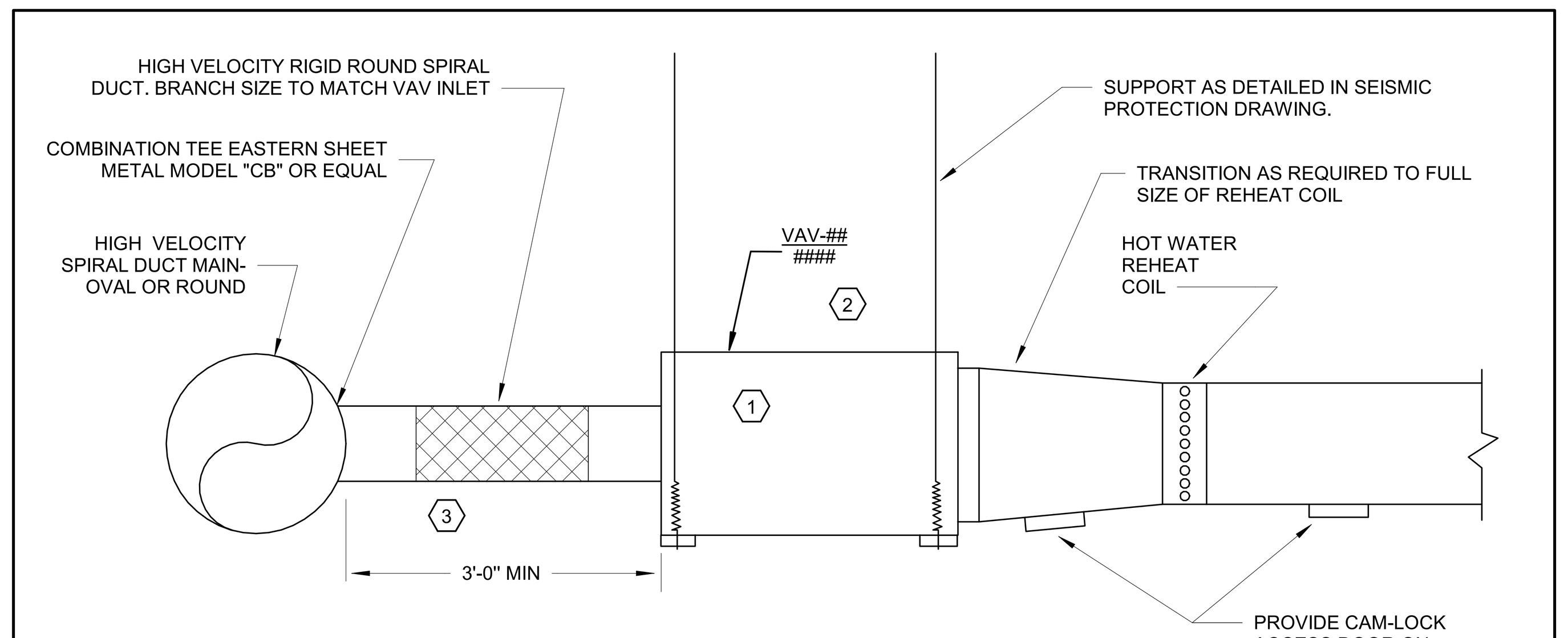
1. FORCE THE 3M MODEL# CP 25N/S CAULK INTO THE ANNULAR SPACE TO THE MAXIMUM EXTENT POSSIBLE, FLUSH WITH THE EXTERIOR OF THE PENETRATION SURFACE.
2. FINISH CAULKING WITH A 1/4" (6mm) MINIMUM BEAD OF CP 25N/S CAULK APPLIED TO THE PERIMETER OF THE CONDUIT/PIPE AT ITS EGRESS FROM THE WALL.
3. THE MAXIMUM ANNULAR SPACE IS NOT TO EXCEED 3/16" (5mm). (IF IT DOES PATCH WALL AND PENETRATE WALL AT ANOTHER LOCATION).
4. 4. INSTALL THE 3M FIRESTOP ON BOTH SIDES OF THE WALL.

PENETRATION FIRESTOP FOR METAL PIPE/CONDUIT THROUGH ONE HOUR WALL

E FIRESTOPPING DETAIL
SCALE: NONE



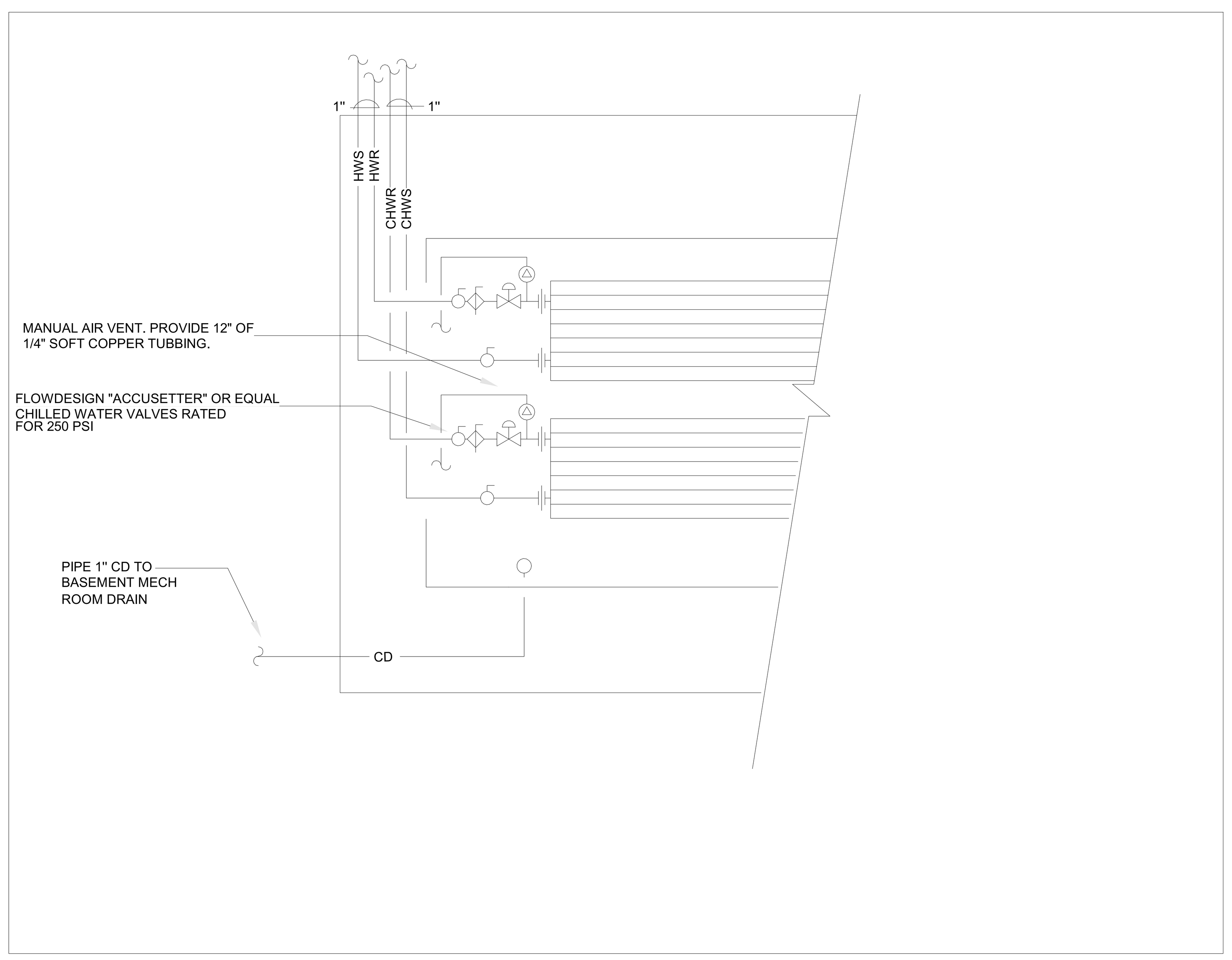
C FUME HOOD EXHAUST FAN DETAIL
SCALE: NONE



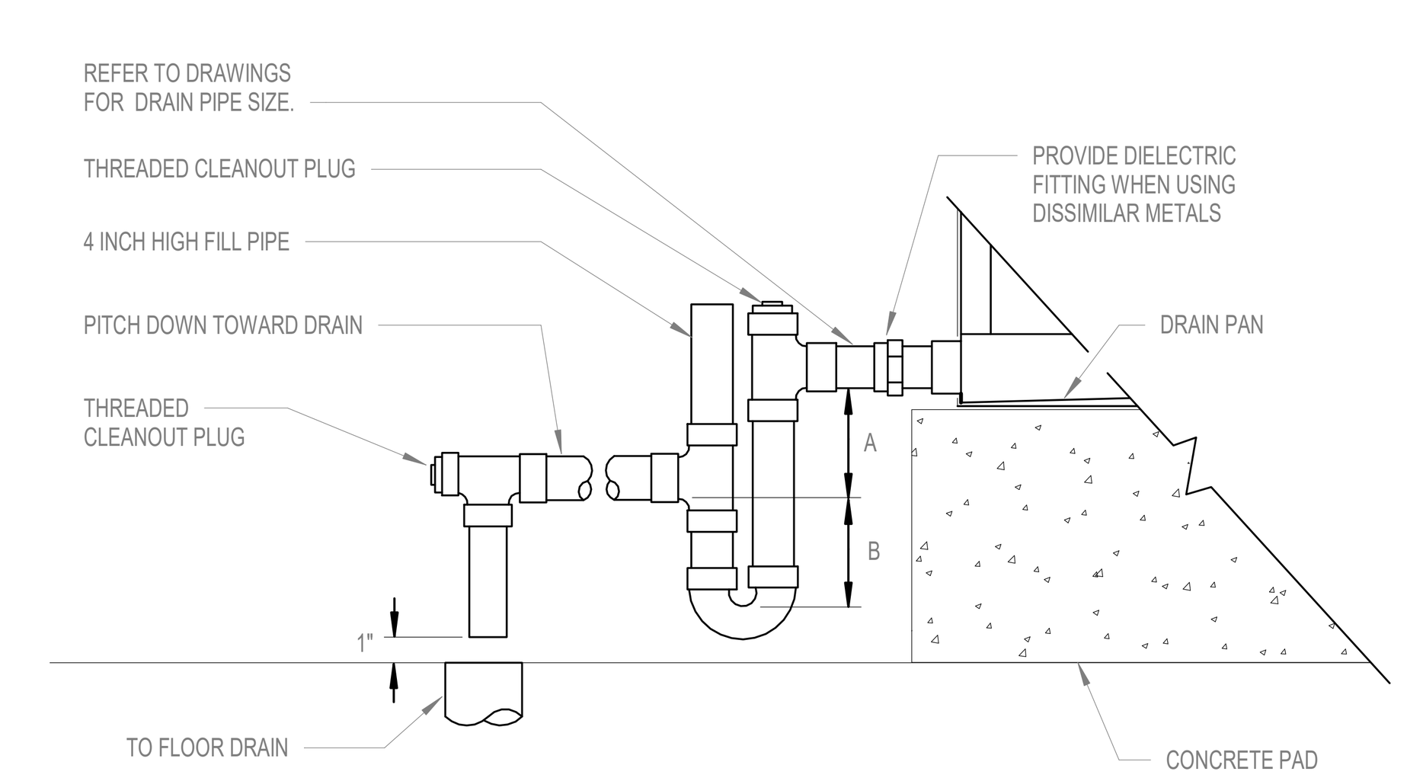
1. SUBMITTAL AND SHEET METAL SHOP DRAWINGS SHALL SHOW PHYSICAL SIZE OF UNIT. AIR FLOW CONTROLS AND ACCESS PANELS. SHOP DRAWINGS SHALL ALSO SHOW ELEVATION OF INSTALLED TERMINAL UNITS.
2. DAMPER AND AIR FLOW CONTROLS MUST BE ACCESSIBLE FOR ADJUSTMENT AND MAINTENANCE. DUCTWORK, CONDUIT OR MAIN CEILING GRIDS SHOULD BE LOCATED ACCORDINGLY.
3. HIGH PRESSURE SUPPLY DUCT SHOULD NOT MAKE ANY SEVERE TRANSITIONS OR TURNS 3 FEET PRIOR TO CONNECTING TO THE TERMINAL UNIT. THESE UNITS HAVE AIR FLOW MEASURING DEVICES THAT REQUIRE STRAIGHT, LAMINAR AIR FLOW ENTERING FOR GOOD CONTROL. FLEXIBLE DUCT IS NOT ALLOWED.

MAINTAIN A MINIMUM OF 24" CLEAR SPACE TO ACCESS COIL DAMPERS, ETC.

D CAV/VAV BOX DETAIL
SCALE: NONE



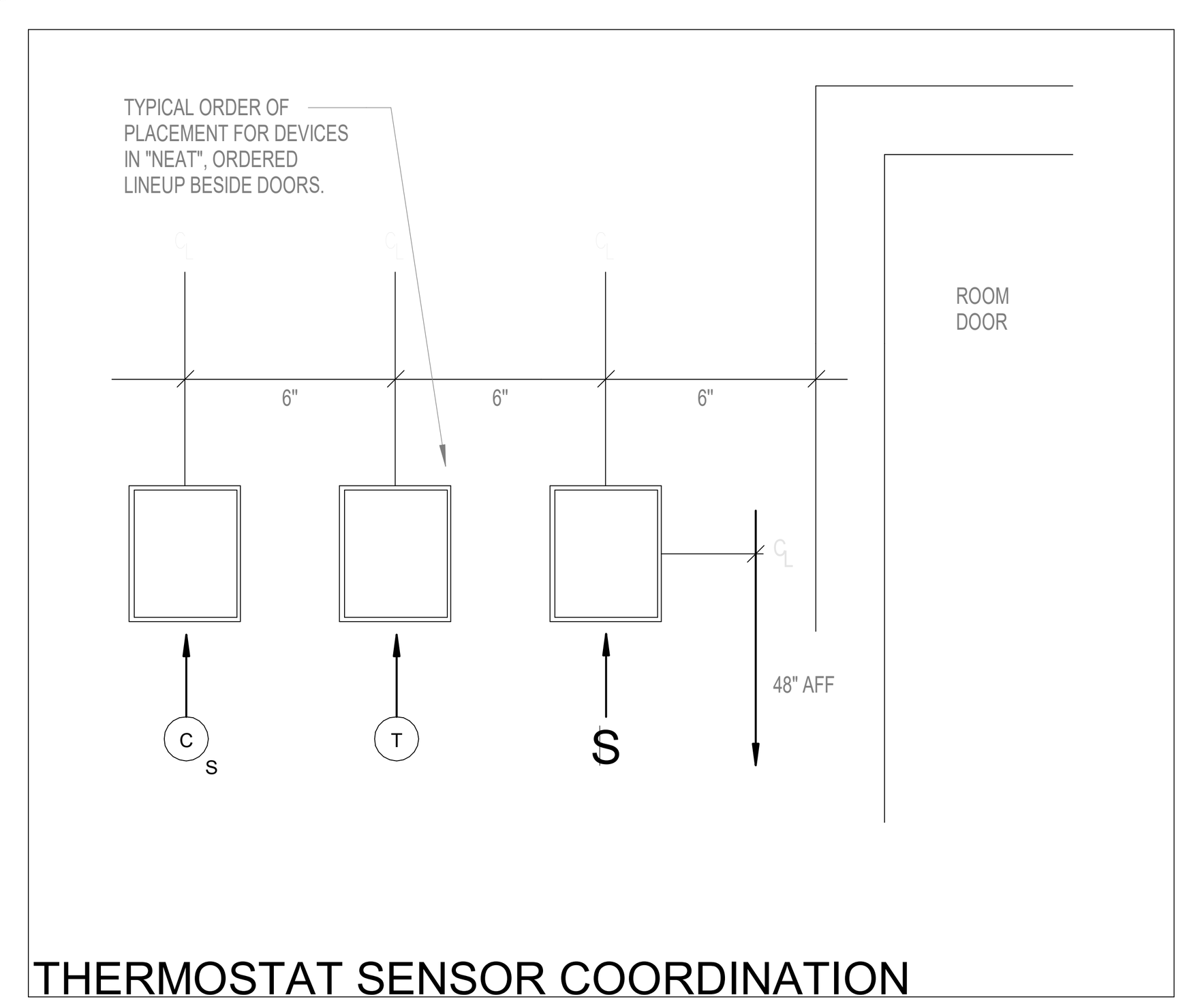
F FAN COIL PIPING DETAIL
SCALE: NONE



UNIT TYPE	A	B
DRAW THRU	2" PLUS X	X

WHERE X = STATIC PRESSURE IN PAN. A & B ARE PER HVAC MANUFACTURERS RECOMMENDATIONS.

G AIR HANDLING UNIT DRAIN TRAP DETAIL
SCALE: NONE



H THERMOSTAT SENSOR COORDINATION DETAIL
SCALE: NONE

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CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

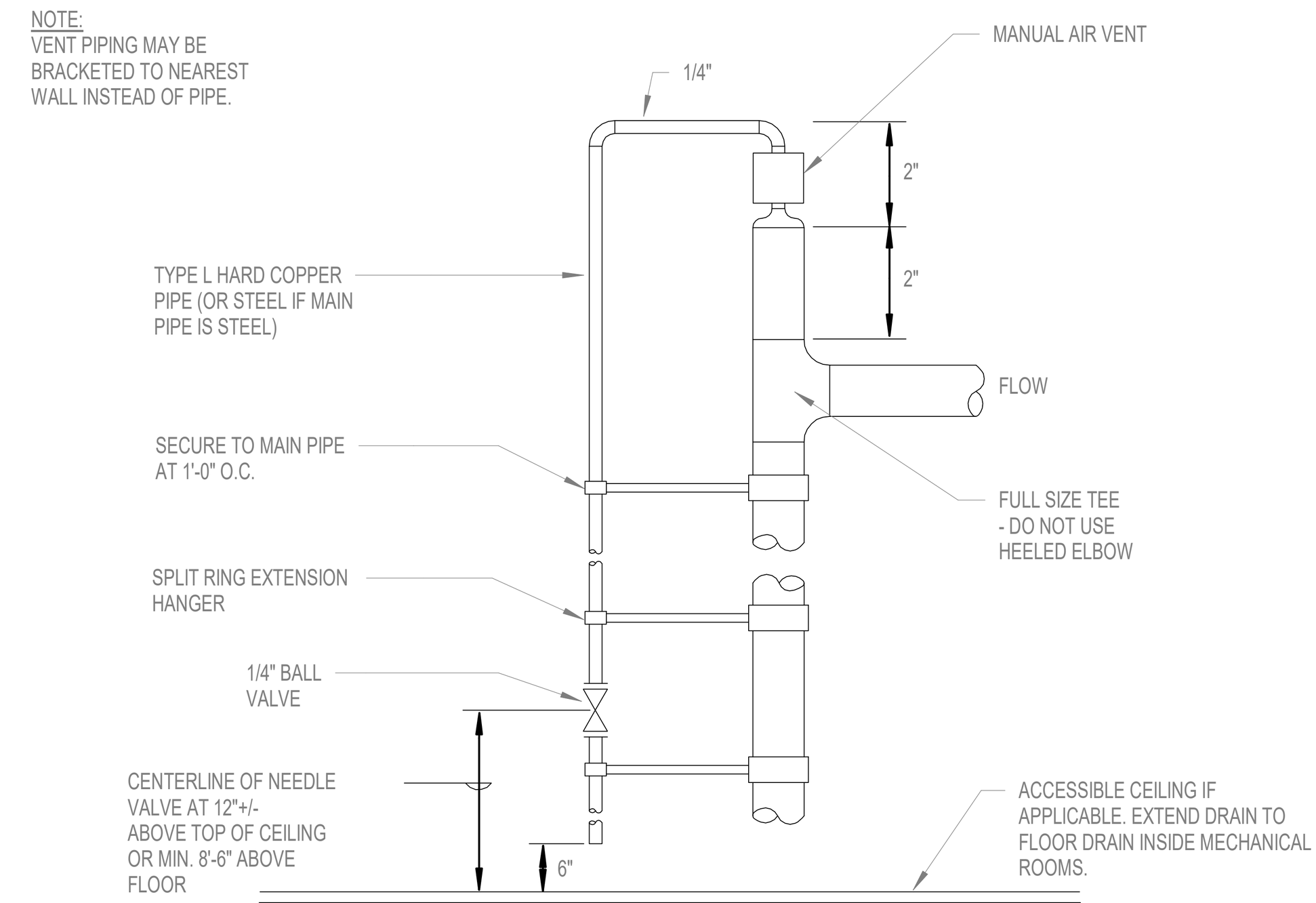
PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

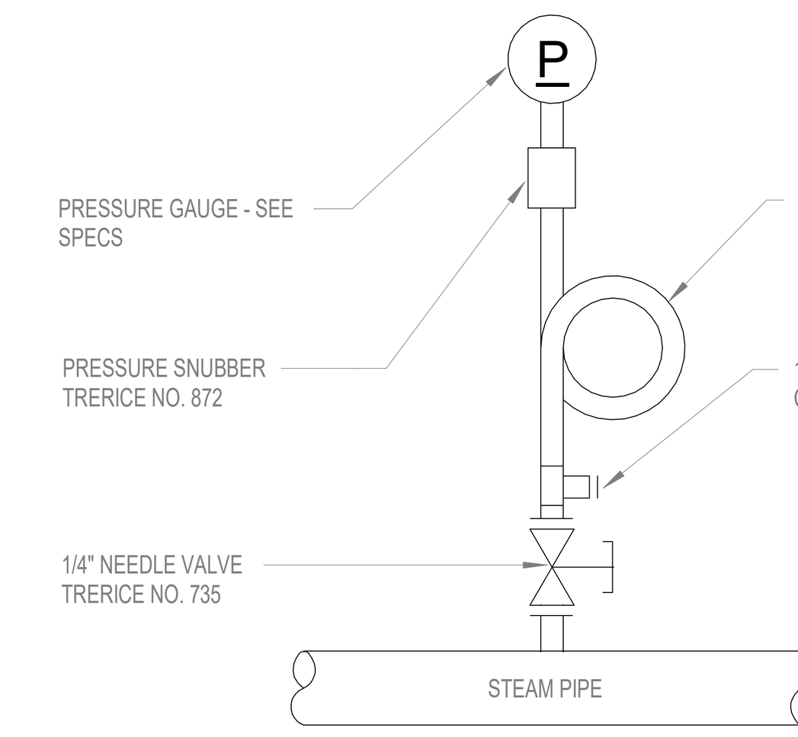
No.	Description	Date

MECHANICAL DETAILS

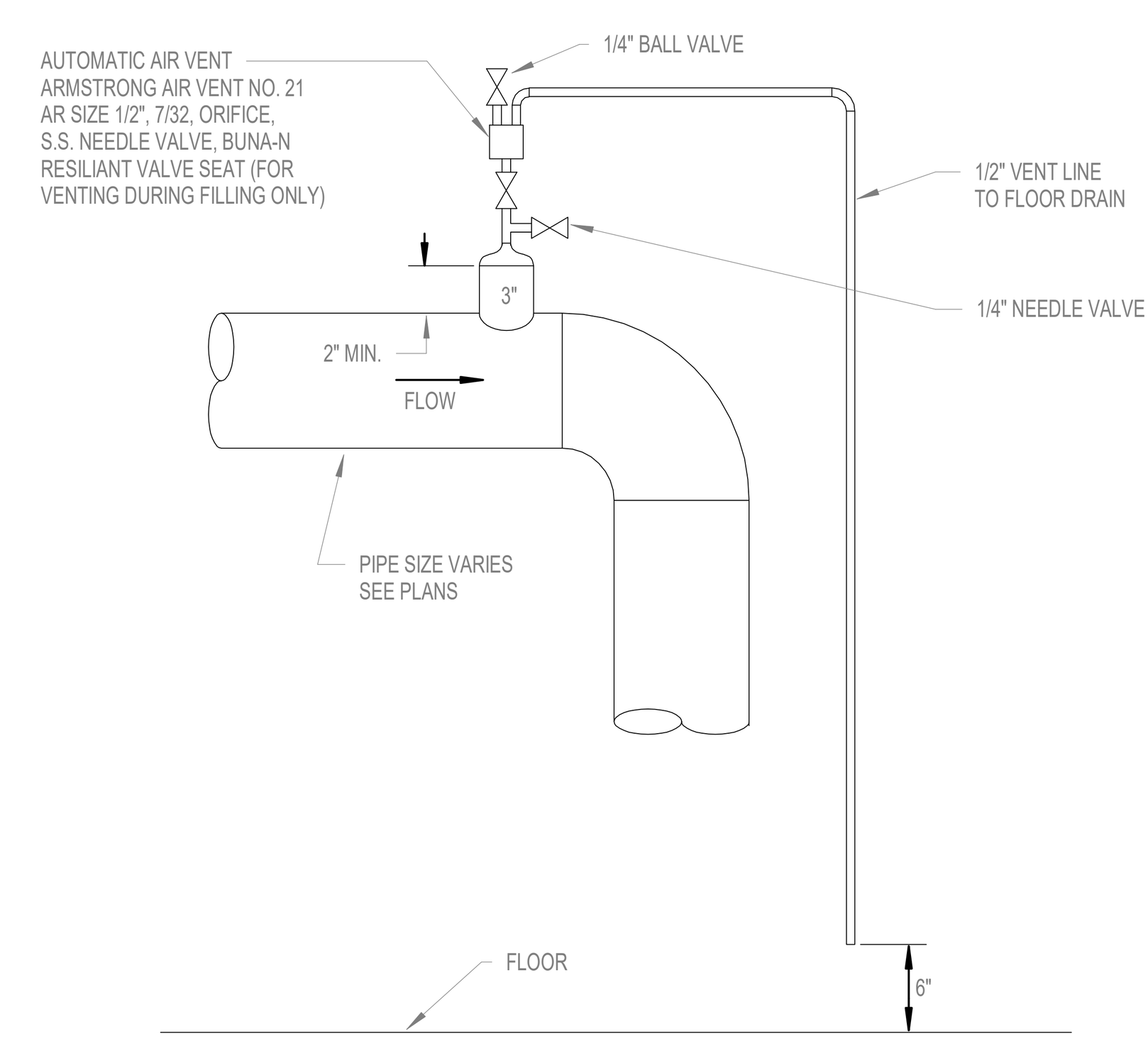
M-301



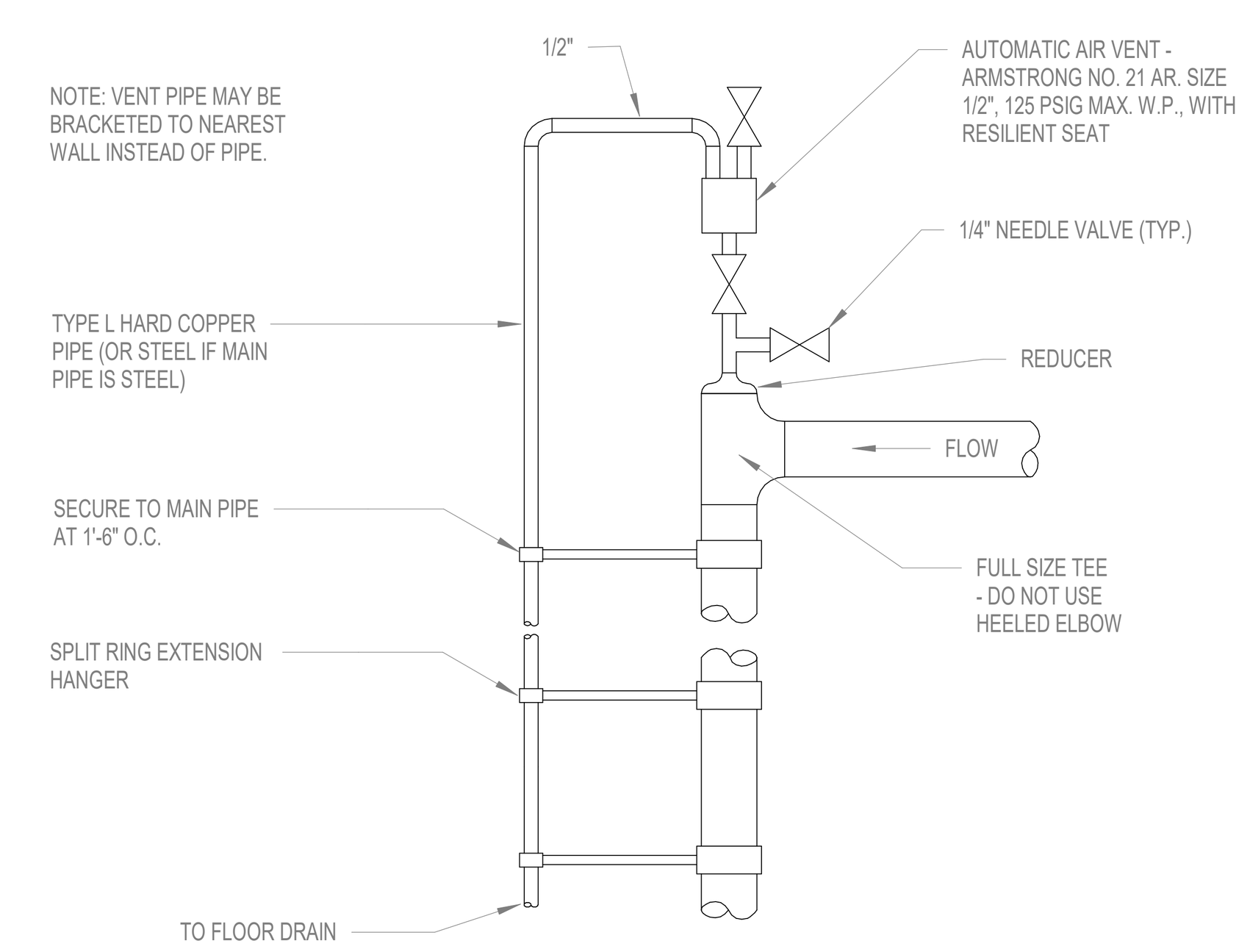
A MANUAL AIR VENT DETAIL - PIPES 3" AND SMALLER
SCALE: NONE



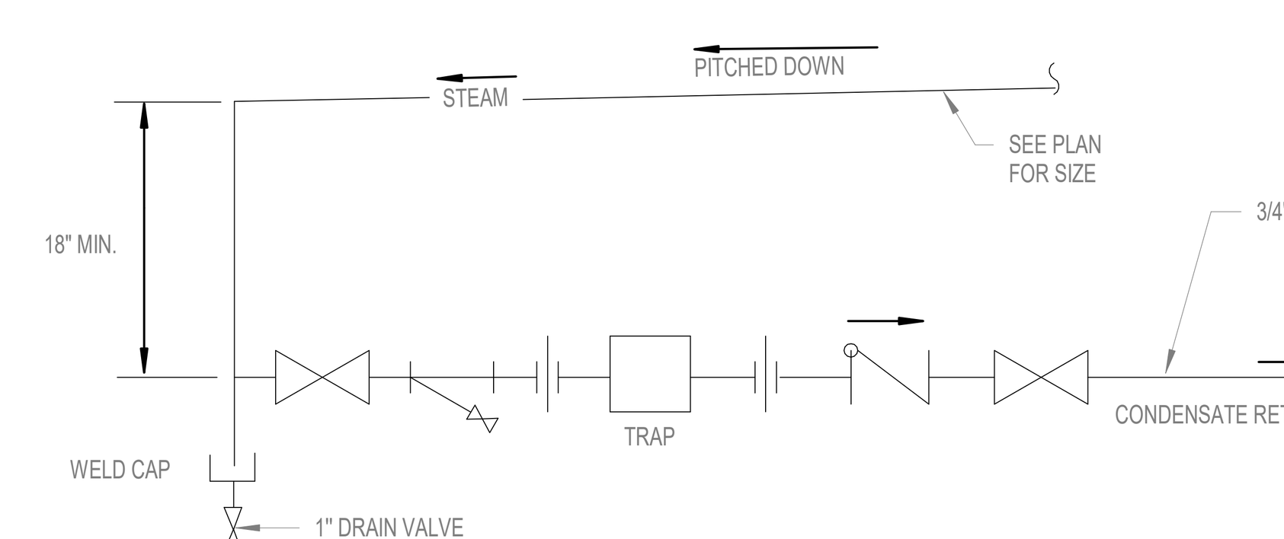
B STEAM PRESSURE GAUGE INSTALLATION DETAIL
SCALE: NONE



C AUTOMATIC AIR VENT DETAIL - PIPES 4" AND LARGER
SCALE: NONE



D AUTOMATIC AIR VENT DETAILS - 3" AND SMALLER
SCALE: NONE



NOTE: COLLECTING LEG TO BE SAME DIAMETER AS STEAM MAIN. PROVIDE 1" DRAIN VALVE AT BOTTOM OF COLLECTING LEG. PROVIDE COLLECTING LEGS AT BUT NOT LIMITED TO:

- END OF MAINS
- AHEAD OF EXPANSION JOINTS
- AHEAD OF PRESSURE REDUCING VALVE
- AHEAD OF TEMPERATURE REGULATORS
- BOTTOM OF RISERS
- SEPARATORS

E TYPICAL STEAM END OF MAIN DRIP LEG DETAIL
SCALE: NONE

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859.253.0892 cmta.com

CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
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REVISIONS

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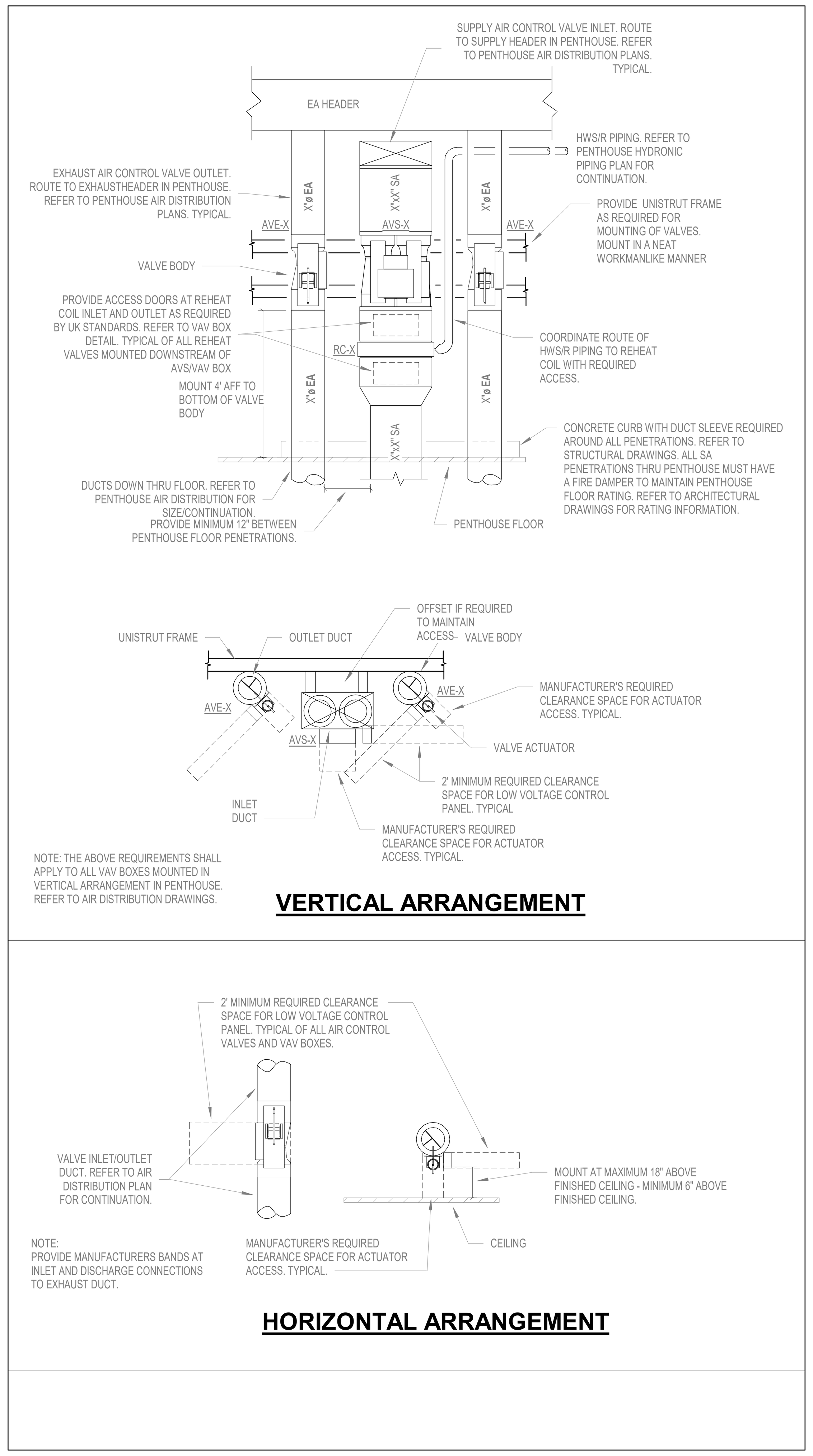
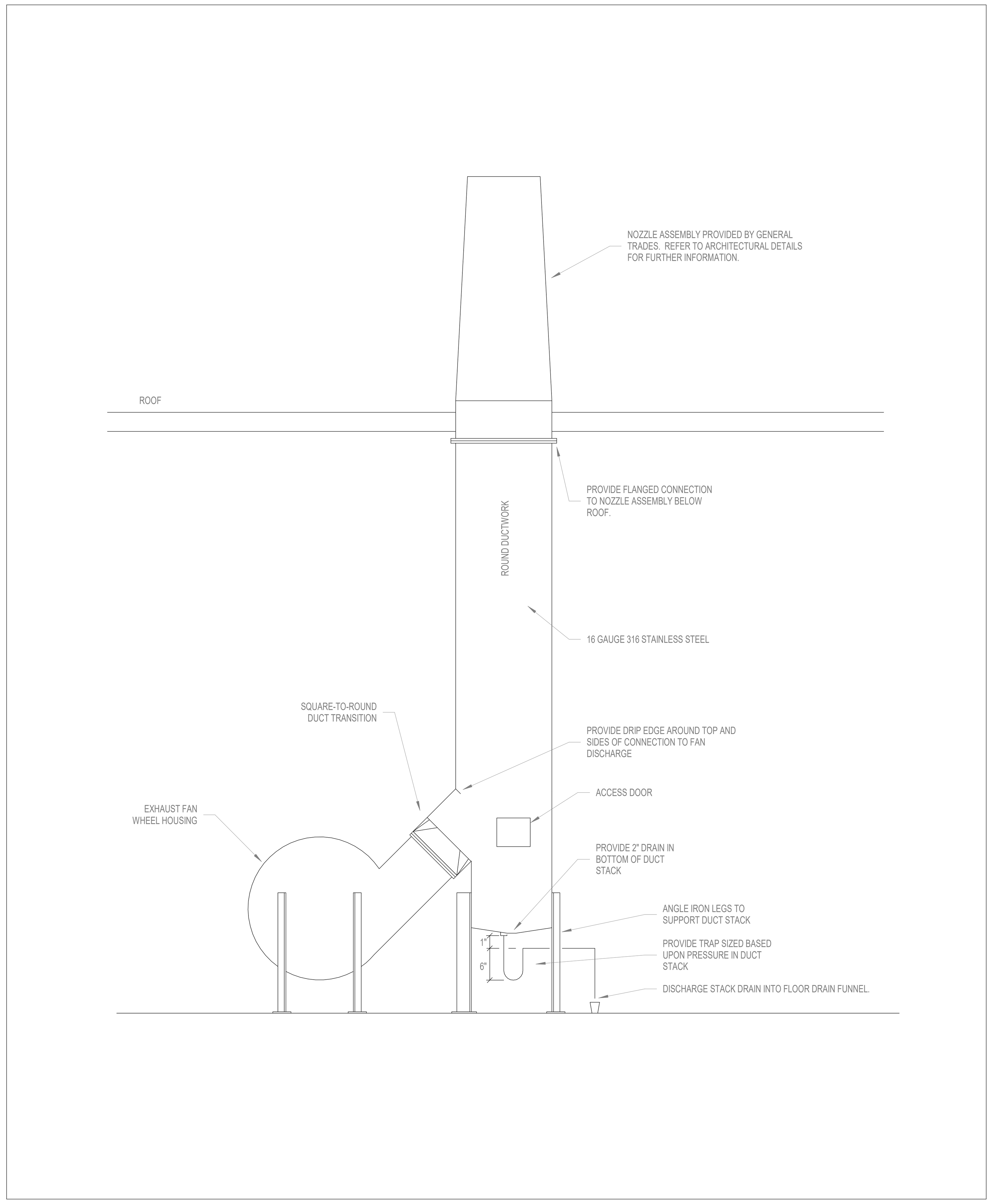
MECHANICAL DETAILS

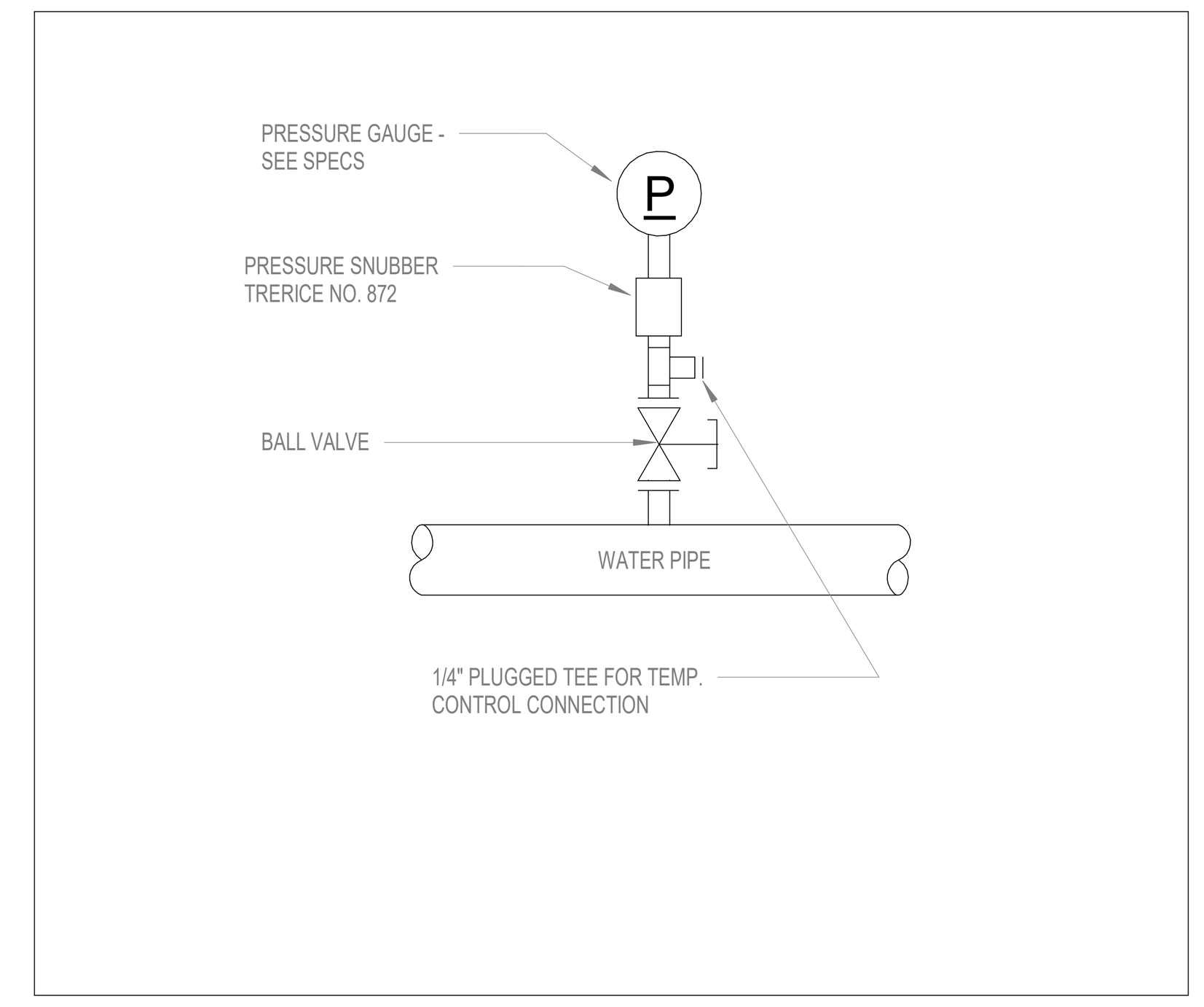
M-302



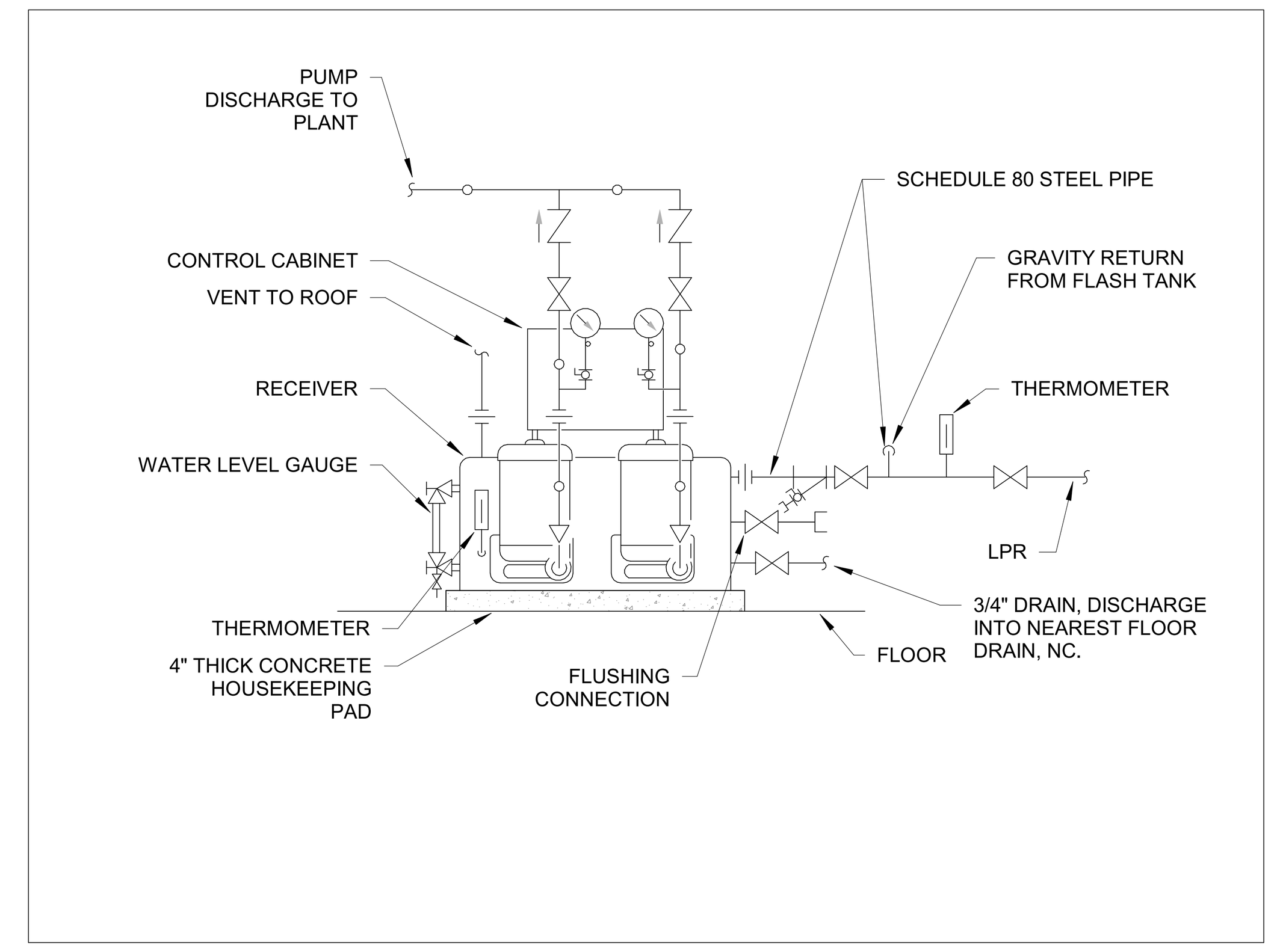
A AIR CONTROL VALVE DETAIL
SCALE: NONE



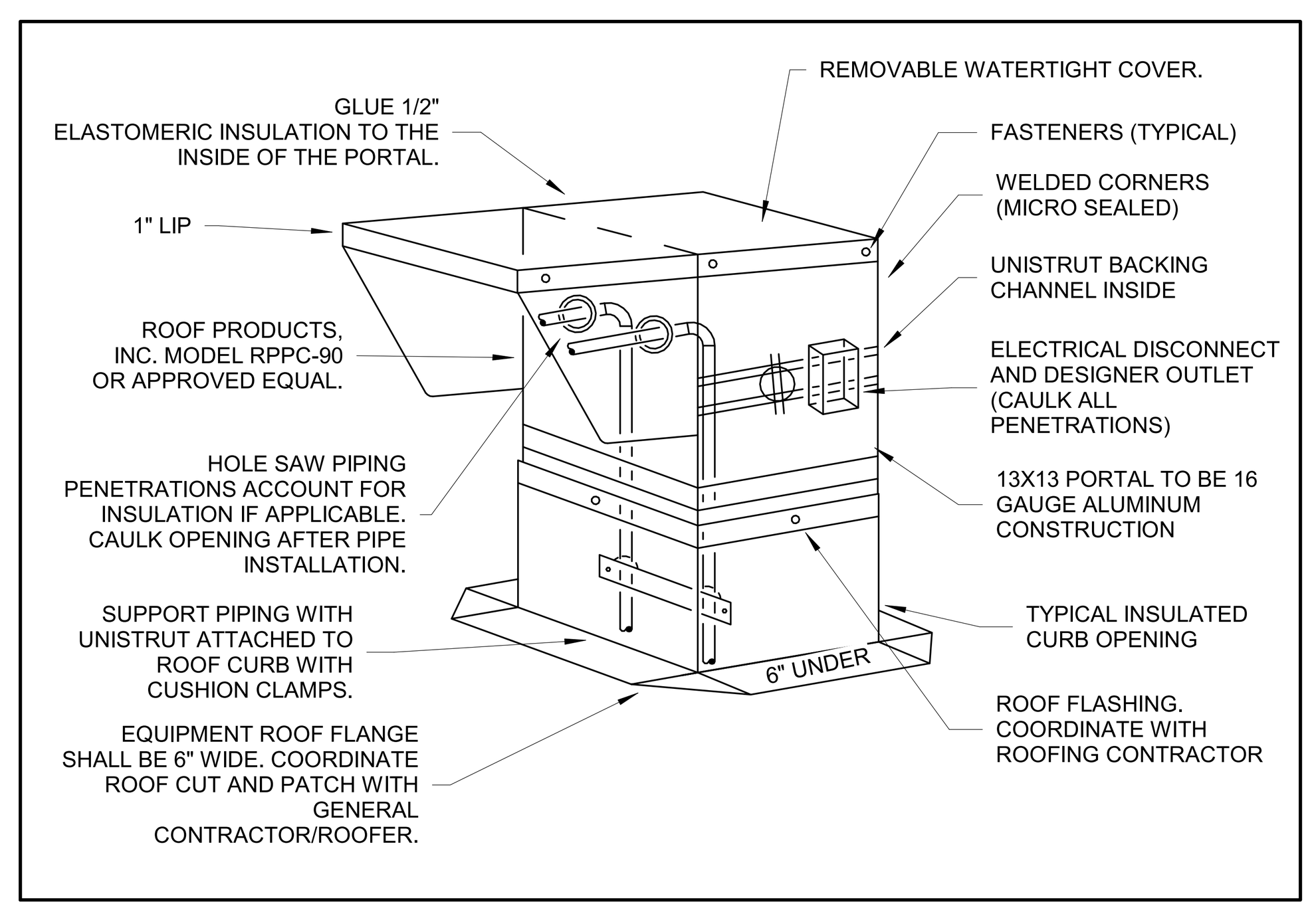
B HAZARDOUS EXHAUST FAN OFFSET STACK DETAIL
SCALE: NONE



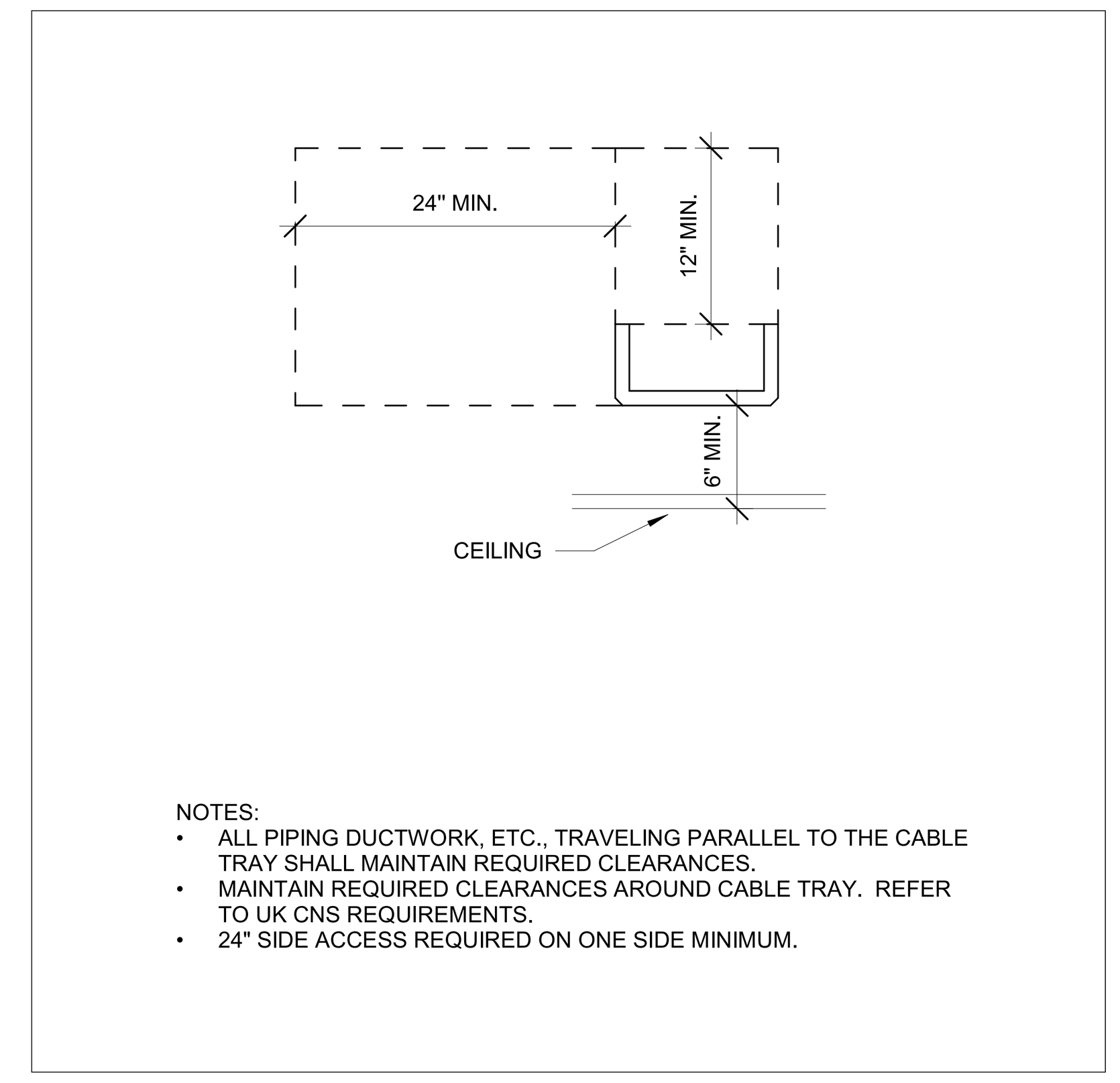
C WATER PRESSURE GAUGE INSTALLATION
SCALE: NONE



D CONDENSATE RECEIVER PUMP PIPING SCHEMATIC
SCALE: NONE



E PIPE CHASE / ROOF CURB DETAIL
SCALE: NONE



F CABLE TRAY CLEARANCE DETAIL
SCALE: NONE

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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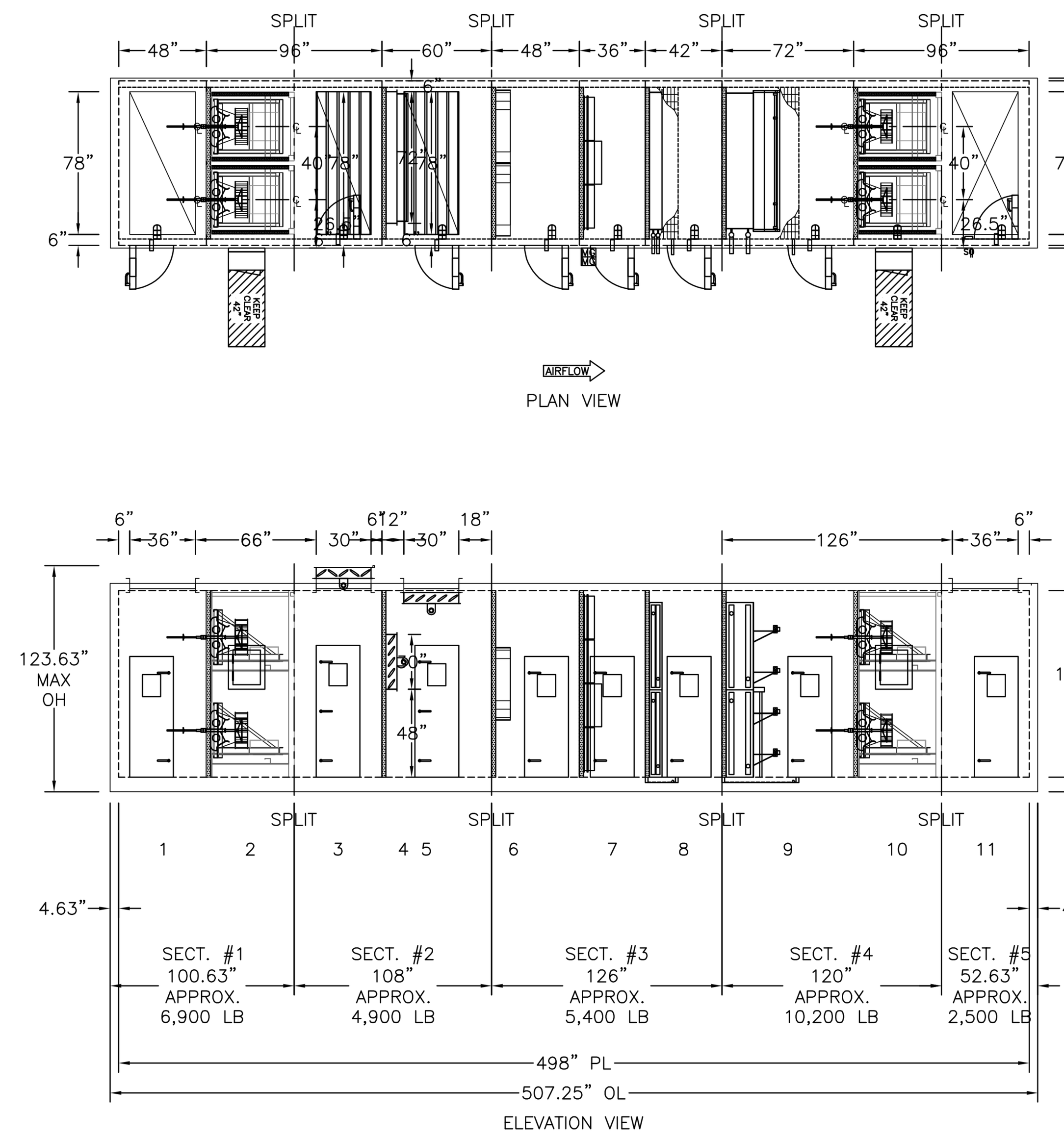
MECHANICAL DETAILS

M-303

3/13/2023 4:27:21 PM

1. RA OPENING
2. MATRIX RETURN FAN W/ BALANCE STREAM & SOUND BAFFLES (TYP OF 4)
3. EA DAMPER
4. RA MIXING DAMPER
5. OA DAMPER
6. AIR BLENDER
7. FILTER, 2" MERV 8 PLEATED & 4" MERV 14 MINI-PLEATS WITH FILTER MONITORING FRAME
8. HOT WATER HEATING COIL(S)
9. CHILLED WATER COOLING COIL(S)
10. MATRIX SUPPLY FAN W/ BALANCE STREAM & SOUND BAFFLES (TYP OF 4)
11. SA OPENING

UNIT IS OWNER PROVIDED AND INSTALLED BY CONTRACTOR.

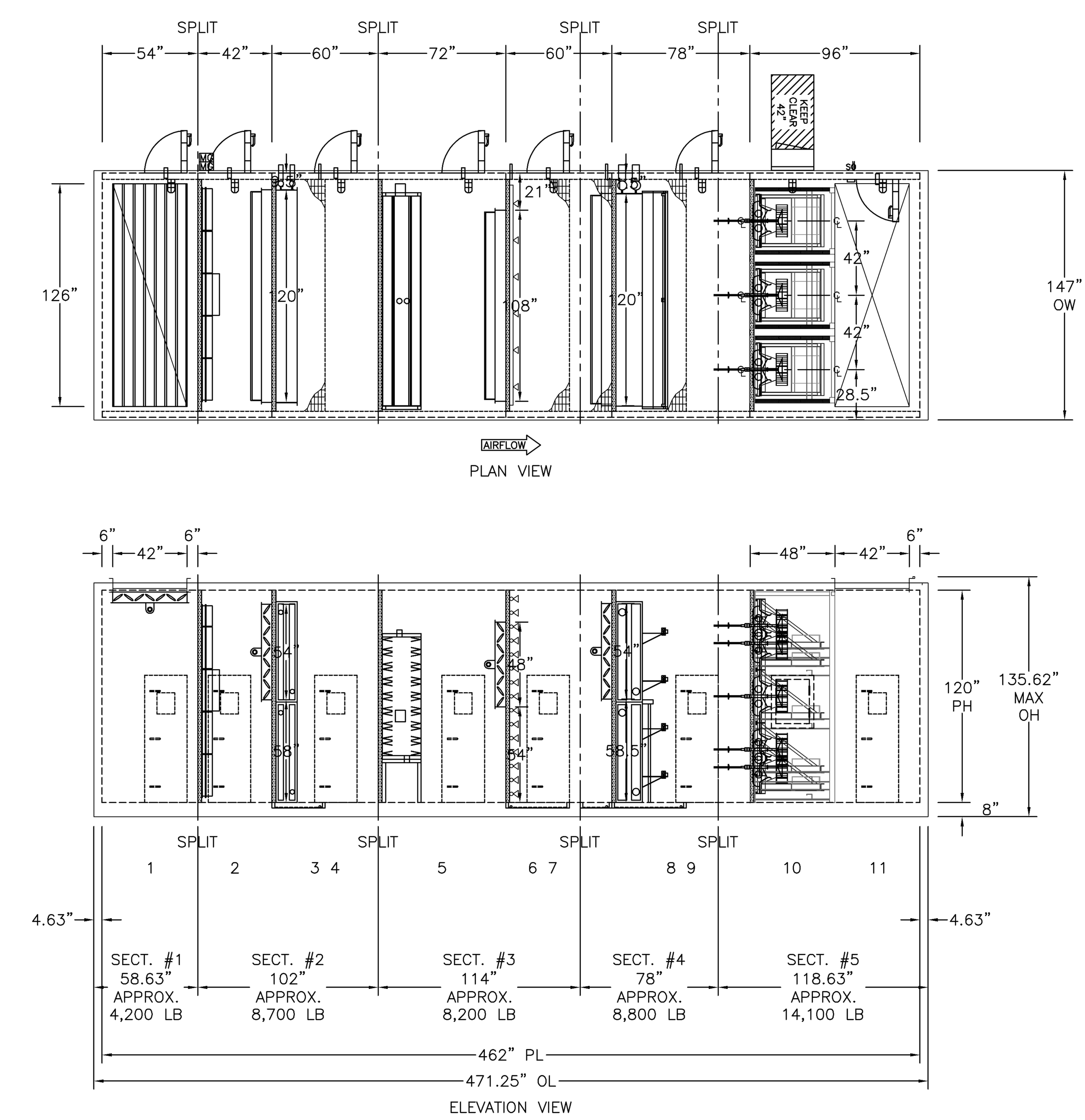


APPROXIMATE UNIT SHIPPING WEIGHT 29,900 LB

A AHU-8 DETAIL
1/8" = 1'-0"

1. OA DAMPER
2. FILTER, 2" MERV 8 PLEATED & 4" MERV 14 MINI-PLEATS WITH FILTER MONITORING FRAME
3. COIL ISOLATION DAMPER
4. BLANK SECTION FOR FUTURE ENERGY RECOVERY COIL(S)
5. STEAM IFB HEATING COIL(S)
6. ISOLATION HUMIDIFIER DAMPER
7. HUMIDIFIER
8. ISOLATION COIL DAMPER
9. CHILLED WATER COOLING COIL(S)
10. MATRIX SUPPLY FAN W/ BALANCE STREAM & SOUND BAFFLES (TYP OF 8)
11. SA OPENING

UNIT IS OWNER PROVIDED AND INSTALLED BY CONTRACTOR.



APPROXIMATE UNIT SHIPPING WEIGHT 44,000 LB

B AHU-9 DETAIL
1/8" = 1'-0"

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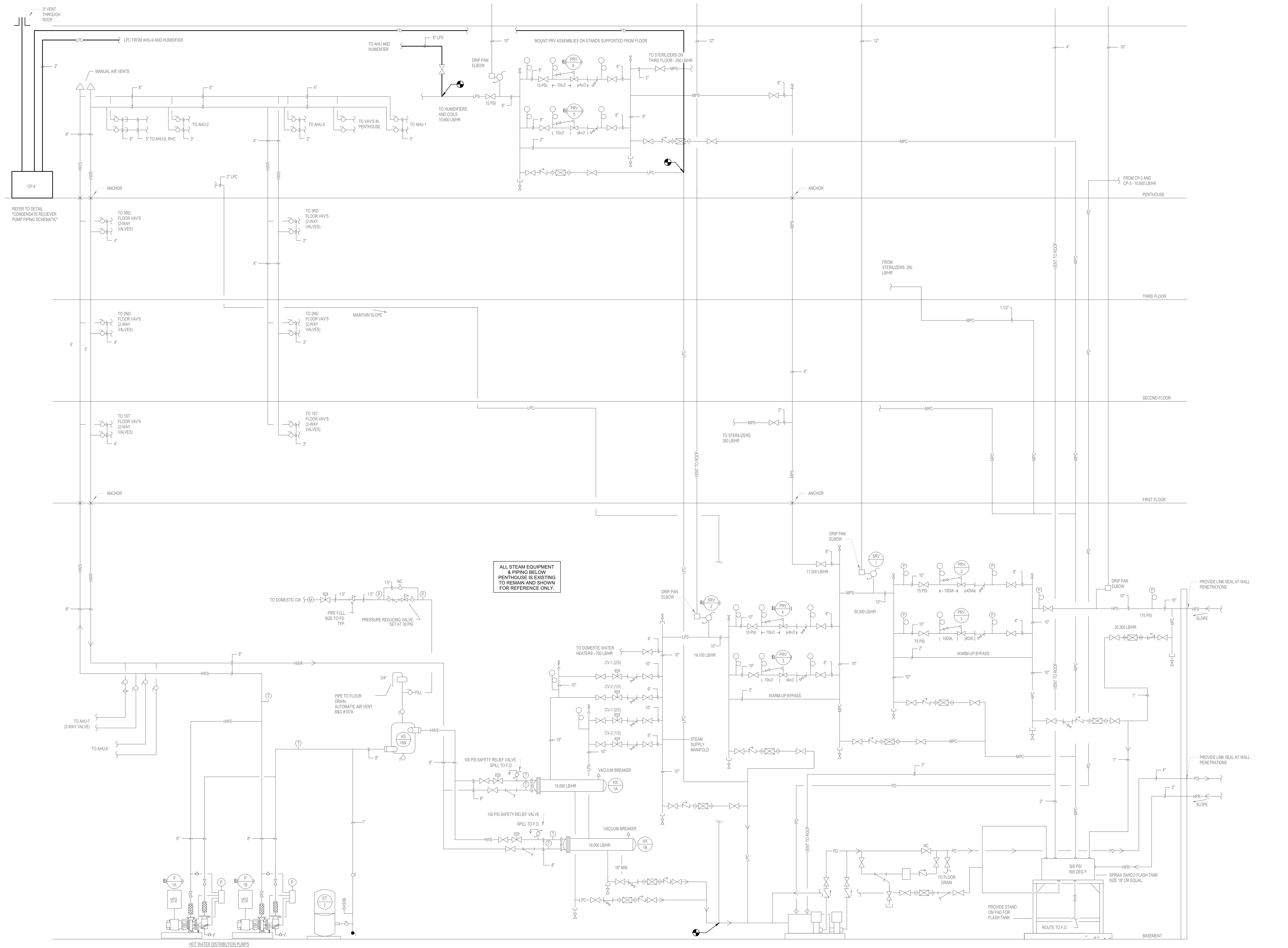
MECHANICAL DETAILS

M-304



STEAM AND HOT WATER BUILDING PIPING SCHEMATIC

NOT TO SCALE

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STATE OF KENTUCKY — CHRISTOPHER REEVES 25045 — LICENSED PROFESSIONAL ENGINEER

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IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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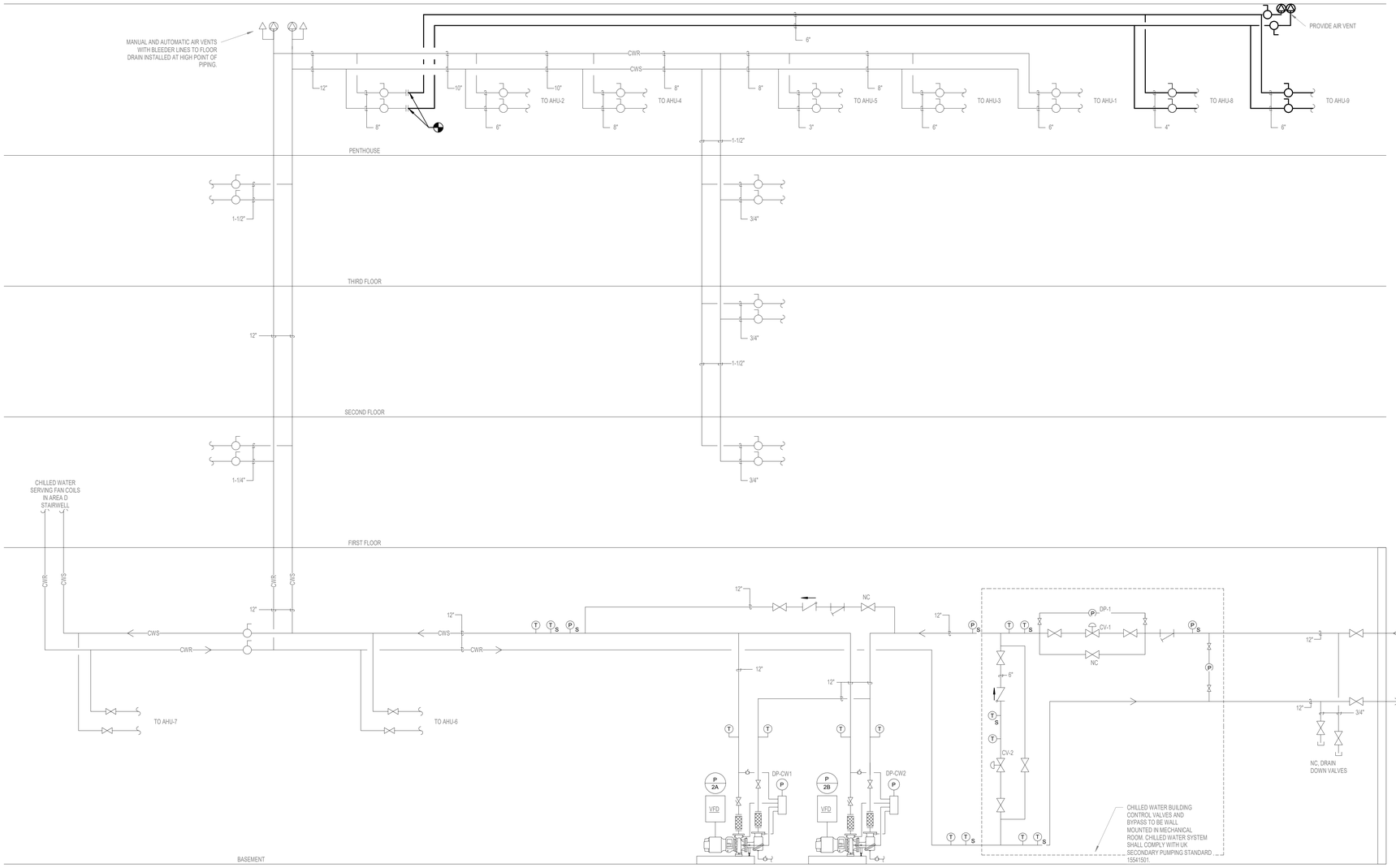
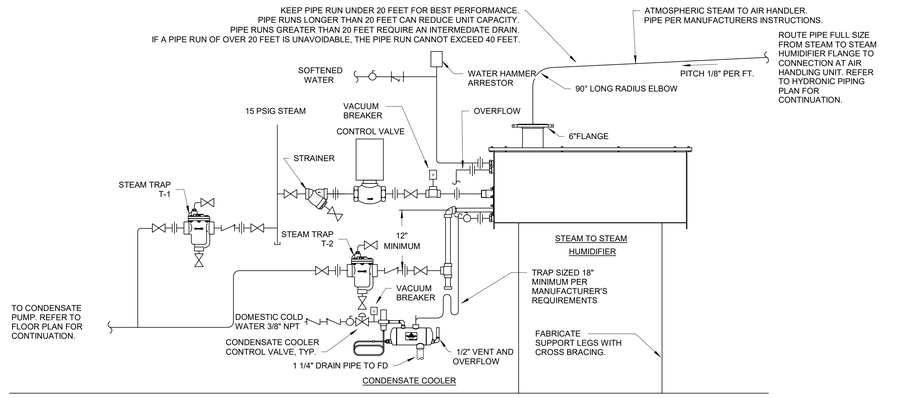
MECHANICAL PIPING SCHEMATICS

M-500



CHILLED WATER PIPING SCHEMATIC

NOT TO SCALE



STEAM TO STEAM HUMIDIFIER DETAIL

NTS

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COMMONWEALTH OF KENTUCKY
CHRISTOPHER M. REEVES
25045
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CONSULTING MECHANICAL & ELECTRICAL ENGINEERS

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IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
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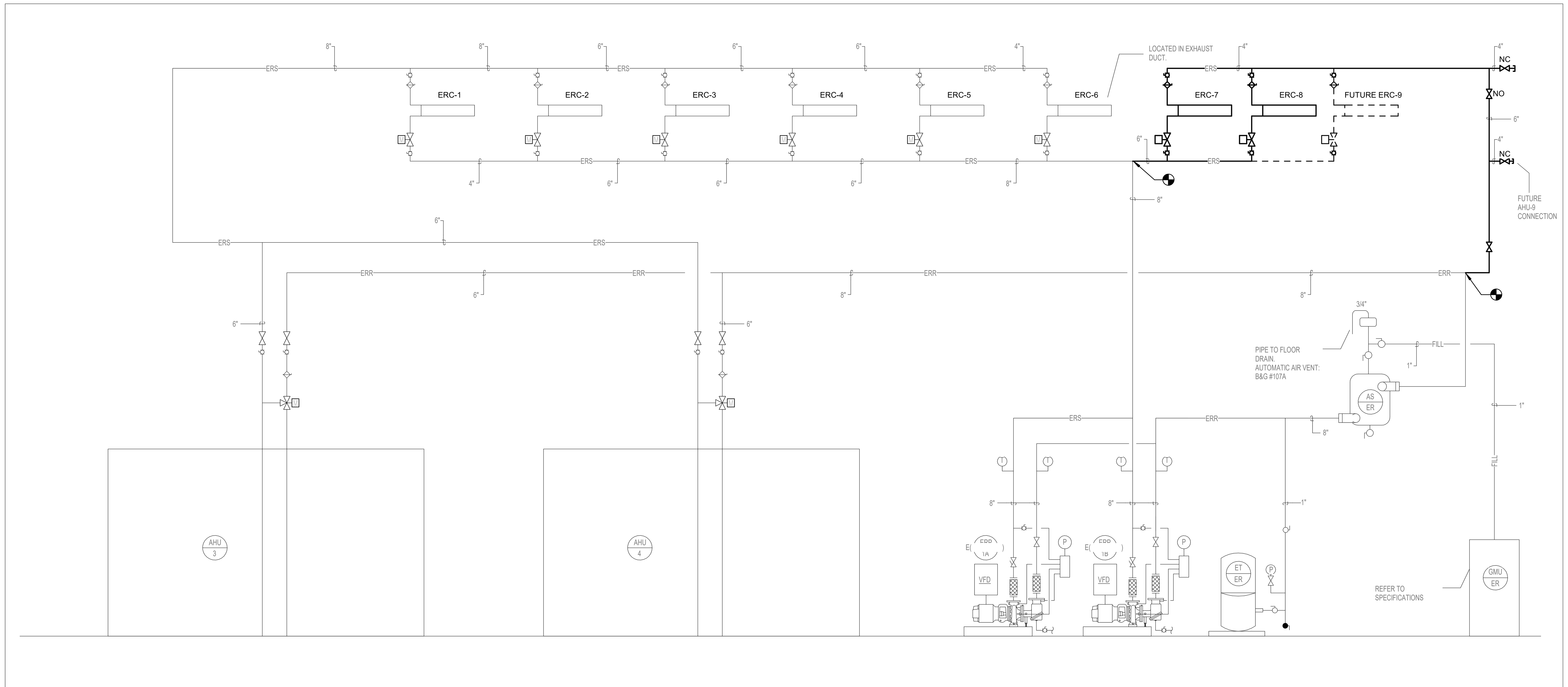
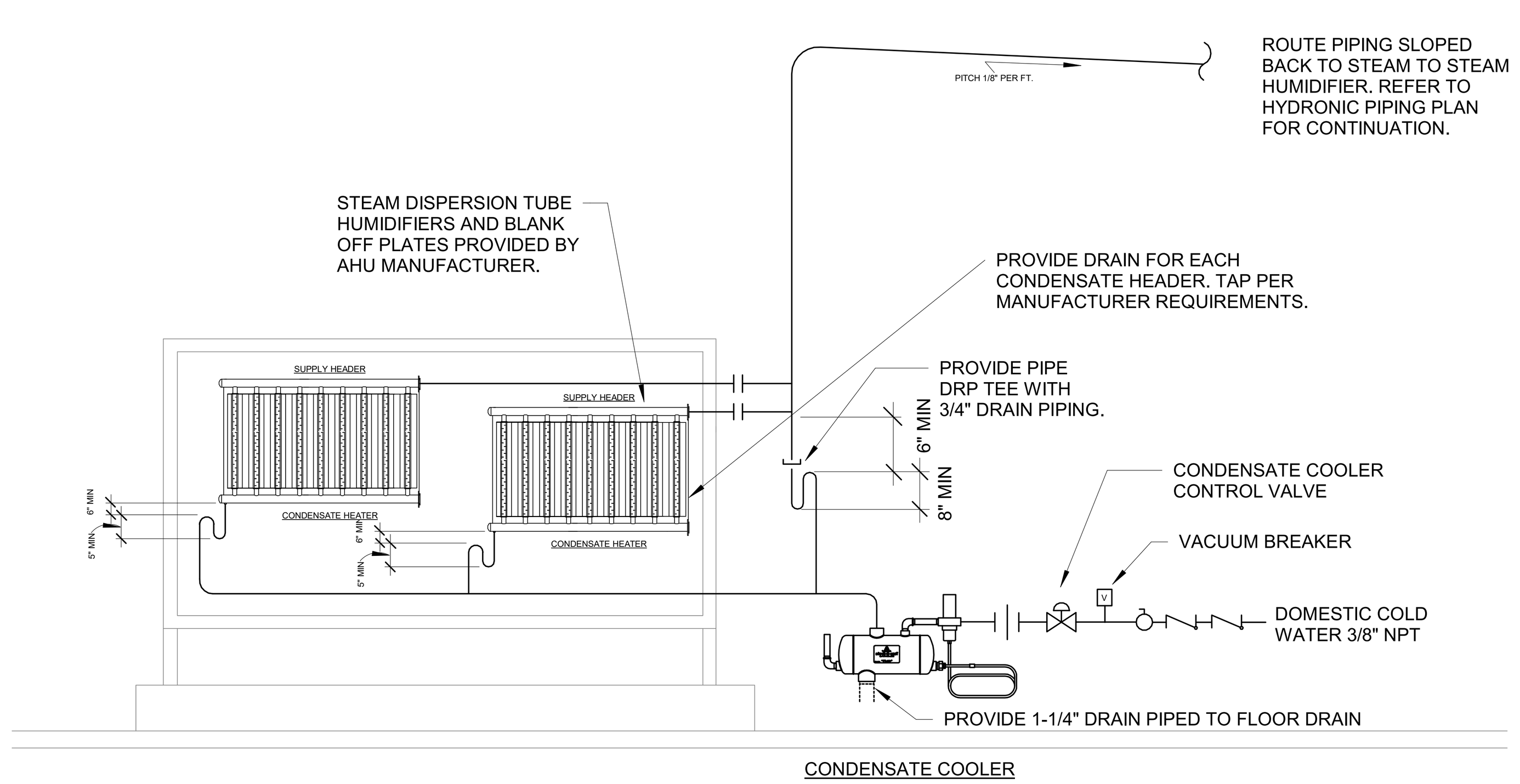
MECHANICAL PIPING SCHEMATICS

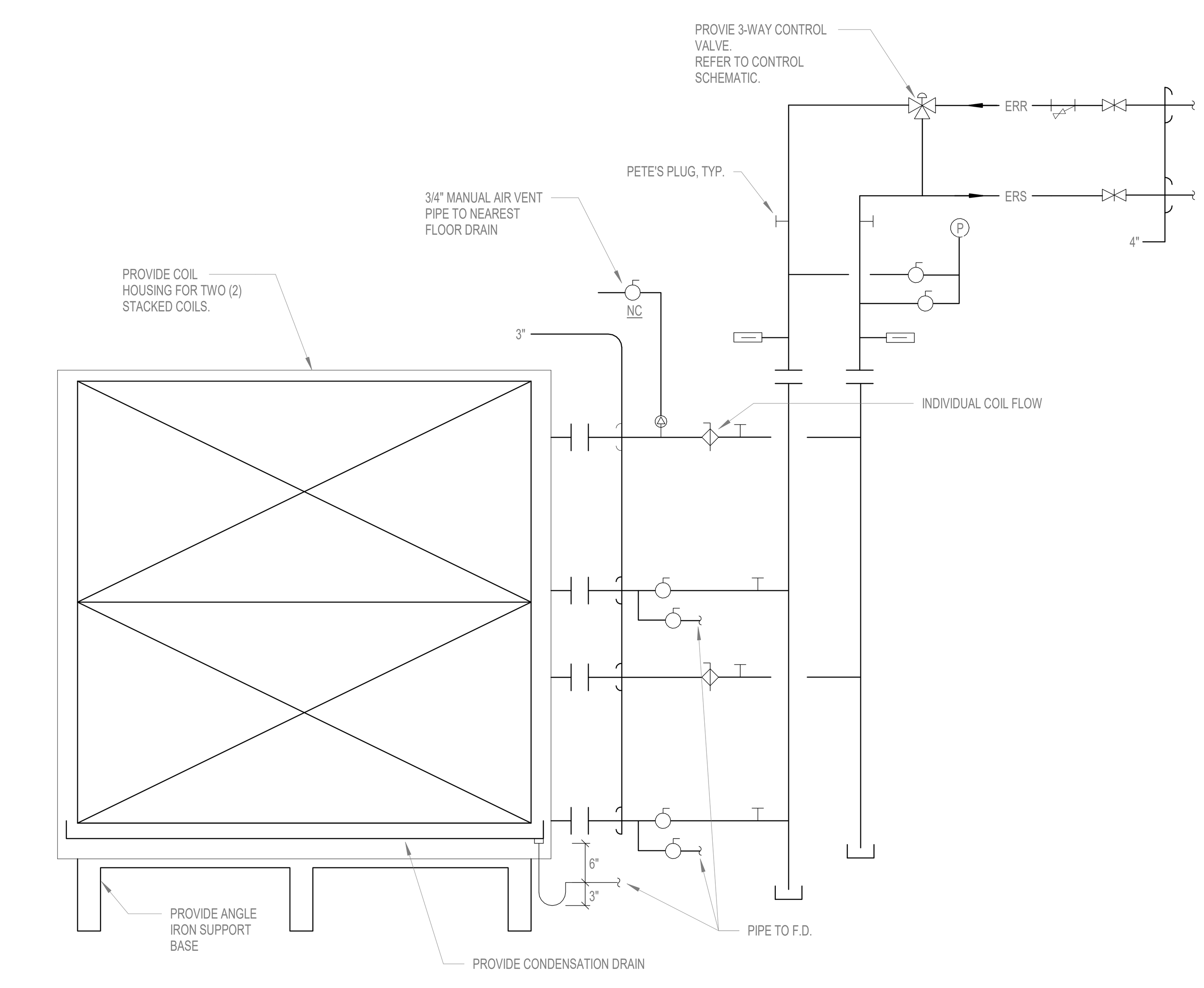
M-501



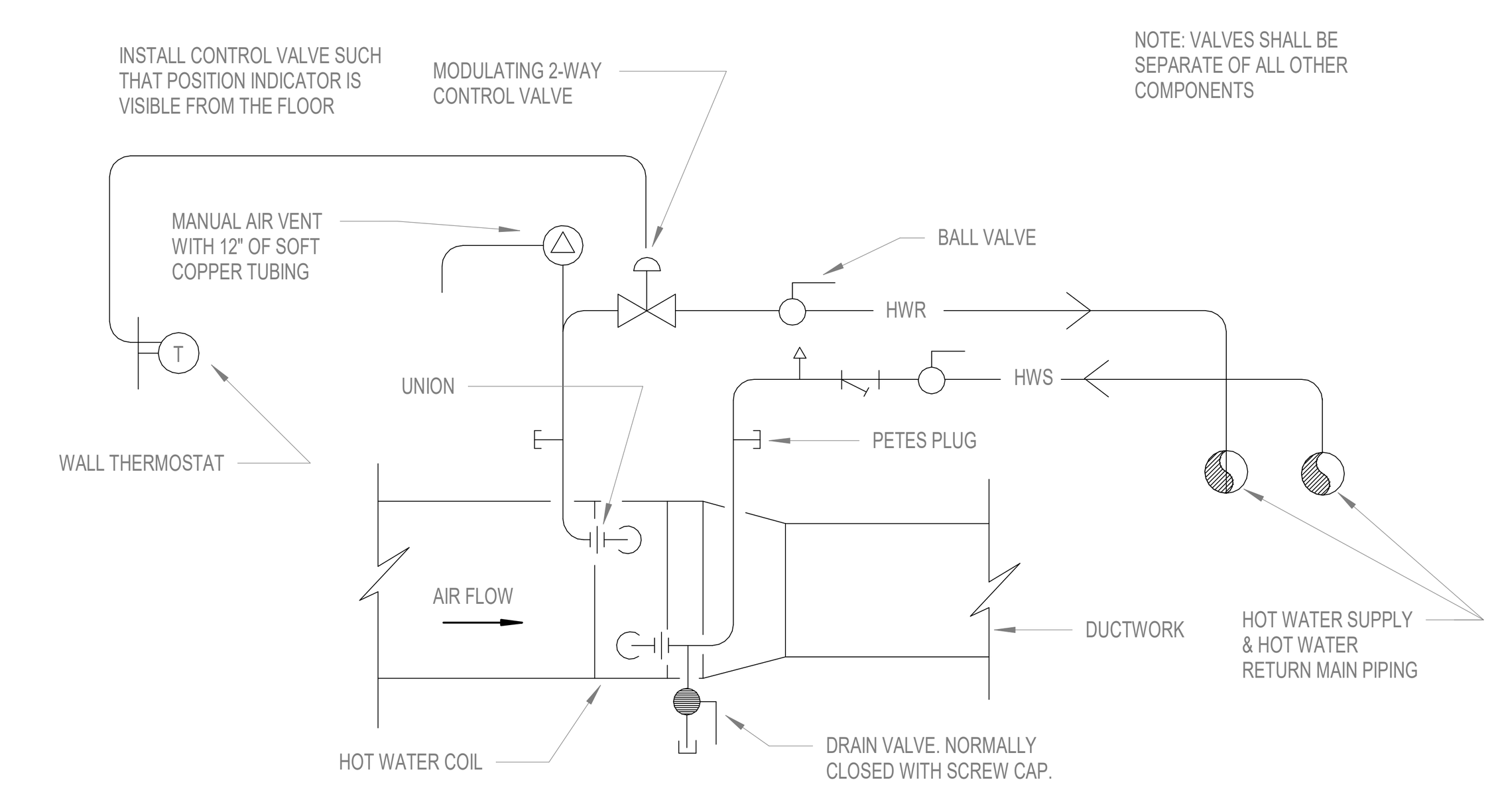
ENERGY RECOVERY LOOP SCHEMATIC
NOT TO SCALE



AHU HUMIDIFIER PIPING SCHEMATIC - AHU 9
NOT TO SCALE



EXHAUST FAN ENERGY RECOVERY COIL PIPING SCHEMATIC
NOT TO SCALE



REHEAT COIL, VAV, & CAV BOX PIPING SCHEMATIC
NOT TO SCALE

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STATE OF KENTUCKY
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25045
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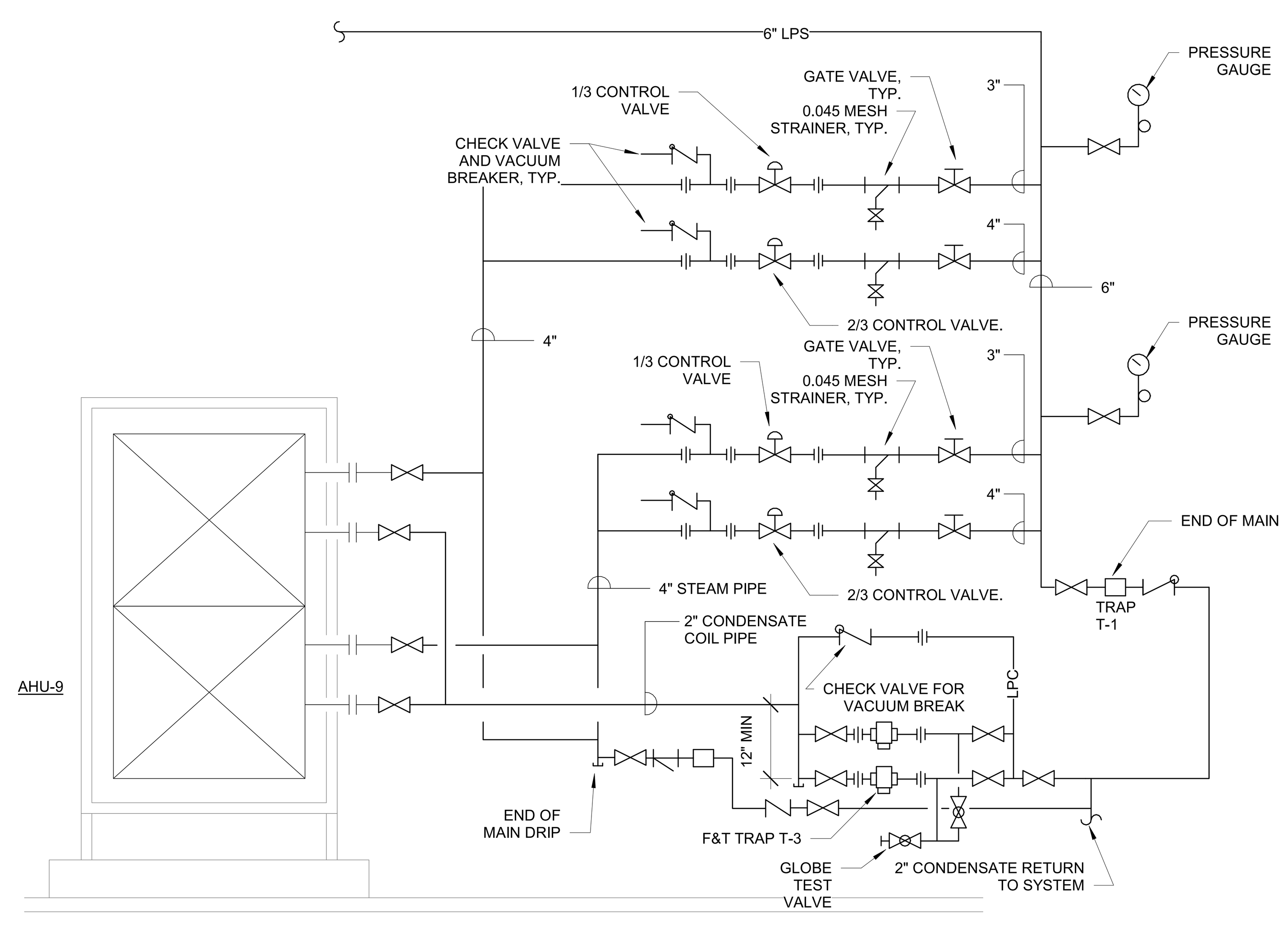
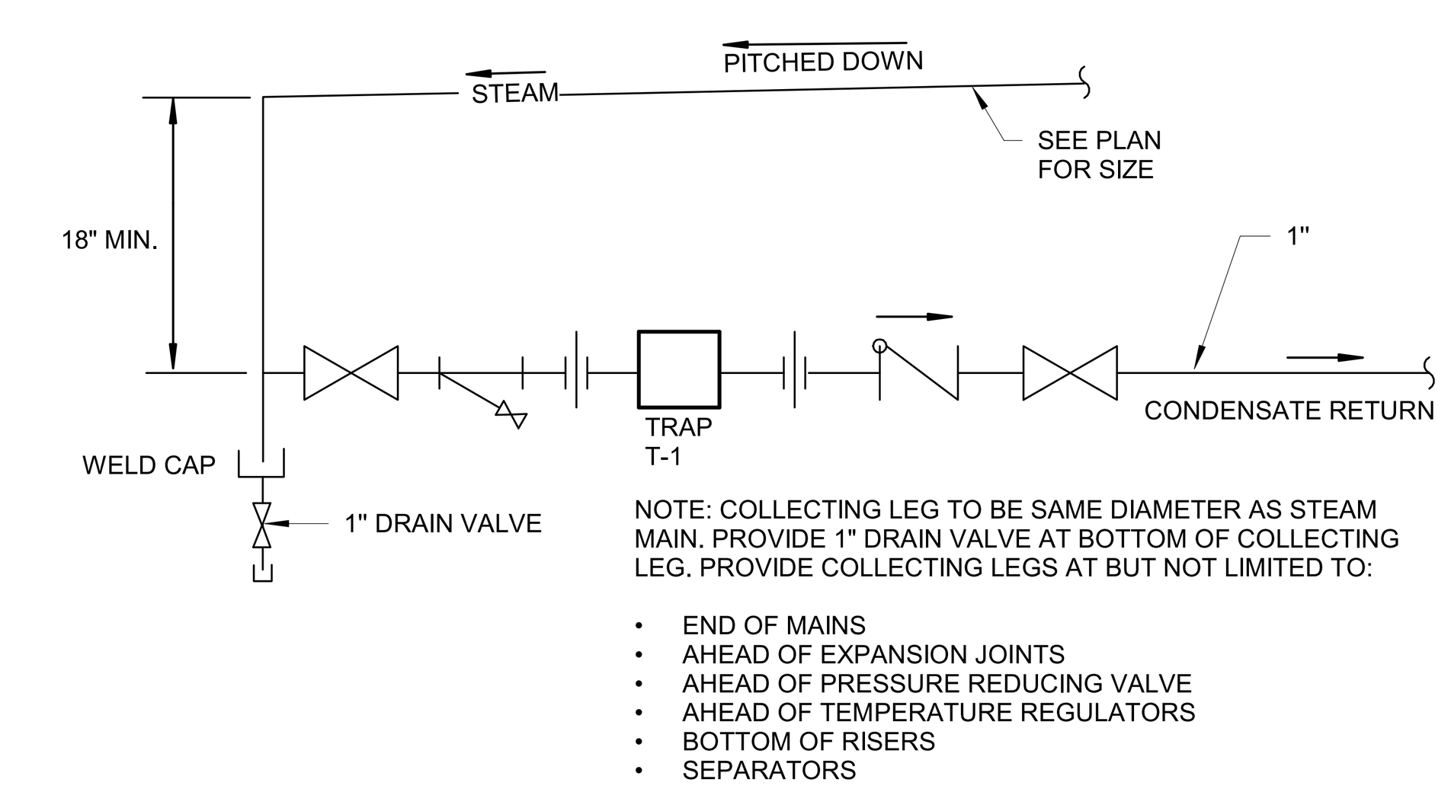
MECHANICAL PIPING SCHEMATICS

M-502



STEAM COIL PIPING SCHEMATIC - AHU-9

NOT TO SCALE

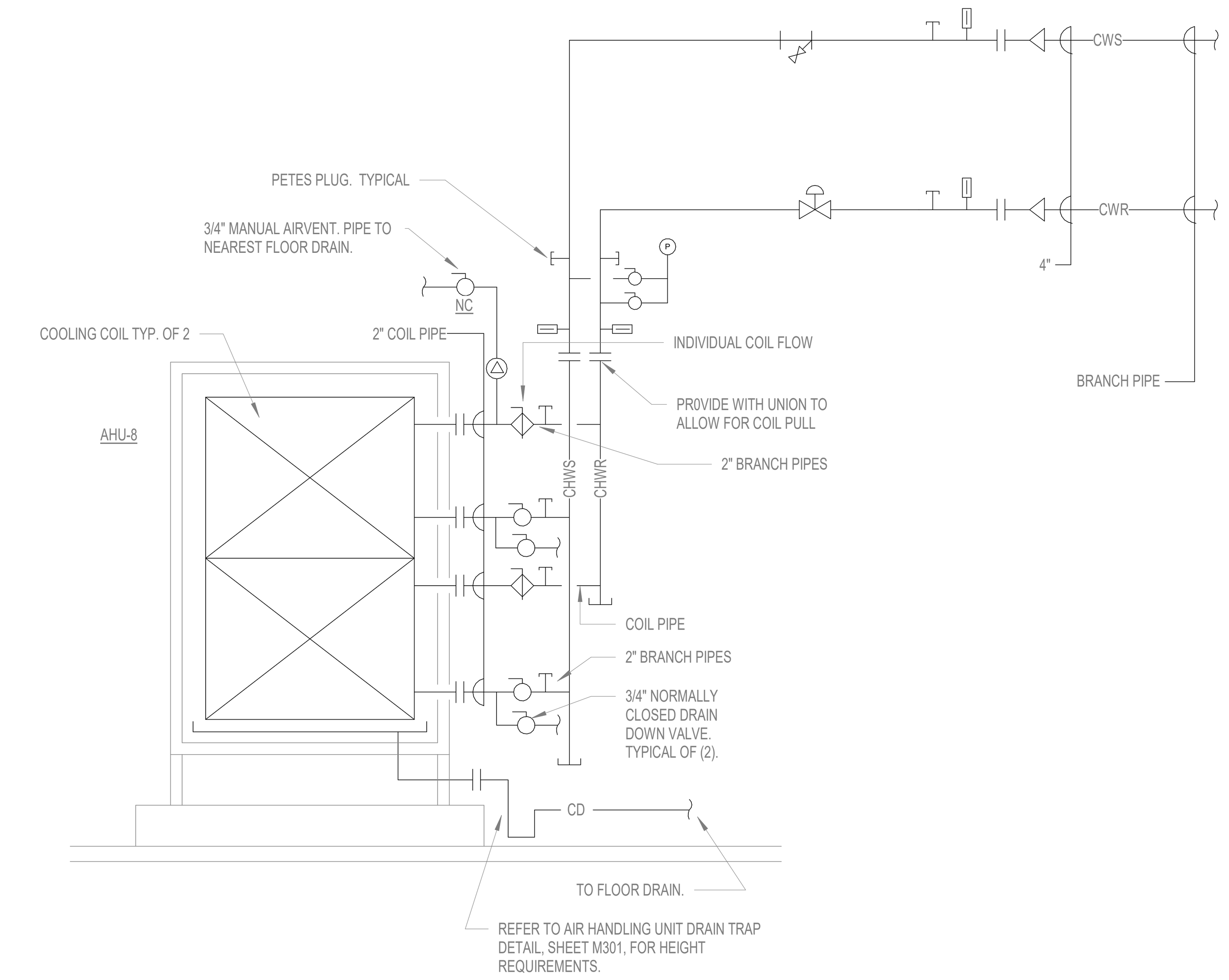


NOTE: COLLECTING LEG TO BE SAME DIAMETER AS STEAM MAIN, PROVIDE 1" DRAIN VALVE AT BOTTOM OF COLLECTING LEG. PROVIDE COLLECTING LEGS AT BUT NOT LIMITED TO:

- END OF MAINS
- AHEAD OF EXPANSION JOINTS
- AHEAD OF PRESSURE REDUCING VALVE
- AHEAD OF TEMPERATURE REGULATORS
- BOTTOM OF RISERS
- SEPARATORS

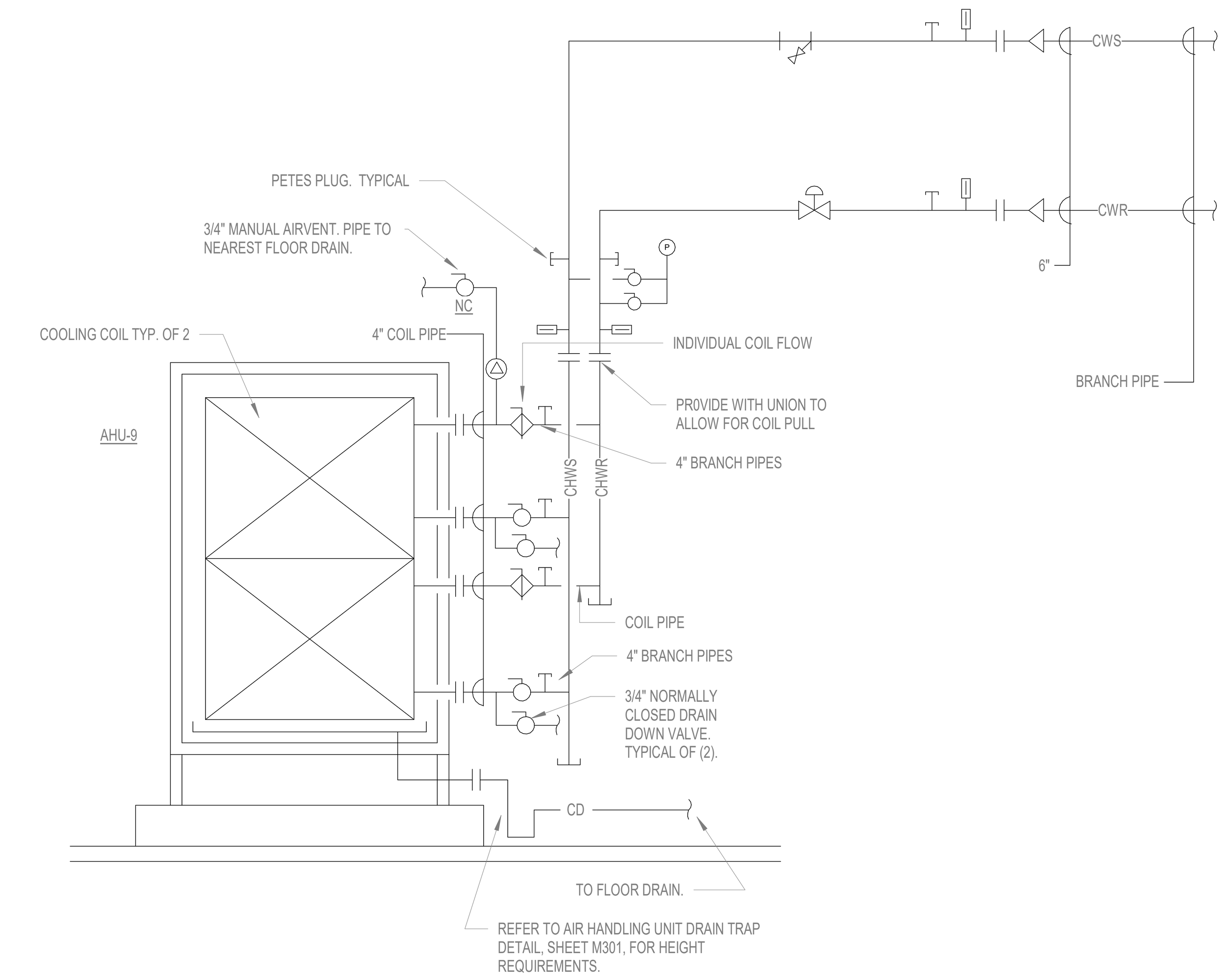
TYPICAL STEAM END OF MAIN DRIP LEG SCHEMATIC

NOT TO SCALE



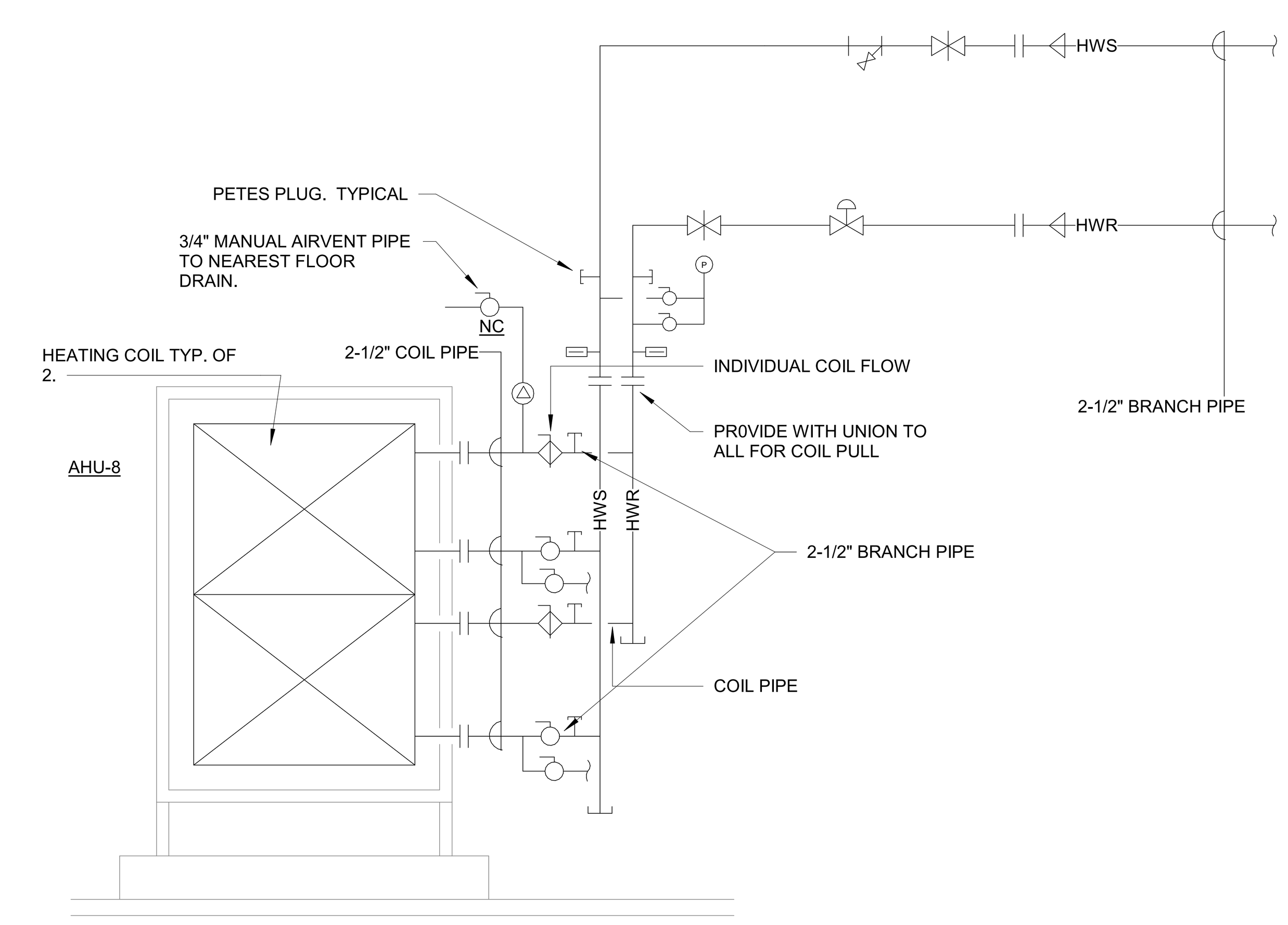
CHILLED WATER COIL PIPING SCHEMATIC - AHU 8

NOT TO SCALE



CHILLED WATER COIL PIPING SCHEMATIC - AHU 9

NOT TO SCALE



HOT WATER COIL PIPING SCHEMATIC - AHU-8

NOT TO SCALE

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MECHANICAL PIPING SCHEMATICS

M-503

ENERGY RECOVERY COIL SCHEDULE

									SUMMER PERFORMANCE			WINTER PERFORMANCE			
MARK	MANUFACTURER	NOMINAL SIZE	FIN SPACING (PER FOOT)	NO. OF ROWS	COIL AIR PD	SUMMER/ WINTER CFM	SUMMER /WINTER GPM	COIL WATER PD	LAT(DB/WB)	HEAT TRANSFER (MBH)	EWT/ LWT(F)	LAT(DB/WB)	HEAT TRANSFER (MBH)	EWT/ LWT(F)	REMARKS
ERC-7	TRANE	60x96	96	6	0.8	27,000	115	23.43	81.5 / 63.3	269	86.2 / 81.2	43.5 / 42.1	795	30 / 45	ALL
ERC-8	TRANE	60x96	96	6	0.8	27,000	115	23.43	81.5 / 63.3	269	86.2 / 81.2	43.5 / 42.1	795	30 / 45	ALL

REMARKS:
1. HERISITE COATING FOR LAB EXHAUST ENERGY RECOVERY.
2. COIL SECTIONS ARE COMPRISED OF (Z) 30x96 COILS.
3. 0.035 TUBE THICKNESS, ALUMINUM FINS, COPPER TUBES.
4. SUMMER CONDITIONS BASED ON ENTERING AIR TEMPERATURE OF 72DB/60WB. WINTER CONDITIONS BASED ON ENTERING AIR TEMPERATURE OF 72DB/54.5WB.
5. PERFORMANCE BASED ON 40% PROPYLENE GLYCOL SOLUTION.

AIR HANDLING UNIT SCHEDULE

								SUPPLY FAN												RETURN FAN											
MARK	MANUF.	MODEL	CONFIGURATION	SERVICE	LOCATION	NOM. SIZE LXWXH (IN.)	WEIGHT (LBS)	SA CFM	MIN. OA CFM	FAN TYPE	# OF FANS - RPM	T.S.P/E.S.P (IN WG)	MOTOR HP/BHP (PER FAN)	VOLT.	PH.	MCA	MOP	VFD	OP. FREQ.	RA CFM	FAN TYPE	# OF FANS - RPM	T.S.P./E.S.P. (IN WG)	MOTOR HP/BHP PER FAN	VOLT.	PH.	MCA	MOP	VFD	OP. FREQ.
AHU-8	CLIMATECRAFT	CAH96X84E	SEE PLANS	NON-LAB AREAS C & D	PENTHOUSE	508X93X124	29900	20000	5000	ARRAY	4	5.03/2.10	15/6.19	460 V	3	62 A	125 A	Yes	44.7	20000	ARRAY	4	2.26/2.00	5/2.56	460 V	3	34 A	70 A	Yes	5.8
AHU-9	CLIMATECRAFT	CAH120X156E	SEE PLANS	LAB & CLASSROOM AREAS C & D	PENTHOUSE	483X141X136	44000	42000	10000	ARRAY	8	7.08/3.00	15/8.73	460 V	3	155 A	300 A	Yes	49.9											

AIR HANDLING UNIT SCHEDULE (CONT...1)

	CHILLED WATER COIL											HEATING COIL													
MARK	TOTAL COOLING CAP. (MBH)	SENSIBLE COOLING CAP. (MBH)	EAT (DB/WB) (F)	LAT (DB/WB) (F)	MAX FACE VELOCITY (FPM)	MAX. AIR PRESSURE DROP (IN. WG.)	EWT/LWT (F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	COIL ROWS/NO. OF COILS	FIN SPACING (FINS/FT)	COIL TYPE	TOTAL HEATING CAP. (MBH)	EAT (F)	LAT (F)	MAX. FACE VELOCITY (FPM)	MAX. AIR PRESSURE DROP (IN. WG.)	EWT/LWT (F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	STEAM INLET PRESSURE (PSI)	STEAM FLOW RATE (LB/HR)	INTERNAL FACE & BYPASS	COIL ROWS/NO. OF COILS	FIN SPACING (FINS/FT)
AHU-8	963.24	617.31	80/67	51.4/51.3	432	0.84	44/60	118	16.2	8/2	11	HOT WATER	675	55	886.3	427	0.07	180/140	34	7.25			No	1/2	9
AHU-9	3668.98	1867.98	95/78	53.8/53.8	467	1.09	44/60	452	9.32	8/2	12	STEAM	2607.6	0	59.2	769	0.44				15	2757	Yes	2/1	9

AIR HANDLING UNIT SCHEDULE (CONT...2)

	FILTER					
MARK	STAGE 1	STAGE 2	MAX. VELOCITY (FPM)	SIZE (SQ. FT)	RESISTANCE (CLEAN/DIRTY)	REMARKS
AHU-8	2" PLEATED MERV 8	4" MINIPLEATS MERV 14	417	48	0.18/0.40	1,2,3,4,5,6,7,8,9,12
AHU-9	2" PLEATED MERV 8	4" MINIPLEATS MERV 14	467	90	0.13/0.40	1,2,3,4,5,6,7,8,9,10,11,12

REMARKS:
1. PROVIDE HUMIDIFIER DISPERSION TUBES TIED TO ASSOCIATED CLEAN STEAM GENERATOR.
2. HOT WATER AND CHILLED WATER COIL PERFORMANCE BASED ON 100% WATER AS WORKING FLUID.
3. PROVIDE SEPARATE LIGHTING CIRCUIT.
4. PROVIDE WITH 6" CONCRETE PAD.
5. FILTER TEST METHOD: ASHRAE 52.2.
6. PROVIDE 2 STAGE PREFILTER SECTION.
7. PROVIDE UV LIGHTS ON COOLING COIL.
8. PROVIDE VOLU-PROBE AIRFLOW STATION ON EACH FAN.
9. EXTERNAL STATIC PRESSURE ASSUMES FULLY LOADED FILTERS.
10. CHILLED WATER COILS SHALL BE FREEZE PROTECTION COONEY COILS.
11. PROVIDE EMPTY ENERGY RECOVERY COIL SECTION IN AIR HANDLING UNIT. THE ENERGY RECOVERY COIL SHALL NOT BE IN CONTRACT.
12. OWNER FURNISHED CONTRACTOR INSTALLED.

VARIABLE FREQUENCY DRIVE SCHEDULE

						ELECTRICAL						
MARK	INSTANCE MARK	MANUFACTURER	MODEL #	SERVICE	MOTOR HP	VOLTAGE	PHASE	HZ	DISCONNECT	BYPASS STARTER	REDUNDANT DRIVE	REMARKS
VFD	AHU-8 RF	ABB	ACH550	AHU-8 RF	20	460 V	3	60	YES	NO	YES	ALL
VFD	AHU-8 SF	ABB	ACH550	AHU-8 SF	60	460 V	3	60	YES	NO	YES	ALL
VFD	AHU-9 SF	ABB	ACH550	AHU-9 SF	120	460 V	3	60	YES	NO	YES	ALL
VFD	EF-14	ABB	ACH550	EF-14	30	460 V	3	60	YES	YES	NO	ALL
VFD	EF-15	ABB	ACH550	EF-15	30	460 V	3	60	YES	YES	NO	ALL
VFD	RF-3	ABB	ACH550	RF-3	15	460 V	3	60	YES	NO	YES	ALL

REMARKS:
1. PROVIDE BACNET INTERFACE FOR INTEGRATION INTO BUILDING AUTOMATION SYSTEM.
2. OWNER FURNISHED CONTRACTOR INSTALLED.

FAN COIL SCHEDULE

						SUPPLY FAN								COOLING COIL						HEATING COIL					
MARK	TYPE	MANUFACTURER	MODEL	DIMENSIONS (LxWxH)	WEIGHT (LBS)	NOM. CFM	ESP (IN WC)	DRIVE	MOTOR HP	MCA	MOP	VOLTAGE	PHASE	EAT/LAT DB	EAT/LAT WB	COOLING CAPACITY (TOT./SENS.) (MBH)	EWT/LWT	GPM	WATER PD (FEET)	EAT/LAT DB	HEATING CAPACITY (MBH)	EWT/LWT	GPM	WATER PD (FEET)	REMARKS
FC-1	HORIZONTAL CABINET	TRANE	HUVC2001	106X43X18	600	1600	1.05	DIRECT	1	13 A	20 A	120 V	1	75 / 53.9	62.5 / 53.1	36.9 / 30.2	44 / 56	6.2	2.99	70 / 144	114.6	180 / 140	5.7	3.0	ALL

REMARKS:
1. REAR INLET, FRONT DISCHARGE.
2. COLOR SELECTED BY ARCHITECT.

REGISTERS, GRILLES, AND DIFFUSERS

MARK	MANUFACTURER	MODEL	TYPE	MATERIAL	CFM	GRILLE SIZE	INLET DUCT SIZE	THROW PATTERN	MOUNTING	P.D.	NOISE CRITERIA	REMARKS
E-1	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	0-100	10"x10"	6" Ø	-	24"X24" LAY-IN	.05	25	1,2
E-3	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	226-400	24"x24"	10" Ø	-	24"X24" LAY-IN	.05	25	1,2
E-4	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	401-600	24"x24"	12" Ø	-	24"X24" LAY-IN	.05	25	1,2
E-5	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	601-1000	24"X24"	14" Ø	-	24"X24" LAY-IN	.05	25	1,2
E-6	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	1001-1500	24"X24"	16"Ø	-	24"X24" LAY-IN	0.05	25	1,2
E-7	TITUS	350FL	ALUMININUM SIDEWALL GRILLE	ALUMINUM	0-200	10"X8"	10"X8"	-	SIDEWALL	.05	25	1,2
FFU-1	TITUS	FFDERAJ	FAN FILTER UNIT	STAINLESS STEEL	0-600	48"x24"	12" Ø	LAMINAR	HARD CEILING	0.1	32	2,4,5,6,7
R-1	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	0-100	22"x22"	6" Ø	-	24"X24" LAY-IN	.05	25	1,2
R-3	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	226-400	24"X24"	10" Ø	-	24"X24" LAY-IN	.05	25	1,2
R-4	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	401-600	24"x24"	12" Ø	-	24"X24" LAY-IN	.05	25	1,2
R-5	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	601-1000	24"x24"	14" Ø	-	24"X24" LAY-IN	.05	25	1,2
R-6	TITUS	50F	1/2" CUBE CORE EGGCRATE GRILLE	ALUMINUM	1001-1500	24"X24"	16"Ø	-	24"X24" LAY-IN	.05	25	1,2
S-1	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	0-100	24"X24"	6" Ø	4-WAY	24"X24" LAY-IN	.05	25	1,2
S-1A	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	0-100	12"x12"	6" Ø	4-WAY	24"X24" LAY-IN	.05	25	1,2
S-2	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	101-225	24"X24"	8" Ø	4-WAY	24"X24" LAY-IN	.05	25	1,2
S-3	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	226-400	18"x18"	10" Ø	4-WAY	24"X24" LAY-IN	.05	25	1,2
S-3A	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	226-400	18"x18"	10" Ø	2-WAY	24"X24" LAY-IN	.05	25	1,2,3
S-3B	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	226-400	18"x18"	10" Ø	3-WAY	24"X24" LAY-IN	.05	25	1,2,3
S-4	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	401-600	24"x24"	12" Ø	4-WAY	24"X24" LAY-IN	.05	25	1,2
S-4A	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	401-600	24"x24"	12" Ø	2-WAY	24"X24" LAY-IN	.05	25	1,2,3
S-5	TITUS	OMNI-AA	SQUARE PLAQUE DIFFISER	ALUMINUM	601-1000	24"X24"	14" Ø	4-WAY	24"X24" LAY-IN	.05	25	1,2
S-6	TITUS	TRITEC	HIGH VOLUME, LOW VELOCITY, RADIAL AIR DIFFUSER	ALUMINUM	0-650	24"X48"	12" Ø	2-WAY	48"X24" LAY-IN	.05	25	1,2
S-7	TITUS	300FL	ALUMININUM SIDEWALL DIFFUSER	ALUMINUM	0-200	10"X8"	10"X8"	2-WAY	SIDEWALL	.05	25	1,2

REMARKS:
1. PRICE, METALAIRE, AND CARNES ARE ACCEPTABLE.
2. COLOR AND FINISH TO BE SELECTED BY ARCHITECT.
3. PROVIDE DIRECTIONAL BLOW CLIPS (DB) TO ACCOMODATE SCHEDULED THROW PATTERN.
4. PROVIDE WITH ECM MOTOR AND HEPA FILTER. ECM MOTOR AND HEPA FILTER ARE TO BE REPLACEABLE FROM ROOM SIDE.
5. FAN FILTER DIFFUSER SHALL BE CAPABLE OF BOTH OPEN AND CLOSED LOOP SETTINGS THAT ARE CHANGEABLE IN THE FIELD.
6. PROVIDE WITH 1/3 HP, 277V, 60Hz MOTOR.
7. PROVIDE PITOT TEST PORT.

FAN SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	TYPE	CFM	E.S.P. (" WG)	FAN CLASS	WEIGHT (LBS.)	RPM	HP	VOLTAGE	PHASE	DRIVE	VFD	MAX DBA	REMARKS
EF-14	TWIN CITY	BAF-SW 402	LAB EXHAUST	AIRFOIL CENTRIFUGAL	27,000	4.5	3	2415	974	30	480 V	3	BELT	YES	99	3,5,7,8,9,10
EF-15	TWIN CITY	BAF-SW 402	LAB EXHAUST	AIRFOIL CENTRIFUGAL	27,000	4.5	3	2415	974	30	480 V	3	BELT	YES	99	3,5,7,8,9,10
EF-16	TWIN CITY	BCV 150	RESTROOM EXHAUST	BACKWARD INCLINED UTILITY SET	2,400	1.5	1	292	1691	1.5	480 V	3	BELT	NO	73	1,2,6,10
RF-3	TWIN CITY	BAF-SW 365	RETURN FAN	AIRFOIL CENTRIFUGAL	20,000	2	1	2379	937	15	480 V	3	BELT	YES	73	2,4,5,10

REMARKS:
1. PROVIDE STARTER AND DISCONNECT.
2. PROVIDE WITH VIBRATION ISOLATION BASE.
3. PROVIDE WITH INERTIA BASE.
4. PROVIDE WITH INLET BOX.
5. PROVIDE WITH FAN ARRANGEMENT 9.
6. PROVIDE WITH FAN ARRANGEMENT 10.
7. HAZARDOUS EXHAUST APPLICATION. PROVIDE WITH SHAFT SEALS.
8. PROVIDE PREMIUM EFFICIENCY MOTORS WITH SHAFT GROUNDING KITS.
9. PROVIDE WITH PHENOLIC COATING.
10. OWNER FURNISHED CONTRACTOR INSTALLED.

SILENCER SCHEDULE

							DYNAMIC INSERTION LOSS, DB								
MARK	MODEL	NOMINAL SIZE (W"xH"xL")	NOM. CFM	VELOCITY (FPM)	SILENCER P.D. (IN WG.)	PD INCL. SYS. EFF. (IN. WG)	63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	REMARKS
ST-AHU-8-SA1	EXRD-UHV-29876	28x16x48	6510	+2093	0.06	0.2	3	3	8	17	19	16	13	12	6
ST-AHU-8-SA2	RD-UHV-29876	30x26x36	5,950	+1098	0.04	0.04	2	4	7	12	8	8	7	5	6
ST-AHU-8-SA3	RD-UHV-29876	30x26x36	7,900	+1458	0.06	0.2	2	4	7	12	8	8	7	5	6
ST-AHU-9-SA	VIBROACOUSTICS REMB-UHV-29768	72X46X84	42,000	+1826	0.16	0.27	7	9	12	22	25	30	22	19	4,5,6,7
ST-EF14	VIBROACOUSTICS RENM-UHB-F4	60x96x72	27,000	-675	0.1	0.16	9	11	22	24	19	20	19	16	1,2,3,6
ST-EF15	VIBROACOUSTICS RENM-UHB-F4	60x96x72	27,000	-675	0.1	0.16	9	11	22	24	19	20	19	16	1,2,3,6

REMARKS:
1. RMB = RECTANGULAR MOLDBLOCK SILENCER. EXRMB = EXTENDED CASING RECTANGULAR MOLDBLOCK SILENCER. RENM = RECTANGULAR NO-MEDIA SILENCER.
2. 304 SS CONSTRUCTION, PACKLESS SOUND ATTENUATOR (NO FILL).
3. ELBOW SILENCER. LENGTH SHOWN IS MEASURED ALONG THE CENTERLINE OF SILENCER. PROVIDE LEG LENGTHS AS DETAILED IN FUME HOOD EXHAUST FAN DETAIL.
4. TYPE: RE - RECTANGULAR ELBOW. MB - MOLDBLOCK MEDIA.
5. LENGTH SHOWN FOR ELBOW SILENCERS IS CENTERLINE LENGTH.
6. VELOCITY SHOWN IS + (FORWARD FLOW) OR - (REVERSE FLOW) AS DEFINED BY ASTM E477-20.
7. MEDIA SHALL BE VIBRO-ACOUSTICS MOLDBLOCK MEDIA OR APPROVED EQUAL CONTAINING 100% NATURAL COTTON FIBERS TREATED WITH AN EPA REGISTERED, NON-TOXIC BORATE SOLUTION, "FLASH DRIED" TO PROVIDE RESISTANCE TO MOLD, MILDEW AND FUNGI. MEDIA SHALL COMPLY WITH UL181 AND NFPA 90A. MODLBLOCK MEDIA™ SHALL BE PACKED WITH A MINIMUM OF 15% COMPRESSION DURING SILENCER ASSEMBLY. MEDIA SHALL NOT CAUSE OR ACCELERATE CORROSION OF ALUMINUM OR STEEL. GLASS FIBER AND ROCKWOOL ARE NOT ACCEPTABLE ALTERNATES.

SPLIT SYSTEM INDOOR UNIT SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	NOMINAL SIZE (W"xL"xH")	WEIGHT (LBS)	NOM. CFM	MCA	MOCP	VOLTAGE	PHASE
SS-1	TRANE MITSUBISHI	TPKFYP024	IT ROOM	47X12X15	46	750	1 A	15 A	208 V	1
SS-2	TRANE MITSUBISHI	TPKFYP024	IT ROOM	47X12X15	46	750	1 A	15 A	208 V	1
SS-3	TRANE MITSUBISHI	TPKFYP024	IT ROOM	47X12X15	46	750	1 A	15 A	208 V	1

SPLIT SYSTEM OUTDOOR UNIT SCHEDULE

MARK	MANUFACTURER	MODEL	SIZE (W"xL"xH")	WEIGHT (LBS)	TOTAL COOLING CAPACITY (BTUH)	EER	MCA	MOCP	VOLTAGE	PHASE	REMARKS
CU-1	TRANE MITSUBISHI	TUHYP0724AN40AN	37X30X72	503	72000	12.5	11 A	15 A	460 V	3	ALL

REMARKS:
1. PROVIDE LOW AMBIENT COOLING DOWN TO 0º F.
2. COOLING PERFORMANCE BASED ON 95/78 OUTDOOR AMBIENT DB/WB.
3. PROVIDE WITH BACNET INTERFACE.

REHEAT COIL SCHEDULE

MARK	COIL SIZE	NO. ROWS	CFM	A.P.D.("WC)	EAT/LAT	GPM	W.P.D. (FT HEAD)	EWT/LWT	MBH	PIPE SIZE	REMARKS
RC-6	12"x12"	2	400	0.11	55 / 110	1.2	1.1	180 / 140	23.9	3/4	ALL
RC-8	11"x10"	2	700	0.21	55 / 110	2.1	2.8	180 / 140	41.8	3/4	ALL
RC-10	20"x15"	2	1100	0.24	55 / 110	3.3	1.4	180 / 140	65.7	1	ALL
RC-12	26"x15"	2	1500	0.26	55 / 110	4.5	2.8	180 / 140	89.6	1	ALL
RC-14	28"x18"	2	2000	0.27	55 / 110	6.0	5.8	180 / 140	119.4	1-1/4	ALL
RC-16	38"x18"	2	2700	0.24	55 / 110	8.1	10.6	180 / 140	161.2	1-1/4	ALL

REMARKS:
1. ALL COILS SUPPLIED MUST CONFORM TO UNIVERSITY OF KENTUCKY STANDARD COIL REQUIREMENTS. TUBE THICKNESS 0.035".

HUMIDIFIER SCHEDULE

MARK	MANUFACTURER	MODEL	CFM	ABSORPTION DISTANCE (FT)	ENTER AIR (DB/RH)	LEAVING AIR (DB/RH)	CAPACITY (LBS/HR)	STEAM INLET PRESSURE
HU-3	CONDAIR	SETC 750	30000	1.93	55/8	55/93	314.7	15

REMARKS:
1. PROVIDE WITH MANUFACTURER'S CONTROL PANEL AND FILL VALVE, DRAIN VALVE AS REQUIRED FOR UNIT OPERATION. COORDINATE PROVISION OF ALL OTHER SENSORS (EG. AIR PROVING SWITCH, HIGH LIMIT SWITCH, HUMIDSTATS, AND STEAM CONTROL VALVE, ETC.) REQUIRED FOR PROPER UNIT OPERATION WITH CONTROLS CONTRACTOR. CONTROLS CONTRACTOR IS ULTIMATELY RESPONSIBLE FOR MEETING SEQUENCE OF OPERATION. REFER TO CONTROLS DRAWINGS.
2. REFER TO HUMIDIFIER DETAIL ON DRAWINGS.
3. PROVIDE WITH NICKET PLATED COPPER HEAT EXCHANGER.
4. PROVIDE WITH IONIC BED, TANK INSULATION.
5. PROVIDE CAST IRON SUPPORT LEGS. CONTRACTOR TO COORDNIATE REQUIRED HEIGHT WITH SLOPE OF CONDENSATE PIPING.

VAV BOX SCHEDULE

				DUCT CONNECTION						
MARK	MANUFACTURER	MODEL	AIR TYPE	INLET	OUTLET	CFM MAX	INLET STATIC PRESSURE (IN)	DISCHARGE NOISE CRITERIA (NC)	RADIATED NOISE CRITERIA (NC)	REMARKS
VAV-5	TRANE	VCCF	SUPPLY	6"Ø	10"x10"	500	0.750	25	25	ALL
VAV-9	TRANE	VCCF	SUPPLY	8"Ø	16"x10"	900	0.750	25	25	ALL
VAV-14	TRANE	VCCF	SUPPLY	10"Ø	20"x12"	1400	0.750	25	25	ALL
VAV-20	TRANE	VCCF	SUPPLY	12"Ø	22"x14"	2000	0.750	25	25	ALL
VAV-30	TRANE	VCCF	SUPPLY	14"Ø	30"x14"	3000	0.750	25	25	ALL

REMARKS:
1. MAXIMUM N.C. VALUE OF 25.
2. PROVIDE DUAL WALL VAV BOX WITH 1" INSULATION.
3. REHEAT COIL IS DUCT MOUNTED.
4. VAV SHALL INCLUDE CFM READING WITH +/- 5% ACCURACY.

CONDENSATE PUMPS AND RECEIVERS

		PUMPS									
MARK	MANUFACTURER	MODEL	GPM	DISCHARGE PRESSURE (PSIG)	HP	RPM	PHASE	VOLTAGE	RECIEVER CAP. (GAL)	INLET SIZE	REMARKS
CP-4	SHIPPENSBURG PUMP	DC 124	17	40	1.5	3500	3	480 V	25	2"	ALL

REMARKS:
1. PROVIDE EACH PUMP DISCHARGE WITH SS FLEX CONNECTOR, PRESSURE GAUGE WITH VALVE, SPRING LOADED CHECK VALVE, BALANCING VALVE AND ISOLATION VALVE.
2. PROVIDE THE FOLLOWING WITH CONTROL PANEL: MAGNETIC STARTERS, DISCONNECT SWITCHES, "OFF-HAND-LEAD-LAG" SELECTOR SWITCH, ELECTRIC-ALTERNATOR, TRANSFORMER, PILOT LIGHTS AND CONTROLS FOR REMOTE ALARMS. INCLUDE SEPARATE DISCONNECTS FOR EACH PUMP.
3. ARMSTRONG, HOFFMAN ARE ACCEPTABLE MANUFACTURERS.
4. PROVIDE WITH GAUGE GLASS.

AIR FLOW CONTROL VALVE SCHEDULE

				DUCT CONNECTION			
MARK	INSTANCE MARK	MANUFACTURER	CONFIGURATION	INLET	MAX CFM	INLET STATIC PRESSURE (IN)	REMARKS
AVS-7	300M	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	374	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	374	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	376	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	376	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	378	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-10	378	PHOENIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVS-7	378A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	378A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-10	382A	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-10	382B	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-25	382C	PHEONIX	SINGLE	14"Ø	200-2500	0.60	ALL
AVE-10	382D	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVS-30	382E	PHOENIX	DUAL	12"Ø	180-3000	0.60	ALL
AVE-7	384A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	384A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	384A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-10	384B	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-10	384C	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-15	384D	PHOENIX	SINGLE	12"Ø	90-1500	0.60	ALL
AVE-10	384E	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-10	384F	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVS-30	384G	PHOENIX	DUAL	12"Ø	180-3000	0.60	ALL
AVE-7	388	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	388	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	388	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-10	390A	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-10	390B	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-15	390C	PHOENIX	SINGLE	12"Ø	90-1500	0.60	ALL
AVE-10	390D	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVE-10	390E	PHEONIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVS-30	390F	PHOENIX	DUAL	12"Ø	180-3000	0.60	ALL
AVE-7	392	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	392	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	392	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-25	394A	PHOENIX	SINGLE	14"Ø	200-2500	0.60	ALL
AVS-7	394A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	394A	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-7	394B	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVS-7	394B	PHOENIX	SINGLE	8"Ø	35-700	0.60	ALL
AVE-10	394C	PHOENIX	SINGLE	10"Ø	50-1000	0.60	ALL
AVS-30	394D	PHOENIX	DUAL	12"Ø	180-3000	0.60	ALL

REMARKS:
1. PROVIDE VALVES RATED FOR VERTICAL MOUNTING AS REQUIRED. REFER TO AIR DISTRIBUTION PLANS FOR VALVE ORIENTATIONS.
2. ALL VALVES DEDICATED TO FUME HOODS MUST BE SHUTOFF VALVES.
3. ALL FUME HOODS SHALL INCLUDE ZONE PRESENCE SENSORS.

STEAM TRAP SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	TYPE	ORIFICE SIZE	MAX. INLET PRESSURE (PSI)	CONNECTION SIZE	CAPACITY (LB/HR)	SAFETY FACTOR	DIFFERENTIAL PRESSURE (PSI)	REMARKS
T-1	ARMSTRONG INTERNATIONAL	800	LP DRIP TRAP	INVERTED BUCKET	3/16"	15	3/4"	150	3	15	1
T-2	ARMSTRONG INTERNATIONAL	50-KD-10	HUMIDIFIER	F & T	1"	10	1.5"	1500	2	0.5	1
T-3	ARMSTRONG INTERNATIONAL	50-KD-10	AHU	F & T	1"	10	2"	4000	2	0.5	1

REMARKS:
1. PROVIDE INLET CHECK VALVE

LOUVER SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	SERVICE	CFM	SIZE	FREE AREA	VELOCITY (FPM)	P.D. (IN)	REMARKS
L-1	RUSKIN	ELF6375DX	INTAKE	AHU-9	42000	104"x124"	53.92	779	0.10	ALL
L-2	RUSKIN	ELF6375DX	INTAKE	AHU-8	20000	104"x124"	53.92	371	0.02	ALL
L-3	RUSKIN	ELF6375DX	RELIEF	AHU-8	20000	104"x124"	53.92	371	0.02	ALL
L-4	RUSKIN	ELF6375DX	RELIEF	AHU-9	20000	104"x124"	53.92	371	0.02	ALL

REMARKS:
1. CUSTOM COLOR SELECTED BY ARCHITECT
2. PROVIDE WITH BIRDSCREEN
3. ANY UNUSED PORTION OF THE LOUVER SHALL BE BLANKED OFF WITH 2 LAYERS OF SHEET METAL AND RIGID INSULATION.

GRAVITY HOOD SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	WEIGHT (LBS)	THROAT LENGTH	THROAT WIDTH	CFM	AIR VELOCITY (FPM)	MAX. AIR P.D. (" W.C.)	REMARKS
GH-1	GREENHECK	FGR	EXHAUST FAN EF-16	84	24	36	2400	420	0.024	ALL

REMARKS:
1. PROVIDE WITH ROOF CURB.
2. ALUMINUM CONSTRUCTION.
3. PROVIDE WITH BIRDSCREEN.

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CONTRACT DOCUMENTS

IMPROVE FACILITIES -
JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

MECHANICAL SCHEDULES

M-601

Autodesk Docs://202277 - UK JSB Improvements/2022 XKJS22 MEP.rvt

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LIGHTING CONTROLS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
LIGHT SWITCH: LOW VOLTAGE (WHEN PRESENT, # INDICATES QUANTITY OF CHANNELS)	46"	$ #
EXAM LIGHT SWITCH	46"	$ X
NIGHT LIGHT SWITCH WITH CONSTANTLY ILLUMINATED HANDLE	46"	$ N
SURGICAL LIGHT INTENSITY CONTROL	46"	$ SL
LOW VOLTAGE DIMMER SWITCH (WHEN PRESENT, # INDICATES QUANTITY OF CHANNELS)	46"	$ D#
GRAPHIC TOUCHSCREEN CONTROL STATION	46"	$ G
LINE VOLTAGE SWITCH	46"	$ LV
LINE VOLTAGE THREE-WAY, FOUR-WAY SWITCH	46"	$ LV3 $ LV4
LINE VOLTAGE THREE-WAY, FOUR-WAY DIMMER SWITCH	46"	$ LV3D $ LV4D
KEYED SWITCH	46"	$ K
OCCUPANCY OR VACANCY SENSOR SWITCH	46"	$ OS $ VS
OCCUPANCY OR VACANCY SENSOR SWITCH WITH DIMMING	46"	$ DOS
LIGHT SWITCH FOR UNDER-CABINET LIGHTS	46"	$ U
ILLUMINATED HANDLE LIGHT SWITCH (ILLUMINATED WHEN LOAD IS OFF)	46"	$ IL
PILOT LIGHT SWITCH (ILLUMINATED WHEN LOAD IS ON)	46"	$ PL
TIMER SWITCH	46"	$ T
OCCUPANCY OR VACANCY SENSOR, CEILING MOUNT	CLG	OS
OCCUPANCY SENSOR, CORNER MOUNT	CLG	OS
DAYLIGHT SENSOR	AS NOTED	DS
PHOTOCELL	AS NOTED	PC
LIGHTING RELAY	AS NOTED	LR
EMERGENCY AUTOMATIC TRANSFER SWITCH FOR LIGHTING CONTROLS (REFER TO DETAIL)	CLG	ER

POWER OUTLETS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
SIMPLEX RECEPTACLE (TEXT INDICATES NEMA TYPE)	1'-6"	X
DUPLEX RECEPTACLE	1'-6"	
SLASH THROUGH ANY DEVICE INDICATES MOUNTING ABOVE COUNTERTOP 4" ABOVE BACKSPLASH		
'G' INDICATES INTEGRAL GROUND FAULT PROTECTION (GFCI)	1'-6"	G
DEAD FRONT GFCI DEVICE, LABEL AND INSTALL IN READILY ACCESSIBLE LOCATION		G
DUPLEX RECEPTACLE WITH TWO INTEGRAL USB CHARGING PORTS	1'-6"	U
USB CHARGING OUTLET WITH FOUR INTEGRAL USB PORTS	1'-6"	U
GANG RECEPTACLE IN COMBINATION WITH SWITCH (PROVIDE DIVIDER IF LIGHTING CIRCUIT IS 277V)	46"	C/S
DUPLEX RECEPTACLE, CEILING MOUNTED	CLG	
QUADRUPLEX RECEPTACLE	1'-6"	
JUNCTION BOX, CEILING OR WALL		J J
VOLTAGE/2 POLE RECEPTACLE, TEXT INDICATES NEMA TYPE	1'-6"	X
VOLTAGE/3 POLE RECEPTACLE, TEXT INDICATES NEMA TYPE	1'-6"	X
'T' INDICATES SAFETY TYPE, TAMPER RESISTANT OUTLET(S)		T
SS INDICATES SURGE SUPPRESION TYPE OUTLET(S)		SS
GROUND FAULT PROTECTED DUPLEX WITH WEATHER-PROOF "WHILE IN USE" TYPE DIE-CAST METAL COVERPLATE WITH LOCKABLE ENCLOSURE AT OUTLET - SEE SPECIFICATIONS	2'-2"	G WP
DUPLEX FOR ELECTRIC WATER COOLER: COORDINATE EXACT LOCATION WITH PLUMBING CONTRACTOR TO CONCEAL OUTLET BEHIND COOLER, PROVIDE READILY ACCESSIBLE GFI DEVICE AT 18" ADJACENT TO WATER COOLER		G EWC
BOX ON ANY DEVICE INDICATES SURFACE MOUNTED BACKBOX/WIREMOLD		
CIRCLE ON ANY DEVICE INDICATES DEVICE FED FROM STUB UP CONDUIT		

FIRE ALARM

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
MAIN CONTROL PANEL CENTRAL PROCESSING UNIT (CPU)	6'-6" TO TOP	FACP
REMOTE L.C.D. FIRE ALARM ANNUNCIATOR	54"	FAA
REMOTE FIRE ALARM ANNUNCIATOR W/ MICROPHONE	54"	FAAM
LOCAL OPERATOR CONSOLE	54"	LOC
SMOKE EVACUATION CONTROL PANEL	54"	SECP
POWER SUPPLY/CONTROL FOR AUDIO/VISUAL DEVICES	46"	NAC
TRANSPONDER CABINET	46"	TRAN
GRAPHICS DISPLAY TERMINAL		GDT
FIRE ALARM CONTROL EXTENDER		EXT
POST INDICATOR VALVE		PIV
PULL STATION : DOUBLE ACTION	46" TO LEVER	F
KEYED, LOCKED PULL STATION : DOUBLE ACTION. STATION SHALL ONLY BE OPERABLE VIA KEY IN POSSESSION OF STAFF.	46" TO LEVER	F K
AUDIO/VISUAL NOTIFICATION APPLIANCE	WALL, CLG	F F
AUDIO-ONLY NOTIFICATION APPLIANCE	WALL, CLG	A A
VISUAL-ONLY NOTIFICATION APPLIANCE	WALL, CLG	V V
BELL / LIGHT	80"	BL
BELL ONLY	80"	B
PHOTO-ELECTRIC SMOKE DETECTOR	CLG	SD
PHOTO-ELECTRIC SMOKE DETECTOR FOR PATIENT ROOM MONITORING (SEE RISER)	CLG	SD P
PROJECTED BEAM SMOKE DETECTOR; EMITTER (BE) AND RECEIVER (BR)		BE BR
HEAT DETECTOR	CLG	HD
CARBON MONOXIDE DUCT DETECTOR	ABOVE CEILING	CD
CARBON MONOXIDE ALARM: SINGLE STATION W/SOUNDER BASE	CLG	CM
CARBON MONOXIDE AUDIO/VISUAL NOTIFICATION APPLIANCE	WALL	F CM
DOOR HOLDER : WALL TYPE	WALL	DH
DOOR HOLDER : CLOSURE TYPE	ABV DOOR	DH C
DUCT SMOKE DETECTOR	ABV CLG	DD
CONNECTION TO SPRINKLER FLOW SWITCH WITH ADDRESSABLE MODULE		FS
CONNECTION TO SPRINKLER TAMPER SWITCH WITH ADDRESSABLE MODULE		TS
PRESSURE SWITCH		PS
ISOLATION MODULE	WALL	I
ZONE ADDRESSABLE MODULE		Z
H.V.A.C. SMOKE DAMPER CONNECTION		SM
FLUSH MOUNTED REMOTE ALARM INDICATING STATION/TEST SWITCH	7'-6"	RI
FIREMAN'S PHONE JACK	4'-6"	FP
FIREMAN'S KNOX BOX CONNECTION		KB
ADDRESSABLE RELAY MODULE		R
INDICATES VANDAL-PROOF POLYCARBONATE COVER, VANDAL PROOF COVERS SHALL BE UL LISTED FOR USE WITH THE SPECIFIC DEVICE THEY ARE PROTECTING		VR
INDICATES CHIME AUDIBLE NOTIFICATION		CH
DEVICE USED FOR ELEVATOR CONTROL		EL

LIGHTING FIXTURES AND EQUIPMENT

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
REFER TO LUMINAIRE SCHEDULE FOR EXACT FIXTURE SPECIFICATIONS, MOUNTING HEIGHTS, ETC.		
SURFACE OR SUSPENDED CEILING FIXTURE		
RECESSED CEILING FIXTURE		
POLE MOUNTED AREA LIGHT WITH CONCRETE BASE		
LIGHTED BOLLARD WITH CONCRETE BASE		◎
EMERGENCY BATTERY WALL-PACK		
WALL MOUNT FIXTURE		
TRACK COMPLETE WITH POWER SUPPLIES AND FIXTURE HEADS		
FLOODLIGHT		
EXIT LIGHT (CEILING, END, WALL MOUNT) WITH OR WITHOUT DIRECTIONAL ARROWS, WITH OR WITHOUT EGRESS HEADS		⊗
STRIP FIXTURE		
CROSS-HATCHING INDICATES LIGHT IS POWERED FROM THE EMERGENCY-CRITICAL BRANCH		▩
PARALLEL-HATCHING INDICATES LIGHT IS POWERED FROM THE EMERGENCY-LIFE SAFETY BRANCH		▥
REMOTE LIGHT FIXTURE DRIVER	AS NOTED	◎
REMOTE BATTERY BACKUP	AS NOTED	◎
CENTRAL BATTERY INVERTER	AS NOTED	◎

MISCELLANEOUS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
CONDUIT CONCEALED IN WALLS OR IN CEILING SPACE: ARROW(S) INDICATE(S) HOME RUN & # OF CIRCUITS: HASHMARKS INDICATE # OF CONDUCTORS.		PHASE NEUTRAL GROUND
NON-REVERSING MOTOR STARTER SNAP SWITCH	AS NOTED	$ M
MOMENTARY CONTACT SWITCH	46"	$ MC
HAND-OFF-AUTO 3-POSTION SWITCH	46"	$ HOA
DISCONNECT SWITCH	5'-0"	
MAGNETIC STARTER	5'-0"	
MAGNETIC COMBINATION STARTER	5'-0"	
VARIABLE FREQUENCY DRIVE	5'-0"	
ENCLOSED FLUSH MTD. CIRCUIT BREAKER	5'-0"	
MUSHROOM SWITCH	46"	
PUSHBUTTON STATION WITH 1, 2, OR 3 BUTTONS.	46"	
PANELBOARD, SURFACE OR FLUSH MOUNTED, HATCHING INDICATES EMERGENCY	6'-6" TO TOP	
TRANSFORMER	AS NOTED	
EQUIPMENT HARDWIRE CONNECTION (SEE DETAIL)		J
KITCHEN EQUIPMENT OUTLET COUPLING CONNECTION (SEE DETAIL)		J
MOTOR CONNECTION, REFER TO EQUIPMENT CONNECTION SCHEDULE		
PLUMBING FIXTURE SOLENOID VALVE/ELECTRIC EYE SENSOR CONNECTION. COORDINATE EXACT CONNECTION REQUIREMENTS WITH MANUFACTURER.		
PLUMBING FIXTURE ELECTRIC EYE TRANSFORMER CONNECTION. TRANSFORMER SHALL BE 120V-24V. MOUNT ABOVE SUSPENDED ACCESSIBLE CEILING IN J-BOX. PROVIDE ADDITIONAL TRANSFORMERS OF SAME TYPE AS/IF NEEDED		
PROVIDE CONNECTION TO HAND DRYER (SEE ARCHITECTURAL SPECIFICATIONS)	VERIFY WITH ARCHITECT	
SURGE PROTECTION DEVICE (SURFACE OR FLUSH MOUNTED)		SPD
GENERATOR ANNUNCIATOR PANEL (SURFACE OR FLUSH MOUNTED) - SEE SPECIFICATIONS	46"	GEN-A
CONDUIT UP		○
CONDUIT DOWN		●
FLEXIBLE CONDUIT		∼
GROUND BUS BAR ON INSULATED STANDOFFS	2'-0"	
BUS DUCT, AMPERAGES AS NOTED	AS SHOWN	▨
WIREWAY WITH REMOVABLE COVER (SIZE AS NOTED)	AS SHOWN	
TRENCH DUCT (SIZE AS NOTED)	AS SHOWN	
WIRE BASKET CABLE TRAY, SIZE AS NOTED	AS SHOWN	
LADDER CABLE TRAY, SIZE AS NOTED	AS SHOWN	
SOLID BOTTOM CABLE TRAY, SIZE AS NOTED	AS SHOWN	
J-HOOK PATHWAY		
EQUIPMENT TAG, REFER TO EQUIPMENT SCHEDULE		EQUIP-#
MECHANICAL EQUIPMENT DESIGNATOR (SEE MECH. SCHEDULES)		EQUIP-#
TAGGED NOTE		⬡
REVISION TAG		△

PANEL FURNITURE

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
PANEL FURNITURE DUPLEX RECEPTACLE. PROVIDE ALL WIRING AS REQUIRED, COORDINATE EXACT INSTALLATION REQUIREMENTS AND LOCATIONS WITH OWNER'S PANEL FURNITURE VENDOR		
PANEL FURNITURE QUADRUPLEX RECEPTACLE. PROVIDE ALL WIRING AS REQUIRED, COORDINATE EXACT INSTALLATION REQUIREMENTS AND LOCATIONS WITH OWNER'S PANEL FURNITURE VENDOR		
PANEL FURNITURE DATA/VOICE OUTLET. PROVIDE ALL WIRING AS REQUIRED, COORDINATE EXACT INSTALLATION REQUIREMENTS AND LOCATIONS WITH OWNER'S PANEL FURNITURE VENDOR		2D
POWER CONNECTION TO PANEL FURNITURE, PROVIDE SEAL-TIGHT CONDUIT CONNECTION FROM RECESSED WALL BOX TO PANEL FURNITURE, PROVIDE FINAL CONNECTIONS TO PANEL FURNITURE AS REQUIRED BY PANEL FURNITURE VENDOR	1'-6"	J FP
COMBINATION POWER AND LOW VOLTAGE CONNECTION TO PANEL FURNITURE, PROVIDE SEAL-TIGHT CONDUIT CONNECTION FROM RECESSED WALL BOX TO PANEL FURNITURE, PROVIDE FINAL CONNECTIONS TO PANEL FURNITURE AS REQUIRED BY PANEL FURNITURE VENDOR	1'-6"	FF

ABBREVIATIONS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
UNLESS OTHERWISE NOTED		UON
OWNER FURNISHED CONTRACTOR INSTALLED		OFCI
OWNER FURNISHED OWNER INSTALLED		OFOI
CONTRACTOR FURNISHED CONTRACTOR INSTALLED		CFCI
CONTRACTOR FURNISHED OWNER INSTALLED		CFOI
INDICATES EMERGENCY POWER		EM
WIREGUARD - PROVIDE MANUFACTURER'S SPECIFIC GUARD FOR DEVICE NOTED		WG
WEATHERPROOF - NEMA-3R, WET LOCATION LISTED. PROVIDE COVERS, RATINGS, ETC, AS SUITABLE FOR OUTDOORS.		WP
EXPLOSION PROOF - PROVIDE WIRING METHODS, ENCLOSURES, RATINGS, ETC. AS SUITABLE FOR HAZARDOUS LOCATION.		XP
EXISTING DEVICE/EQUIPMENT		(E)

SPECIAL OUTLETS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
FLOORBOX, AS SCHEDULED	FLOOR	FB
POKE-THRU, AS SCHEDULED	FLOOR	P#
WALLBOX, AS SCHEDULED	WALL	WB#
AUDIO/VISUAL SYSTEM OUTLET WITH DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION	1'-6"	AV
COMBINATION POWER AND DATA OUTLET LOCATION, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION	1'-6"	
COMBINATION POWER AND DATA OUTLET LOCATION, GFCI DUPLEX RECEPTACLE, REFER TO ASSOCIATED DETAIL FOR ADDITIONAL INFORMATION	1'-6"	
OVERHEAD PROJECTOR: PROVIDE DUPLEX RECEPTACLE, ONE DATA, HDMI, 3.5mm AUDIO, AND VGA OUTLET ON (3) PLATES	CLG	
SPECIAL VIDEO SYSTEM SIGNAL INPUT		-NA-
SURFACE PLUG-MOLD		
SURFACE WIRE-MOLD		
POWER POLE AS NOTED		PP

TELEVISION

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
TELEVISION HEADEND (SPLITTERS/AMPLIFIERS/DISTRIBUTION)	46"	TV
TELEVISION SYSTEM OUTLET WITH DUPLEX RECEPTACLE, COORDINATE LOCATION WITH WALL BRACKET WHERE APPLICABLE	7'-0"	T

OVERHEAD PAGING

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
PAGING SPEAKER: CEILING	CLG	S
PAGING SPEAKER W/ VOLUME CONTROL	CLG	SV
PAGING SPEAKER: WALL	8'-0"	S
RECESSED WALL MOUNTED PAGING SPEAKER DUKANE 5A606 SPEAKER. ATLAS 417-8WD	8'-0"	RS
VANDAL PROOF / WEATHERPROOF WALL MOUNTED PAGING SPEAKER. QUAM VP1	SEE FLOOR PLANS	VS V
EXTERIOR VANDAL PROOF / WEATHERPROOF WALL MOUNTED PAGING SPEAKER, SHALL BE PAINTED COLOR SELECTED BY ARCHITECT/OWNER. QUAM VP6	SEE FLOOR PLANS	S WP
WALL MOUNTED PAGING HORN	9'-0"	H
CALL INITIATION STATION	46"	C
WALL VOLUME CONTROL	46"	V
PAGING MICROPHONE	1'-6"	M
PANIC BUTTON (MOUNTING PER DRAWINGS)	46", UNDER DESK	PB PB
NOTIFICATION LIGHT (MOUNTING PER DRAWINGS)	7'-6", CLG	NL PB
LCD WALL DISPLAY		LCD
PAGING SYSTEM HEADEND	46"	PA

CLOCKS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
TYPICAL CLOCK MOUNTING HEIGHTS: FOR CEILING HEIGHTS < 9'-8" : MOUNT CENTER OF BACKBOX AT 8" BELOW CEILING. FOR CEILING HEIGHTS >= 9'-8" : MOUNT CENTER OF BACKBOX AT 9'-0" AFF.		
ANALOG CLOCK: SINGLE FACE	SEE ABOVE	
ANALOG CLOCK: DUAL FACE	SEE ABOVE	
DIGITAL CLOCK: SINGLE FACE	SEE ABOVE	DC
DIGITAL CLOCK: DUAL FACE	SEE ABOVE	2DC
CLOCK SYSTEM HEAD END	84"	CLOCK

AV SYSTEMS

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
PROJECTOR WITH MOUNT (CEILING OR WALL AS INDICATED)	REFER TO DRAWINGS	P P
LOCAL SOUND SPEAKER: CEILING	CLG	LS
WIRELESS MICROPHONE ANTENNA	CLG	MA
LOCAL SOUND SPEAKER: WALL	REFER TO SPECS.	LS
MICROPHONE INPUT: # INDICATES NUMBER OF INPUTS.	1'-6"	M
WIRELESS MICROPHONE ANTENNA, WALL MOUNT	REFER TO SPECS.	MA
AV INPUT (OR OUTPUT) WALL PLATE. REFER TO DRAWINGS AND SPECIFICATIONS FOR TYPE AND QUANTITY OF CONNECTIONS.	1'-6"	AV
BLUETOOTH INPUT MODULE	1'-6"	BT
AV TOUCHSCREEN CONTROL STATION	46"	CS
LOCAL SOUND SYSTEM HEADEND	REFER TO SPECS.	LS

LINETYPE LEGEND

────────	EXISTING
– – – – – –	DEMOLISHED
━━━━━━━━	NEW

SECURITY PANIC ALARM

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
PANIC ALARM BUTTON	SEE DRAWINGS	PB
PANIC ALARM ANNUNCIATOR	46"	PA
PANIC ALARM STROBE - REFER TO SPECIFICATIONS FOR LENS AND HOUSING COLOR	SAME AS FIRE ALARM	PS PS
PANIC ALARM POWER SUPPLY CABINET	5'-0"	SEC-P

SECURITY INTERCOM

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
AUDIO/VIDEO INTERCOM STATION: MASTER WITH SELECTIVE DOOR CONTROLS, POWER SUPPLIES & DOOR RELAY CONTACTS AS REQUIRED FOR OPERATION OF ANY DOOR IN THE SYSTEM AND VIEWING OF ANY AUDIO/VIDEO INTERCOM REMOTE ON THE SYSTEM. AIPHONE#IX-MV W/DESK STAND - COLOR BY ARCHITECT.	DESK MOUNT	IM
AUDIO/VIDEO INTERCOM STATION: REMOTE WITH FLUSH-MTD S.S. ENCLOSURE. AIPHONE #IX-DVF.	46"	IR

SECURITY ACCESS CONTROL

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
DOOR ALARM	DOOR FRAME	DA DA
DOOR POSITION SWITCH	DOOR FRAME	DP
MAGNETIC LOCK(S)	ABV DOOR	ML
ELECTRIC LOCKSET	AT LATCH	EL
DOOR DELAYED EGRESS/ELECTRIFIED PANIC MECHANISM	ABV DOOR	DE
ELECTRIC STRIKE	AT LATCH	ES
AUTOMATIC DOOR CONNECTION (MAY ALSO HAVE ELECTRIC STRIKE/MAG-LOCK/ELECTRIFIED PANIC CONNECTION - SEE ARCHITECTURAL HARDWARE SPECIFICATIONS)	CLG	AD
DOOR RELEASE PUSH-PLATE / INFRA-RED OPERATOR STATION. PROVIDE ANY ADDITIONAL ROUGH-IN FOR "EMERGENCY RELEASE" OPERATOR STATIONS AS REQUIRED.	46"	PP
DOOR RELEASE KEYSWITCH STATION	6'-0"	KS
DOOR RELEASE KEYPAD STATION	46"	KP
DOOR RELEASE PROXIMITY READER STATION. PROVIDE ANY ADDITIONAL ROUGH-IN FOR "EMERGENCY RELEASE" OPERATOR STATIONS AS REQUIRED.	46"	PR
SAME AS "PR" EXCEPT MULLION MOUNT	46"	PR M
MOTION SENSOR DOOR CONTROL	CLG	MS MS
PUSH-TO-EXIT BUTTON	46"	PE
REMOTE DOOR RELEASE PUSH-BUTTON	8" ACT	RR
RECESSED JUNCTION BOX	SEE DRAWINGS	JB JB
ACCESS CONTROL HEADEND	5'-0"	SEC-A

SECURITY CCTV VIDEO SURVEILLANCE

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
CCTV CAMERA: CEILING MOUNT DOME (TEXT INDICATES TYPE) REFER TO SCHEDULE FOR TYPES	CLG	###
CCTV CAMERA: WALL MOUNT DOME (TEXT INDICATES TYPE) REFER TO SCHEDULE FOR TYPES	WALL	###
INDICATES EXTERIOR CAMERA RATED FOR CONDITIONS, WET LOCATION LISTED, WITH AUXILLARY HEATER		WP
INDICATES CAMERA WITH PAN/TILT/ZOOM FUNCTION		PTZ
CCTV HEAD END	SEE DRAWINGS	SEC-C

SECURITY INTRUSION DETECTION

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
MOTION DETECTOR (WALL OR CEILING MOUNT)	CLG	MD MD
GLASS BREAK SENSOR (WALL OR CEILING MOUNT)	CLG	GB GB
LOCAL SOUNDER	SEE DRAWINGS	LS LS
INTRUSION DETECTION KEYPAD CONTROLLER	46"	ID
SECURITY SYSTEM HEAD END	5'-0"	SEC

DATA / VOICE

DESCRIPTION	MOUNTING HEIGHT	SYMBOL
DATA OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF DATA JACKS. NO NUMBER INDICATES 1 JACK.	1'-6"	2D ▽
VOICE OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF VOICE JACKS. NO NUMBER INDICATES 1 JACK.	1'-6"	▼
COMBINATION OUTLET : NUMBER BESIDE OUTLET INDICATES NUMBER OF DATA/VOICE JACKS	1'-6"	2D/1V
SLASH THROUGH ANY DEVICE INDICATES MOUNTING ABOVE COUNTERTOP 4" ABOVE BACKSPLASH		
OUTLET (VOICE ONLY) : PAYPHONE TYPE	AS REQ'D.	PAY ▼
DATA RACK: TWO POST. REFER TO COMMUNICATIONS RISERS AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.		
DATA RACK: FOUR POST. REFER TO COMMUNICATIONS RISERS AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.		▭
TELECOMMUNICATIONS SYSTEM BACKBOARD. PROVIDE 96"H x 3/4"D FIRE-RETARDENT PLYWOOD BACKBOARD WITH TWO (2) COATS OF NON-C0NDUCTIVE, FIRE-RETARDANT LIGHT GRAY PAINT, #3/0 TO GROUND BAR AT MAIN SERVICE SWITCHBOARD, 30-PT GROUND BAR AND A 6'-0", #3 AWG PIGTAIL AT BACKBOARD. INSTALL BOARD AT 2' AFF. (LENGTH OF BOARD AS INDICATED ON FLOOR PLAN)		━━
WIRELESS ACCESS POINT OUTLET WITH PROVISIONS FOR (2 DATA OUTLET FOR ANTENNA. PROVIDE A COMPLETE DATA OUTLET WITH FACEPLATE ABOVE CEILING, MOUNTED AT AN ACCESSIBLE HEIGHT NO MORE THAN 24" ABOVE CEILING. AT EACH OUTLET, PROVIDE A 20' COIL OF CABLE AHEAD OF THE OUTLET FOR ADJUSTMENT OF FINAL OUTLET LOCATION. THE CONTRACTOR SHALL COORDINATE EXACT LOCATIONS WITH THE OWNER AND ADJUST OUTLET LOCATIONS AT SUBSTANTIAL COMPLETION TO ACCOMMODATE OWNER'S WAP LOCATIONS.	CEILING WALL	A WAP

CABLE AND CONDUIT COLOR SCHEDULE

SYSTEM	CABLE COLOR	CONDUIT COLOR	JACK INSERT	CABLE TYPE
HVAC CONTROLS	TBD	GREEN	N/A	CAT6
VOICE/DATA	GREEN	BLUE	REFER TO SPECIFICATIONS	CAT6A
WAP	GREEN	BLUE	GREEN	CAT6A
SECURITY	TBD	PURPLE	N/A	REFER TO SPECIFICATIONS
IP CAMERAS	GRAY	BLUE	TBD	CAT6
FIRE ALARM	RED	RED	N/A	REFER TO SPECIFICATIONS
EMERGENCY BRANCH	REFER TO SPECIFICATIONS	YELLOW	N/A	REFER TO SPECIFICATIONS
STANDBY BRANCH	REFER TO SPECIFICATIONS	ORANGE	N/A	REFER TO SPECIFICATIONS

RESPONSIBILITY MATRIX

	ELECTRICAL CONTRACTOR	MECHANICAL CONTRACTOR	MCPPD	UTILITIES AND ENERGY MANAGEMENT
FURNISH ALL CONTROL DEVICES		X		
INSTALL CONTROL SENSORS		X		
INSTALL CONDUIT FOR CONTROLS WIRING	X			
RUNNING CONTROLS WIRING	X			
TERMINATE CONTROLS WIRING	X			
CONTROLS COMMISSIONING/CHECKOUT	X	X	X	X
CONTROLS GRAPHICS				X
CONTROLS ALARMS				X
PROGRAM CONTROLS				X
INTEGRATION				X

ELECTRICAL GENERAL NOTES

A EACH CONTRACTOR, PROPOSER, SUPPLIER AND/OR MANUFACTURER SHALL REFER TO ALL DOCUMENTS PERTAINING TO THIS PROJECT AND COORDINATE ACCORDINGLY SO AS TO ENSURE ADEQUACY OF FIT, COMPLIANCE WITH SPECIFICATIONS, PROPER VOLTAGE AND CURRENT CHARACTERISTICS TO AVOID CONFLICT WITH ANY OTHER BUILDINGS SYSTEMS. VERIFY SAME WITH SHOP DRAWINGS.

B ADDITIONAL ELECTRICAL REQUIREMENTS MAY BE SHOWN ON PLANS FROM OTHER DISCIPLINES IN THIS SET. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW ALL PLANS AND SPECIFICATIONS FOR A COMPLETE UNDERSTANDING OF THE PROJECT REQUIREMENTS.

C WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ALL LOCAL, STATE, AND NATIONAL CODES. INCLUDING BUT NOT LIMITED TO NFPA 70 (NEC), NFPA 72, INTERNATIONAL BUILDING CODES, ETC.

D CONTRACTOR SHALL FOLLOW SEISMIC RESTRAINT AND DESIGN REQUIREMENTS CONTAINED IN LATEST ADOPTED STATE AND INTERNATIONAL BUILDING CODES, WITH ALL AMENDMENTS AS ADOPTED BY THE CURRENT LEGISLATION. REFER TO ELECTRICAL AND STRUCTURAL SPECIFICATIONS FOR ADDITIONAL INFORMATION.

E ALL OFFSETS, TURNS, FITTINGS, TRIM, DETAIL, ETC. MAY NOT BE INDICATED, BUT SHALL BE PROVIDED AS REQUIRED. ADDITIONAL ALLOWANCES SHALL BE INCLUDED FOR SAME AT EACH PROPOSER'S DISCRETION.

F INSTALL NO PIPING, CONDUIT, DUCTWORK, ETC. IN A LOCATION OR IN A MANNER WHICH WILL ALLOW FREEZING OR THE COLLECTION OF CONDENSATION THEREON. IF IN DOUBT, CONTACT THE ENGINEER.

G ADVISE THE ENGINEER OF ANY CONFLICTS, ERRORS, OMISSIONS, ETC. AT LEAST TEN DAYS PRIOR TO BID DATE, TO ALLOW CLARIFICATION BY WRITTEN ADDENDUM.

H WHERE CONFLICTS ARE FOUND BETWEEN DRAWINGS, DETAILS, OR SPECIFICATIONS, THE MORE STRINGENT REQUIREMENT SHALL APPLY. NOTIFY ARCHITECT OF DISCREPANCY IN WRITING.

I DEVIATION FROM SPECIFICATIONS OR PLANS REQUIRES PRIOR WRITTEN APPROVAL FROM THE ENGINEERS AND MUST BE SUBMITTED IN WRITING NO LATER THAN TEN DAYS PRIOR TO THE BID DATE.

J OBSERVE ALL APPLICABLE CODES, RULES AND REGULATIONS THAT MAY APPLY TO THE WORK UNDER THIS CONTRACT. (CITY, COUNTY, LOCAL, STATE, FEDERAL, MUNICIPALITY, UTILITY COMPANY, OSHA, ETC.).

K MOUNTING HEIGHTS FOR WALL MOUNTED DEVICES INDICATED ABOVE FINISHED FLOOR ARE TO CENTER OF DEVICE UON. MOUNTING HEIGHTS TO CEILING SUSPENDED DEVICES ARE TO BOTTOM OF DEVICE UON.

L INSTALL EQUIPMENT, MATERIALS, ETC. IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND DIRECTIONS. IF IN CONFLICT WITH THE DESIGN INDICATED IN CONTRACT DOCUMENTS, ADVISE THE ENGINEER PRIOR TO INSTALLATION FOR CLARIFICATION.

M DO NOT RECESS PANELBOARD TUBS OR OTHER FLUSH-MOUNTED EQUIPMENT IN WALLS THAT HAVE A FIRE RATING. NO INSTALLATION SHALL DIMINISH OR VOID FIRE RESISTIVE RATINGS IN ANYWAY.

N THE PURPOSE AND INTENT OF ALL OF THE DOCUMENTS PERTAINING TO THIS PROJECT IS TO PROVIDE A COMPLETE, FUNCTIONAL, SAFE, LIKE-NEW FACILITY. ANYTHING LESS SHALL BE UNACCEPTABLE.

O ALL SYSTEMS, EQUIPMENT AND MATERIALS ARE TO BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. WORK NOT MEETING THIS CRITERION SHALL BE REMOVED AND REINSTALLED SATISFACTORILY. FINAL DETERMINATION OF THE ACCEPTABILITY OF THE QUALITY OF WORK RESIDES WITH THE ENGINEER

P ALL WORK, MATERIALS, EQUIPMENT, ETC. SHALL BE FULLY GUARANTEED FOR ONE FULL CALENDAR YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION AS DOCUMENTED BY THE ENGINEER, UNLESS LONGER WARRANTY PERIODS FOR EQUIPMENT ARE SPECIFIED.

Q UNLESS OTHERWISE SPECIFIED OR INDICATED, ALL EQUIPMENT AND/OR MATERIALS WITHIN OCCUPIED SPACES OR EXPOSED TO VIEW ON THE BUILDING EXTERIOR SHALL BE PRIMED AND FINISHED SO AS TO COMPLEMENT ADJACENT SURFACE, UNLESS OTHERWISE NOTED. COORDINATE WORK AND COLORS WITH ARCHITECT.

R WHERE PENETRATING ROOFING MEMBRANE OR OTHER MATERIALS USED FOR WEATHERPROOFING THE BUILDING, MAKE SUCH PENETRATION IN A WAY THAT WILL NOT VOID OR DIMINISH THE ROOFING WARRANTY OR INTEGRITY IN ANYWAY. COORDINATE ALL SUCH PENETRATIONS WITH THE ROOFING MANUFACTURER AND ARCHITECT.

S THE CONTRACTOR IS RESPONSIBLE FOR ALL UTILITY COMPANY FEES, CASH CONTRIBUTIONS OR OTHER COSTS THAT THE UTILITY COMPANY MAY REQUIRE TO COMPLETE THEIR WORK. (ELECTRIC, TELEPHONE, TELEVISION, DATA, ETC.).

T COORDINATE WITH ARCHITECTURAL FLOOR PLANS, ELEVATIONS AND CASEWORK DETAILS FOR LOCATION OF ADDITIONAL RECEPTACLES, UTILITY OUTLETS, ELECTRICAL DEVICES, ETC.

U CEILING-MOUNTED ELECTRICAL DEVICES SHALL BE CENTERED IN 2'X2' CEILING TILE AND INSTALLED CENTERED ON 2' DIMENSION OF 2'X4' TILE AND ON CENTERLINE OR A QUARTER POINT ON 4' DIMENSION.

V ANY VIBRATING, OSCILLATING OR OTHER NOISE OR MOTION PRODUCING EQUIPMENT SHALL BE ISOLATED FROM SURROUNDING SYSTEMS IN AN APPROVED MANNER. NOISY OR STRUCTURALLY DAMAGING INSTALLATIONS SHALL BE SATISFACTORILY REPLACED OR REPAIRED AT THE INSTALLING CONTRACTORS' EXPENSE. THE FINAL DECISION ON THE SUITABILITY OF A PARTICULAR INSTALLATION'S ACCEPTABILITY SHALL BE THAT OF THE ENGINEER.

W CHECK ALL THREE PHASE MOTORS WITH A PHASE ROTATION METER, PRIOR TO PLACING IN SERVICE.

X PROVIDE DETAILED SHOP DRAWINGS TO ENGINEER PRIOR TO PURCHASING OR INSTALLING ANY EQUIPMENT

Y DEVIATIONS IN SIZES, CAPACITIES, FIT, FINISH, ETC. FOR EQUIPMENT FROM THAT PRIME SPECIFIED SHALL BE THE RESPONSIBILITY OF THE PURCHASER OF THAT EQUIPMENT. ANY PROVISIONS REQUIRED TO ACCOMMODATE A DEVIATION, WHETHER APPROVED BY THE ENGINEER OR NOT, SHALL BE THE RESPONSIBILITY OF THE PURCHASER.

Z THE CONSTRUCTION MANAGER, GENERAL CONTRACTOR, OR WHOMEVER HOLDS THE PRIME CONTRACT(S) FOR THIS CONSTRUCTION IS RESPONSIBLE FOR THE COORDINATION, APPEARANCE, SCHEDULING AND TIMELINESS OF THE WORK OF ALL TRADES, CONTRACTORS, SUPPLIERS, INSTALLERS, ETC. POOR OR UNTIMELY WORK ON THE PART OF ANY SUBCONTRACTOR SHALL BE RESOLVED BY THE PARTY WHO ENGAGED THEM ON THIS PROJECT.

AA WHERE MOUNTING HEIGHTS ARE NOT INDICATED OR ARE IN CONFLICT WITH ANY OTHER BUILDING SYSTEM, CONTACT THE ENGINEER BEFORE AFFECTING INSTALLATION. REFER ALSO TO ARCHITECTURAL INTERIOR AND EXTERIOR ELEVATIONS, CEILING HEIGHTS AND OTHER DETAILS OF THESE DOCUMENTS, AS APPLICABLE.

AB WHERE FIRE-RATED CEILING ASSEMBLIES ARE NOTED, PROVIDE UL-LISTED FIRE-RATED GYPSUM BOARD OR PRE-MANUFACTURED ENCLOSURES ABOVE LUMINAIRES, CEILING DEVICES, ETC. IN OR ON CEILING, AS REQUIRED TO MAINTAIN CEILING RATINGS.

AC COORDINATE THE LOCATION OF DRAINS, ELECTRICAL OUTLETS, GAS OUTLETS, ETC. WITH ALL CASEWORK, KITCHEN EQUIPMENT, MECHANICAL ROOM EQUIPMENT, ETC. PRIOR TO COMMENCING INSTALLATION. WORK NOT SO COORDINATED SHALL BE REMOVED AND PROPERLY INSTALLED AT THE EXPENSE OF THE RESPONSIBLE CONTRACTOR(S).

AD ALL ELECTRICAL COMPONENTS OR EQUIPMENT SHALL BE LISTED AND LABELED BY UNDERWRITER'S LABORATORIES OR OTHER APPROVED LISTING AGENCY. APPROVAL AND LABELING OF INDIVIDUAL COMPONENTS ON AN ASSEMBLY IS NOT ACCEPTABLE AS MEETING THIS REQUIREMENT, UNLESS WAIVED BY THE ENGINEER IN WRITING.

AE ALL WIRING SYSTEMS SHALL BE INSTALLED WITH A MINIMUM OF SPLICES. CONDUCTORS, WHETHER SINGLE OR MULTI-PAIR, SHALL BE INSTALLED CONTINUOUS INSOFAR AS POSSIBLE FROM TERMINAL POINT TO TERMINAL POINT.

AF NO CONDUIT, SUPPORTS, ETC. SHALL BE RUN THROUGH ACCESS CLEARANCES OF EQUIPMENT BY OTHER TRADES (I.E. VAV BOXES). COORDINATE WITH ALL TRADES PRIOR TO CONSTRUCTION.

AG ALL CONTRACTORS SHALL EXERCISE EXTREME CARE IN THE COURSE OF THEIR WORK SO AS TO ENSURE THAT THEY DO NOT INTERRUPT ANY EXISTING SERVICE OR SUB-SERVICE FOR SAFETY PURPOSES. PAY PARTICULAR ATTENTION TO THIS PRECAUTION RELATIVE TO NATURAL GAS AND ELECTRICAL LINES. VERIFY THE LOCATION, SIZE, TYPE, ETC. OF EACH UNDERGROUND OR OVERHEAD UTILITY. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL FEDERAL, STATE AND/OR LOCAL RULES, REGULATIONS, STANDARD AND SAFETY REQUIREMENTS. UTILITIES SHALL BE INSTALLED IN ACCORDANCE WITH THE APPLICABLE MUNICIPALITY OR UTILITY COMPANY STANDARDS. IN ALL CASES, THE MOST STRINGENT REQUIREMENT SHALL APPLY.

AH ALL SUPPORTS FOR EQUIPMENT, DEVICES OR FIXTURES SHALL BE UNIQUE, DIRECTLY FROM THE BUILDING STRUCTURE. DO NOT SUPPORT WORK FROM OTHER TRADES EQUIPMENT OR SUPPORTS WITHOUT WRITTEN PERMISSION FROM THE ENGINEER AND CONSENT OF THE OTHER TRADE, IN WRITING.

AI WHERE INTERRUPTING AN EXISTING UTILITY OR SERVICE DELIBERATELY OR ACCIDENTALLY, THE RESPONSIBLE CONTRACTOR SHALL WORK CONTINUOUSLY AS NEEDED TO RESTORE SAME, PROVIDING PREMIUM TIME AS NEEDED.

AJ REFER TO ARCHITECTURAL WALL ELEVATIONS (WHERE GIVEN) FOR HEIGHTS AND MOUNTING RELATIONSHIP OF OUTLETS AND EQUIPMENT. IF IN DOUBT, CONTACT ENGINEER FOR DIRECTION PRIOR TO ROUGH IN.

AK FLUSH OR PEDESTAL TYPE FLOOR OUTLETS/BOXES, AS INDICATED ON PLAN, SHALL BE LOCATED BY DIMENSIONS PROVIDED BY THE ARCHITECT, UNLESS OTHERWISE SHOWN ON PLANS. IF IN DOUBT, CONTACT THE ENGINEER PRIOR TO ROUGHING-IN ANY WORK.

AL AS APPLICABLE, REFER TO ARCHITECTURAL PHASING PLANS AND PHASING BOUNDARIES ON THESE DRAWINGS FOR SEQUENCING OF WORK, FULL EXTENT OF AREAS INVOLVED, EXTENT OF CEILING WORK, ETC. PROVIDE TEMPORARY CONNECTIONS FOR CIRCUITS AND WORK AS REQUIRED TO MAINTAIN SEQUENCE OF THE WORK FROM PHASE TO PHASE.

AM THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING REQUIRED FOR HIS WORK. ALL CUTTING AND PATCHING SHALL BE IN ACCORDANCE WITH THE ARCHITECT'S STANDARDS FOR SUCH WORK.

AN ALL WORK SHALL BE CONCEALED UNLESS SPECIFICALLY INDICATED TO BE EXPOSED, OR REQUIRED TO BE EXPOSED. IF IN DOUBT, CONTACT THE ENGINEER FOR CLARIFICATIONS PRIOR TO INSTALLING ANY SUCH WORK.

AO INTERRUPTION OF ANY EXISTING SERVICES SHALL BE COORDINATED WITH THE OWNER, GENERAL CONTRACTOR, UTILITY COMPANY AS NECESSARY, AND THE ARCHITECT, AT LEAST TWO WEEKS IN ADVANCE OF ANTICIPATED INTERRUPTION. A SCHEDULE FOR THESE OUTAGES SHALL BE DEVELOPED AND AGREED UPON BETWEEN THE PARTIES MENTIONED TO AVOID UNNECESSARY INCONVENIENCE TO THE OWNER OR ANY AFFECTED PARTY. NOTIFY THE UTILITY COMPANY OF ANY ANTICIPATED SERVICES REQUIRED TWO WEEKS IN ADVANCE, IN WRITING. IF UTILITY COMPANY REQUIRES A LONGER NOTIFICATION PERIOD, SO PROVIDE.

AP WHERE BACKBOXES ARE LOCATED IN THE SAME VERTICAL CHANNEL/STUD SPACE ON OPPOSITE SIDES OF THE SAME WALL, PROVIDE SOUND-INSULATING PUTTY AROUND BOXES AS REQUIRED TO ELIMINATE SOUND TRANSMISSION FROM ROOM TO ROOM.

AQ JUNCTION BOXES LOCATED ABOVE ACCESSIBLE CEILINGS SHALL BE LOCATED NO MORE THAN 36" ABOVE CEILING LEVEL. LABEL EACH BOX IN AREA OF WORK WITH A PERMANENT MARKER OR IN ACCORDANCE WITH SPECIFICATIONS, WHICHEVER IS MORE STRINGENT.

AR ALL MATERIALS FURNISHED AND ALL WORK INSTALLED SHALL COMPLY WITH THE CURRENT EDITION OF THE NATIONAL ELECTRICAL CODES, NATIONAL FIRE CODES OF THE NATIONAL FIRE PROTECTION ASSOCIATION, THE REQUIREMENTS OF LOCAL UTILITY COMPANIES, AND WITH THE REQUIREMENTS OF ALL GOVERNMENTAL AGENCIES OR DEPARTMENTS HAVING JURISDICTION. IF ANY CONFLICTS OR DISCREPANCIES OCCUR THE MOST STRINGENT SHALL APPLY.

AS DO NOT SCALE FROM DRAWINGS, AS PRINTING DISTORTS SCALE. WORK SHALL BE LAID OUT FROM DIMENSIONED DRAWINGS, OR DIMENSIONS SUPPLIED TO THE CONTRACTOR.

AT NOISY WORK, WORK OUTSIDE CONSTRUCTION BARRIERS, WORK IN OCCUPIED AREAS, ETC. SHALL BE PERFORMED AFTER HOURS OR ON WEEKENDS. COORDINATE EXACT SCHEDULING WITH FACILITY PRIOR TO CONSTRUCTION.

AU ALL ITEMS HAVING KEYED LOCKS/OPERATORS SHALL HAVE CORED LOCKS/OPERATORS. ALL KEYING SHALL MATCH THE OWNER'S EXISTING KEY-WAYS. COORDINATE EXACT REQUIREMENTS WITH OWNER PRIOR TO CONSTRUCTION.

AV REFER TO ARCHITECTURAL PLANS FOR PHASING REQUIREMENTS. WORK SHALL BE COMPLETED IN PHASES PER THE PHASING PLAN AND AS COORDINATED WITH OWNER AND GENERAL CONTRACTOR. PROVIDE ALL REQUIRED INCREMENTAL INSPECTIONS, CERTIFICATIONS, ETC. AND ALL TEMPORARY SERVICES AS REQUIRED BY OWNER TO ACCOMPLISH THE PHASING PLAN.

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CONTRACT DOCUMENTS

IMPROVE FACILITIES -
JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
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PROJECT	202277/XKJS22
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ELECTRICAL LEGEND

E-001

A FIRST FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'C'
1/8" = 1'-0"

ELECTRICAL DEMOLITION NOTES

- A DOTTED LINES INDICATE ITEMS FOR REMOVAL (UON) AND SOLID HALFTONE LINES INDICATE EXISTING ITEMS TO REMAIN.
- B THE CONTRACTOR SHALL MAINTAIN THE CONTINUITY OF EXISTING CIRCUITS THAT CONTAIN DEVICES OR EQUIPMENT THAT ARE TO REMAIN. WHEN DEMOLITION OF AN ELECTRICAL DEVICE (OR CIRCUIT) IS INDICATED ON THE DRAWINGS: THE CONTRACTOR SHALL ENSURE THAT OTHER DEVICES OR EQUIPMENT "UPSTREAM" OR "DOWNSTREAM" ON THE CIRCUITS SHALL REMAIN IN "PRE- DEMOLITION" WORKING ORDER. "LEFT-OVER" CIRCUIT BREAKERS SHALL REMAIN, BE SWITCHED TO OFF POSITION, AND BE LABELED AS SPARES IN THEIR PANELS. PROVIDE NEW TYPEWRITTEN DIRECTORIES FOR ALL PANELS AFFECTED.
- C LOCATIONS OF DEVICES, CONNECTIONS, ETC., INDICATED ON THIS DRAWING WERE TAKEN FROM VARIOUS SOURCES. THEY ARE DIAGRAMMATIC ONLY AND ARE SUBJECT TO VARIATION FROM EXISTING CONDITIONS. CERTAIN EXISTING ELEMENTS MAY NOT BE INDICATED AT ALL. THE CONTRACTOR PROPOSING TO DO ANY PART OF THE WORK INDICATED HEREON SHALL VISIT THIS SITE AND DETERMINE TO HIS/HER SATISFACTION THAT THEY MAY COMPLETE ALL WORK REQUIRED FOR THE BID WHICH HE/SHE PROPOSES.
- D REMOVE ALL ASSOCIATED BACKBOXES, CONDUIT AND CONDUCTORS FOR DEVICES / FIXTURES / ETC. BEING REMOVED (BACK TO SOURCE), WHETHER INDICATED OR NOT (UON). CONTRACTOR SHALL PATCH AND REPAIR ANY EXISTING WALLS, FLOORS OR CEILINGS WHERE DEVICES ARE SHOWN TO BE REMOVED (PATCH AND REPAIR TO RECEIVE NEW FINISHES - SEE ARCHITECTURAL PLANS).
- E COORDINATE DISPOSAL OF ALL FIXTURES, DEVICES, ETC. (INDICATED FOR DEMOLITION) WITH OWNER. TURN OVER ITEMS REMOVED TO OWNER AT THEIR OPTION.
- F COORDINATE WITH OTHER TRADES FOR THE REMOVAL AND/OR RELOCATION OF ELECTRICAL DEVICES AND CONNECTIONS ASSOCIATED WITH THEIR EQUIPMENT.
- G PROVIDE TEMPORARY EMERGENCY EXIT LIGHTS AT CONSTRUCTION BARRIERS AS REQUIRED.
- H CONTRACTOR SHALL PATCH AND REPAIR ALL EXISTING WALLS / CEILINGS AS REQUIRED WHERE DEVICES ARE BEING REMOVED OR INSTALLED.
- I UNUSED/ABANDONED CONDUCTORS DISCOVERED ABOVE ACCESSIBLE CEILINGS SHALL BE REMOVED IN ACCORDANCE WITH NEC REQUIREMENTS.
- J EXISTING ELECTRICAL SYSTEMS IN CONFLICT WITH CONSTRUCTION SHALL BE RELOCATED TO PERMIT INSTALLATION OF DEVICES AND EQUIPMENT SHOWN ON PLANS.
- K CONTRACTOR SHALL SEAL ALL EXISTING AND NEW PENETRATIONS OF BUILDING ENVELOPE (EXTERIOR WALLS, ROOF, ETC.) WATER-TIGHT AND AS APPROVED BY ARCHITECT AND ENGINEER. ROOFING SHALL BE RESTORED BY A LICENSED ROOFING CONTRACTOR BASED ON WRITTEN INSTRUCTIONS AND DETAILS FROM ROOFING MANUFACTURER AS REQUIRED TO MAINTAIN ROOF WARRANTY. REFER TO ARCHITECTURAL AND ENGINEERING PLANS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS.
- L DEVICES INDICATED WITH AN "R" SHALL BE RELOCATED. REMOVE, PROTECT, AND REINSTALL IN NEW LOCATION INDICATED ON NEW WORK PLANS. INTERCEPT AND EXTEND ALL EXISTING CABLING TO NEW LOCATION. CLEAN AND RE-LAMP RELOCATED LUMINAIRES.
- M ALL EXISTING PANELS AFFECTED BY THIS CONTRACTOR'S WORK SHALL BE PROVIDED WITH NEW TYPE-WRITTEN PANEL DIRECTORIES AND INSERT SLEEVES. PANEL DIRECTORIES SHALL NOT USE ROOM NAMES OR NUMBERS FROM THESE DRAWINGS. DIRECTORIES SHALL BE DETAILED AND COORDINATED WITH OWNER'S SUITE NUMBERS, FINAL ROOM NUMBERS, IT RACK NAMES, WORKSTATION DESIGNATIONS, ETC. UNUSED BREAKERS SHALL BE IN OFF POSITION.
- N CONTRACTOR TO VERIFY THAT THERE ARE NO ELECTRICAL CIRCUITS IN CHASES BEING REMOVED UNDER DEMOLITION WHICH REMAIN IN SERVICE AND CANNOT BE REMOVED. SHOULD SUCH CIRCUITS BE ENCOUNTERED, THE CONTRACTOR IS TO REROUTE AND RECONNECT AS REQUIRED TO MAINTAIN SERVICE.

TAGGED NOTES

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- ED1 REMOVE ALL LIGHT FIXTURES, LIGHTING DEVICES, RECEPTACLES, ELECTRICAL EQUIPMENT, DATA DEVICES, ETC. AND ALL ASSOCIATED WIRING AND CONDUIT IN SHELL SPACE.
- ED2 REMOVE CIRCUIT WIRING AND CONDUIT FOR UNIT HEATERS.
- ED3 REMOVE CARD READER AND RETURN TO OWNER FOR FUTURE USE.

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FIRST FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'C'

E-111C

Autodesk Docs://202277 - UK JSB Improvements/2022.XKJS22 MEP.rvt

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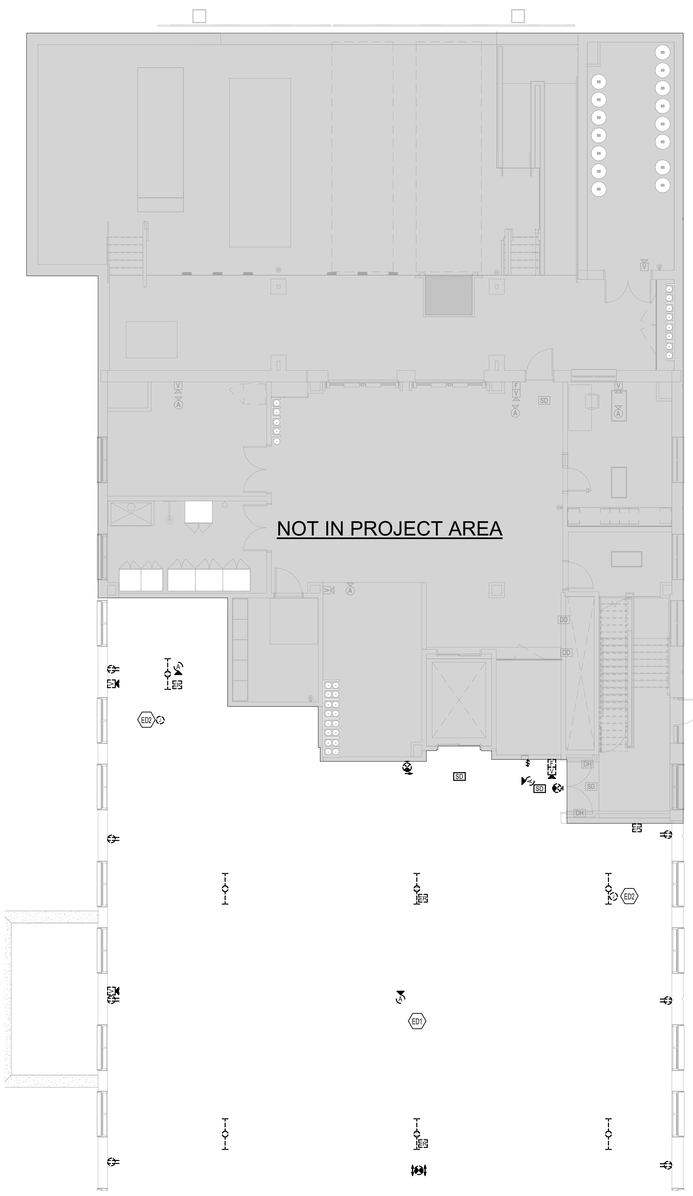

A FIRST FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'D'
1/8" = 1'-0"

ELECTRICAL DEMOLITION NOTES

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PROJECT	202277/XKJS22
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REVISIONS

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FIRST FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'D'

E-111D

A SECOND FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'C'
1/8" = 1'-0"

ELECTRICAL DEMOLITION NOTES

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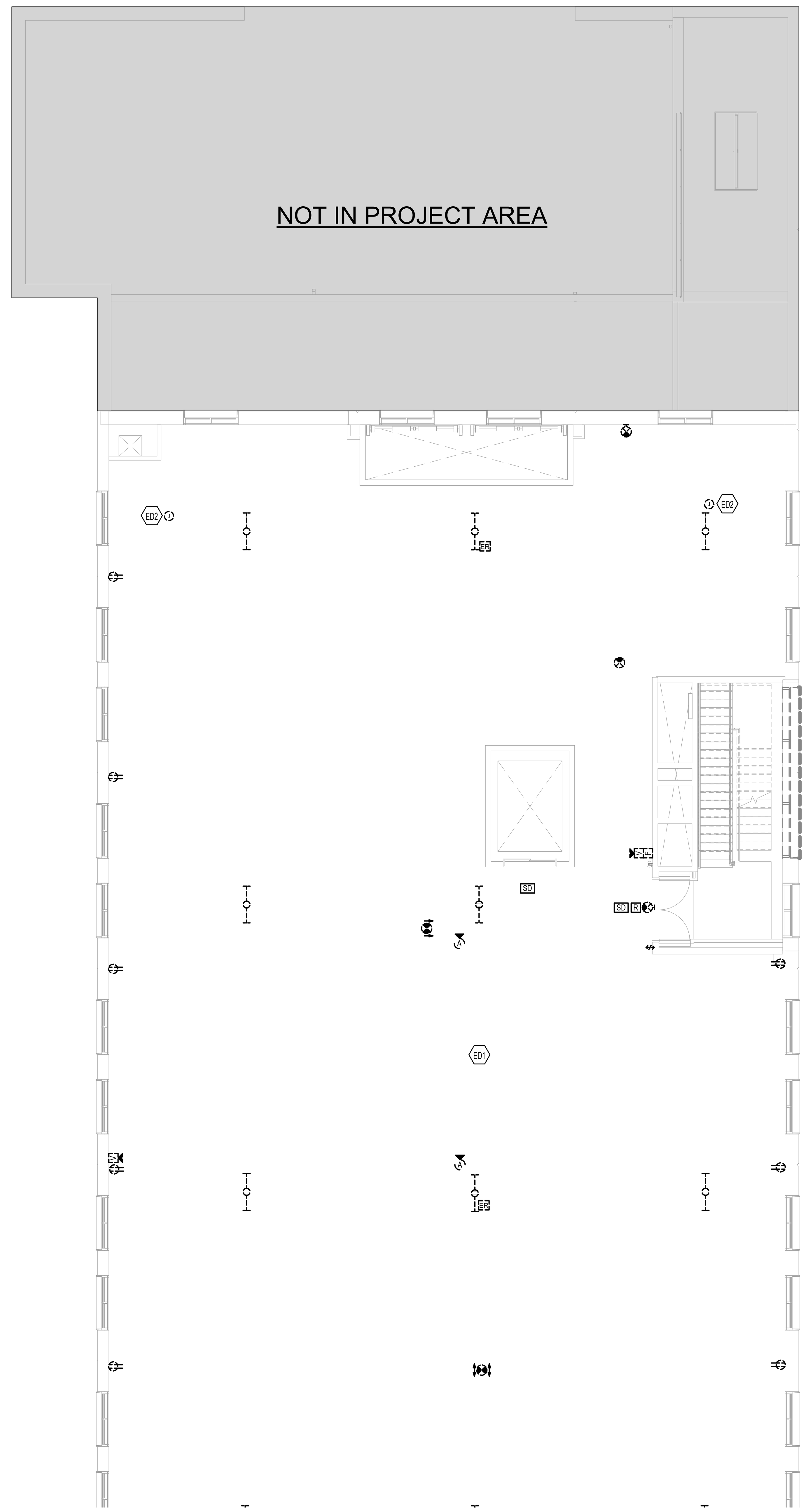
SECOND FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'C'

E-112C



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SECOND FLOOR ELECTRICAL DEMOLITION - AREA 'D'

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A THIRD FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'C'

1/8" = 1'-0"

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STATE OF KENTUCKY
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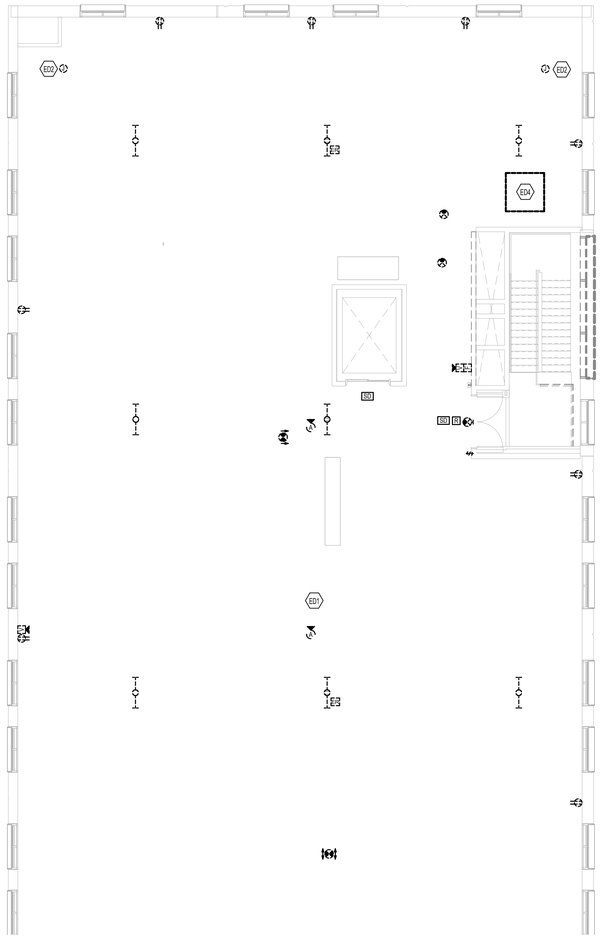
THIRD FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'C'

E-113C



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ALAN R. KELLUM
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IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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THIRD FLOOR ELECTRICAL DEMOLITION PLAN - AREA 'D'

E-113D

SECTION 200100 - GENERAL PROVISIONS - MECHANICAL

1. GENERAL

A. The Advertisement for Bids, Instructions to Bidders, Bidding Requirements, General, Special and Supplementary Conditions, and all other contract documents shall apply to the Contractor's work as well as to each of his Sub-Contractor's work. All manufacturers, suppliers, fabricators, contractors, etc. submitting proposals to any part if for work, services, materials or equipment to be used on or applied to this project are hereby directed to familiarize themselves with all documents pertinent to this Contract. In case of conflict between these General Provisions and the General and/or Special Conditions, the affected Contractor shall contact the Engineer for clarification and final determination.

B. Each Proposer shall also be governed by any unit prices and Addenda insofar as they may affect his part of the work or services.

C. The work included in this division consists of the furnishing of all labor, equipment, transportation, excavation, backfill, supplies, material, appurtenances and services necessary for the satisfactory installation of the complete and operating Mechanical System(s) indicated or specified in the Contract Documents.

D. Any materials, labor, equipment or services not mentioned specifically herein which may be necessary to complete or perfect any part of the Mechanical Systems in a substantial manner, in compliance with the requirements stated, implied or intended in the drawings and/or specifications, shall be included as part of this Contract.

E. It is not the intent of this section of the specifications to make any Contractor, other than the Construction Manager responsible to the Owner, Architect and Engineer. All transactions such as submittal of shop drawings, claims for extra costs, requests for equipment or materials substitution, shall be routed through the General Contractor to the Architect (if applicable), then to the Engineer. Also, this section of the specifications shall not be construed as an attempt to arbitrarily assign responsibility of work, material, equipment or services to a particular trade or Contractor. Unless stated otherwise, the subdivision and assignment of work under the various sections shall be optional.

F. It is the intent of this Contract to deliver to the Owners a "like new" project once work is complete. Although plans and specifications are complete to the extent possible, it shall be the responsibility of the Contractors involved to remove and/or relocate or re-attach any existing or new systems which interfere with new equipment or materials required for the complete installation without additional cost to the Owner.

G. In general, and to the extent possible, all work shall be accomplished without interruption of existing facilities operations. The Contractor shall advise the Owners at least two weeks prior to the interruption of any services or utilities. The Owners shall be advised of the exact time that interruption will occur and the length of time the interruption will last. Failure to comply with this requirement may result in complete work stoppage by the Contractors involved until a complete schedule of interruptions can be developed.

H. Definitions and Abbreviations

(1) Contractor - Any Contractor whether proposing or working independently or under the supervision of a General Contractor and/or Construction Manager and who installs any type of

mechanical work (Controls, Plumbing, HVAC, Sprinkler, Gas Systems, etc.) or, the General Contractor.

(2) Engineer - The Consulting Mechanical-Electrical Engineers either consulting to the Owners, Architect, other Engineers, etc. In this case: CMTA, Inc., Consulting Engineers.

(3) Architect - The Architect of Record for the project.

(4) Furnish - Deliver to the site in good condition and turn over to the Contractor who is to install.

(5) Provide - Furnish and install complete, tested and ready for operation.

(6) Install - Receive and place in satisfactory operation.

(7) Indicated - Listed in the Specifications, shown on the Drawings or Addenda thereto.

(8) Typical - Where indicated repeat this work, method or means each time the same or similar condition occurs whether indicated or not.

(9) Contract Documents - All documents pertinent to the quality and quantity of work to be performed on this project. Includes, but not limited to: Plans, Specifications, Instructions to Bidders, General and Special Conditions, Addenda, Alternates, Lists of Materials, Lists of Sub-Contractors, Unit Prices, Shop Drawings, Field Orders, Change Orders, Cost Breakdowns, Schedules of Value, Periodical Payment Requests, Construction Contract with Owners, etc.

(10) Proposer - Any person, agency or entity submitting a proposal to any person, agency or entity for any part of the work required under this contract.

(11) OSHA - Office of Safety and Health Administration.

(12)KBC - Kentucky Building Code.

(13)The Project - All of the work required under this Contract.

(14)NEC - National Electrical Code.

(15)NFPA - National Fire Protection Association.

(16)ASME - American Society of Mechanical Engineers.

(17)AGA - American Gas Association.

(18)SMACNA - Sheet Metal and Air Conditioning Contractors National Association.

(19)ANSI - American National Standards Institute.

(20)ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers.

(21)NEMA - National Electrical Manufacturers Association.

(22)UL - Underwriters Laboratories.

(23)ADA - Americans with Disabilities Act.

(24)IMC - International Mechanical Code.

(25)IECC - International Energy Conservation Code.

(26)IFGC - International Fuel Gas Code.

I. Required Notices:

(1) Ten days prior to the submission of a proposal, each proposer shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, Proposers signify that they have included the cost of all required items in the proposal and that the Proposer will be responsible for the safe and satisfactory operation of the entire system.

J. All work shall conform to University of Kentucky official design standards. A complete copy of the design standards is located at the following location: https://www.uky.edu/cpmd/design-standards/divisions-20---29---facility-services-subgroup All contractors shall familiarize themselves with this standard and bid the project accordingly. If a conflict arises between the specifications and the facility standard, the proposer shall notify the engineer of the conflict prior to his bid.

2. INTENT

A. It is the intention of the Contract Documents to call for finished work, tested and ready for operation.

B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

3. DRAWINGS AND SPECIFICATIONS

A. The drawings are diagrammatic only and indicate the general arrangement of the systems and are to be followed. If deviations from the layouts are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Engineer for approval before proceeding with the work. The drawings are not intended to show every item which may be necessary to complete the systems. All proposers shall anticipate that additional items may be required and submit their bid accordingly.

B. The drawings and specifications are intended to supplement each other. No Proposer shall take advantage of conflict between them, or between parts of either. Should this condition exist, the Proposer shall request a clarification not less than twelve days prior to the submission of the proposal so that the condition may be clarified by Addendum. In the event that such a condition arises after work is started, the interpretation of the Engineer shall be final.

C. The drawings and specifications shall be considered to be cooperative and anything appearing in the specifications which may not be indicated on the drawings or conversely, shall be considered as part of the Contract and must be executed the same as though indicated by both.

D. Contractor shall make all his own measurements in the field and shall be responsible for correct fitting. He shall coordinate this work with all other branches of work in such a manner as to cause a minimum of conflict or delay.

E. The Engineer shall reserve the right to make adjustments in location of piping, ductwork, equipment, etc. where such adjustments are in the interest of improving the project.

F. Should conflict or overlap (duplication) of work between the various trades become evident, this shall be called to the attention of the Engineer. In such event neither trade shall assume that he is to be relieved of the work which is specified under his branch until instructions in writing are received from the Engineer.

G. Unless dimensioned, the mechanical drawings only indicate approximate locations of equipment, piping, ductwork, etc. Dimensions given in figures on the drawings shall take precedence over scaled dimensions and all dimensions, whether given in figures or scaled, shall be verified in the field to ensure no conflict with other work.

H. Each Proposer shall review all drawings including Architectural, Mechanical, Electrical, Fire Protection, Landscaping, Structural, Surveys, etc., to ensure that the work he intends to provide does not encroach a conflict with or affect the work of others in any way. Where such effect does occur, it shall be the Proposer's responsibility to satisfactorily eliminate any such encroachment conflict or effect prior to the submission of his proposal. Each Proposer shall in particular ensure that there is adequate space to install his equipment and materials. Failure to do so shall result in the correction of such encroachment conflict or effect of any work awarded the proposer and shall be accomplished fully without expense to others and that they are reasonably accessible for maintenance. Check closely all mechanical and electrical closets, chases, ceiling voids, wall voids, crawl spaces, etc., to ensure adequate spaces.

I. Where on the drawings a portion of the work is drawn out and the remainder is indicated in outline, or not indicated at all, the parts drawn out shall apply to all other like portions of the work. Where ornamentation or other detail is indicated by starting only, such detail shall be continued throughout the courses or parts in which it occurs and shall also apply to all other similar parts of the work, unless otherwise indicated.

J. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

K. Where on the Drawings or Addenda the word typical is used, it shall mean that the work method or means indicated as typical shall be repeated in and each time it occurs whether indicated or not.

L. Special Note: Always check ceiling heights indicated on Architectural Drawings and Schedules and ensure that they may be maintained after all mechanical and electrical equipment is installed. Do not install equipment in the affected area until the conflict is resolved.

4. EXAMINATION OF SITE AND CONDITIONS

A. Each Proposer shall inform himself of all of the conditions under which the work is to be performed, the site of the work, the structure of the ground, above and below grade, the obstacles that may be encountered, the availability and location of necessary facilities and all relevant matters concerning the work. Each Proposer shall also fully acquaint himself with all existing conditions as to ingress and egress, distance of haul from supply points, routes for transportation of materials, facilities and services, availability of utilities, etc. His proposal shall cover all expenses or disbursements in connection with such matters and conditions. No allowance will be made for lack of knowledge concerning such conditions after bids are accepted.

5. EQUIPMENT AND MATERIALS SUBSTITUTIONS OR DEVIATIONS

   A. When any Contractor requests approval of materials and/or equipment of different physical size, capacity, function, color, access, it shall be understood that such substitution, if approved, will be made without additional cost to anyone other than the Contractor requesting the change regardless of changes in connections, space requirements, electrical characteristics, electrical services, etc., from that indicated. In all cases where substitutions affect other trades, the Contractor requesting such substitutions shall advise all such Contractors of the change and shall remunerate them for all necessary changes in their work. Any drawings, Specifications, Diagrams, etc., required to describe and coordinate such substitutions or deviations shall be professionally prepared at the responsible Contractor's expense. Review of Shop Drawings by the Engineers does not in any way absolve the Contractor of this responsibility.

   B. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; any devices, products, materials, fixtures, forms, or types of construction which, in the judgment of the Engineer, are equivalent to those specified are acceptable, provided the provisions of Paragraph (A) immediately preceding are met. Requested substitutions shall be submitted to the Engineer a minimum of twelve days prior to bids.

   C. Wherever any equipment and material is specified exclusively only such items shall be used unless substitution is accepted in writing by the Engineers.

   D. Each Proposer shall furnish along with his proposal a list of specified equipment and materials which he is to provide. Where several makes are mentioned in the specifications and the Contractor fails to state which he proposes to furnish, the Engineer shall choose any of the makes mentioned without change in price. Inclusion in this list shall not ensure that the Engineers will approve shop drawings unless the equipment, materials, etc., submitted in shop drawings is satisfactorily comparable to the items specified and/or indicated.

6. SUPERVISION OF WORK

   A. The Contractor shall personally supervise the work for which he is responsible or have a competent superintendent, approved by the Engineers, on the work at all times during progress with full authority to act for him.

7. CODES, RULES, PERMITS, FEES, INSPECTIONS, REGULATIONS, ETC.

   A. The Contractor shall give all necessary notices, obtain and pay for all permits, government sales taxes, fees, inspections and other costs, including all utility connections, meters, meter settings, taps, tap fees, extensions, water and/or sewer system development charge, etc. in connection with his work. He shall also file all necessary plans, prepare all documents and obtain all necessary approvals of all governmental departments and/or the appropriate municipality or utility company having jurisdiction, whether indicated or specified or not. He shall hire an independent Registered Engineer to witness installations and provide necessary certifications where required by utility companies, municipal agencies or others that have review authority. He shall also obtain all required certificates of inspection for his work and deliver same to the Engineers before request for acceptance and final payment for the work. Ignorance of Codes, Rules, Regulations, Laws, etc. shall not render the Contractor irresponsible for compliance. The Contractor shall also be versed in all Codes, Rules and Regulations pertinent to his part of the work prior to submission of a proposal.

B. The Contractor shall include in his work, without extra cost, any labor, materials, services, apparatus and drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not indicated or specified.

C. All materials furnished and all work installed shall comply with the National Fire Codes of the National Fire Protection Association, with the requirements of local utility companies, or municipalities and with the requirements of all governmental agencies having jurisdiction.

D. All materials and equipment so indicated and all equipment and materials for the electrical portion of the mechanical systems shall bear the approval label of, or shall be listed by the Underwriters' Laboratories (UL), Incorporated. Each packaged assembly shall be approved as a package. Approval of components of a package shall not be acceptable. Where required by the Code and/or the Authority Having Jurisdiction, provide the services of a field labeling agency to provide a UL label for the entire system in the field under evaluation.

E. All plumbing work is to be constructed and installed in accordance with plans and specifications which have been approved in their entirety and/or reflect any changes requested by the State Department of Health. Plumbing work shall not commence until such plans are in the hands of the Contractor.

F. All Heating, Ventilation and Air Conditioning work shall be accomplished in accordance with the Kentucky Building Code (KBC) and amendments thereto, the latest standards recognized by the American Society of Heating, Refrigerating and Air Conditioning and the National Fire Protection Association. Contractor shall secure a permit from the Division of HVAC. Final inspection certificate shall be provided by Contractor and a copy included in Operation and Maintenance Manuals.

G. All pressure vessel installations shall comply with the State, and/or Federal Code applicable. A Certificate of Final Boiler Inspection shall be required.

H. The Contractor shall furnish three (3) copies of all Final Inspection Certificates obtained to the Engineer when work is complete. Final payment for work will be contingent upon compliance with this requirement.

I. Where minimum code requirements are exceeded in the Design, the Design shall govern.

J. The Contractor shall ensure that his work is accomplished in accord with the OSHA Standards and that he conducts his work and the work of his personnel in accord with same.

K. Work in elevators, elevator shafts and elevator equipment rooms shall comply with the Elevator Code enforced by the Commonwealth of Kentucky.

L. All work relating to the handicapped shall be in accord with regulations currently enforced by the Department of Housing, Buildings and Construction, Commonwealth of Kentucky and the American Disabilities Act.

M. All work in conjunction with a natural gas installation shall, in addition to all other Codes, Rules, Regulations, Standards, etc., comply with the requirements of the local gas supplier and/or standards and recommendations of the American Gas Association.

N. All work in relation to domestic water systems shall, in addition to all other Codes, Rules, Regulations and Standards, be in compliance with the requirements of the local water utility company and the adopted edition of the 10 States Standards.

O. All work in relation to the installation of sanitary or storm sewers shall, in addition to all other Codes, Rules, Regulations and Standards, be in compliance with the local agency governing such installations and the adopted edition of the 10 States Standards.

P. All work relating to the handicapped shall be in accord with regulations currently enforced by the Department of Housing, Buildings, and Construction, Commonwealth of Kentucky and the American Disabilities Act.

8. EQUIPMENT AND PIPING SUPPORT

A. Each piece of equipment, apparatus, piping, or conduit suspended from the structure or mounted above the floor level shall be provided with suitable structural support, pipe stand, platform or carrier in accordance with the best recognized practice. Such supporting or mounting means shall be provided by the Contractor for all equipment and piping. Exercise extreme care that structural members of building are not overloaded by such equipment. Provide any required additional bracing, cross members, angles, support, etc., as indicated or required by the Structural Engineer. This, in some instances, will require the Contractor to add an angle to a joist to transfer the load to a panel point. If in doubt, contact the Structural Engineer.

9. DUCT AND PIPE MOUNTING HEIGHTS

A. All exposed or concealed ductwork, piping, etc., shall be held as high as possible unless otherwise noted and coordinated with all other trades. Exposed piping and ductwork shall, insofar as possible, run perpendicular or parallel to the building structure.

10. COST BREAKDOWNS (SCHEDULE OF VALUES)

A. Within thirty days after acceptance of the Contract, the Contractor shall furnish to the Engineer, one copy of a detailed cost breakdown on each respective area of work. These cost breakdowns shall be made in a format approved by the Engineer. Payments will not be made until satisfactory cost breakdowns are submitted.

11. CORRECTION PERIOD

A. All equipment, apparatus, materials, and workmanship shall be the best of its respective kind. The Contractor shall replace all parts at his own expense, which are proven defective as described in the General Conditions. The effective date of completion of the work shall be the date of the Architect's or Engineer's Statement of Substantial Completion. Items of equipment which have longer guarantees, as called for in these specifications, shall have warranties and guarantees completed in order, and shall be in effect at the time of final acceptance of the work by the Engineer. The Contractor shall present the Engineer with such warranties and guarantees at the time of final acceptance of the work. The Owner reserves the right to use equipment installed by the Contractor prior to date of final acceptance. Such use of equipment shall not invalidate the guarantee except that the Owner shall be liable for any damage to equipment during this period, due to negligence of his operator or other employees. Refer to other sections for any special or extra warranty requirements.

B. It is further clarified that all required and specified warranties shall begin on the date of Substantial Completion, not at the time of equipment start-up.

C. All compressors shall have five-year warranty.

12. COMPUTER-BASED SYSTEM SOFTWARE

    A. For all equipment, controls, hardware, computer-based systems, programmable logic controllers, and other materials provided as a part of the work, software that is installed shall be certified in writing to the Engineer and Owner by the manufacturer and/or writer to be free of programming errors that might affect the functionality of the intended use.

13. CHANGES IN MECHANICAL WORK

    REFER TO GENERAL AND SPECIAL CONDITIONS.

14. CLAIMS FOR EXTRA COST

    REFER TO GENERAL AND SPECIAL CONDITIONS.

15. SURVEY, MEASUREMENTS AND GRADE

    A. The Contractor shall lay out his work and be responsible for all necessary lines, levels, elevations and measurements. He must verify the figures shown on the drawings before laying out the work and will be held responsible for any error resulting from his failure to do so.

    B. The Contractor shall base all measurements, both horizontal and vertical from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.

    C. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the contract documents, he shall promptly notify the Engineer and shall not proceed with this work until he has received instructions from the Engineer on the disposition of the work.

16. TEMPORARY USE OF EQUIPMENT

    A. The permanent heating and plumbing equipment, when installed, may be used for temporary services, with the consent of the Engineers. Should the permanent systems be used for this purpose the Contractors shall make all temporary connections required at their expense. They shall also make any replacement required due to damage wear and tear, etc., leaving the same in "as new" condition.

    B. Permission to use the permanent equipment does not relieve the Contractors from the responsibility for any damages to the building construction and/or equipment which might result because of its use.

    C. A pre-start-up conference shall be held with the Architect, Owner, General Contractor and the Mechanical Contractor. Equipment shall not be started until after this meeting.

    D. During all phases of construction:

        (1) Air Handling Units:

            a. At a minimum, four complete sets of filter media are required for each unit. In each unit, install two sets of filter media during construction (more shall be required if construction

activities dictate more frequent changes). In each unit, install one set of filter media at substantial completion. Leave one set of filter media in boxes in appropriate mechanical room as a spare set for the Owner. All other filters shall be used by the Contractor during construction. Dispose of all construction filter media.

b. On the outside of all return air openings install a minimum of two sets of fiberglass filter media, such as cheesecloth, to be utilized as pre-filters for the “construction” filters. Install first set upon start-up and then install second set when first set is dirty. Dispose of all dirty construction filters. Change filters as often as necessary to keep units from becoming dirty at no additional cost.

c. At substantial completion of the project the entire unit shall be cleaned to present a like “new” unit for the Owner and all filters shall be replaced with new.

(2) Heat Pump Units:

a. The IT Room unit shall not be used for heating and cooling until the IT closets have been cleaned and the equipment is ready to operate.

17. TEMPORARY SERVICES

A. The Contractor shall arrange any temporary water, electrical and other services which he may require to accomplish his work. Refer also to General and Special Conditions.

18. RECORD DRAWINGS

A. The Contractor shall ensure that any deviations from the Design are as they occur recorded in red, erasable pencil on record drawings kept at the jobsite. The Engineer shall review the record documents from time to time to ensure compliance with this specification. Compliance shall be a contingency of final payment. Pay particular attention to the location of under floor sanitary and water lines, shut-off valves, cleanouts and other appurtenances important to the maintenance and operation of Mechanical Systems. Also, pay particular attention to Deviations in the Control Systems and all exterior utilities. Keep information in a set of drawings set aside at the job site especially for this purpose. Deliver these record drawings electronically in AutoCAD 2007 format along with the hand marked field set to the Engineer. Electronic bid drawings will be furnished to the Contractor for his use.

19. MATERIALS AND WORKMANSHIP

A. All equipment, materials and articles incorporated in the work shall be new and of comparable quality to that specified. Each Proposer shall determine that the materials and/or equipment he proposes to furnish can be brought into the building(s) and installed within the space available. In certain cases, it may be necessary to remove and replace walls, floors and/or ceilings and this work shall be the responsibility of the Contractor. All equipment shall be installed so that all parts are readily accessible for inspection, maintenance, replacement of filters, etc. Extra compensation will not be allowed for relocation of equipment for accessibility or for dismantling equipment to obtain entrance into the building(s). Ensure, through coordination, that no other Contractor seals off access to space required for equipment, materials, etc.

B. Materials and equipment, where applicable, shall bear Underwriters' Laboratories label where such a standard has been established.

C. Use extreme care in the selection of equipment and its installation to ensure that noise and vibration are kept at a minimum. The Engineer's determination shall be final and corrections to such discrepancies shall be made at the cost of the Contractor.

D. Each length of pipe, fitting, trap, fixture and device used in the plumbing or drainage systems shall be stamped or indelibly marked with the weight or quality thereof and with the manufacturer's mark or name.

E. All equipment shall bear the manufacturer's name and address. All electrically operated equipment shall bear a data plate indicating required horsepower, voltage, phase and ampacity.

20. COOPERATION AND COORDINATION WITH OTHER TRADES

A. The Contractor shall give full cooperation to all other trades and shall furnish in writing with copies to the Engineer, any information necessary to permit the work of other trades to be installed satisfactorily and with the least possible interference or delay.

B. Where any work is to be installed in close proximity to, or will interfere with work of other trades, each shall cooperate in working out space conditions to make a satisfactory adjustment. If so directed by the Engineer, the Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4” = 1'-0”, clearly indicating how his work is to be installed in relation to the work of other trades, or so as not to cause any interference with work of other trades. He shall make the necessary changes in his work to correct the condition without extra charge.

C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

21. QUALIFICATIONS OF WORKMEN

A. All mechanical work shall be accomplished by qualified workmen competent in the area of work for which they are responsible. Untrained and incompetent workmen, as evidenced by their workmanship, shall be summarily relieved of their responsibilities in areas of incompetency. The Engineer shall reserve the right to determine the quality of workmanship of any workman and unqualified or incompetent workman shall refrain from work in areas not satisfactory to him. Requests for relief of a workman shall be made through the normal channels of Architect, Contractor, etc.

B. All plumbing work shall be accomplished by Journeymen Plumbers under the direct supervision of a Master Plumber as defined and clarified under Kentucky State Plumbing Law Regulations and Code. Proof and Certification may be requested by the Engineer.

C. All sheet metal, insulation and pipe fitting work shall be installed by workmen normally engaged or employed in these respective trades, except where only small amounts of such work are required and are within the competency of workmen directly employed by the Contractor involved.

D. All automatic control systems shall be installed by workmen normally engaged or employed in this type work, except in the case of minor control requirements (residential type furnaces, packaged HVAC equipment with integral controls, etc.) in which case, if a competent workman is the employee of this Contractor, he may be utilized subject to review of his qualifications by the Engineer and after written approval from same.

E. All special systems (Pneumatic Tube, Oxygen, Vacuum, Lab Air, Automatic Sprinkler Equipment, etc.) shall be installed only by workmen normally engaged in such services. Exception to this specification may only be made in writing by the Engineer.

F. All electrical work shall be installed only by competent workmen under direct supervision of a fully qualified Electrician.

22. CONDUCT OF WORKMEN

A. The Contractor shall be responsible for the conduct of all workmen under his supervision. Misconduct on the part of any workman to the extent of creating a safety hazard, or endangering the lives and property of others, shall result in the prompt relief of that workman. The consumption of alcoholic beverages or other intoxicants, narcotics, barbiturates, hallucinogens or debilitating drugs on the job site is strictly forbidden.

23. PROTECTION OF MATERIALS AND EQUIPMENT

A. The Contractor shall be entirely responsible for all material and equipment furnished by him in connection with his work and special care shall be taken to properly protect all parts thereof from physical, sun, and weather damage during the construction period. Such protection shall be by a means acceptable to the manufacturer and Engineer. All rough-in soil, waste, vent and storm piping, ductwork, etc., shall be properly plugged or capped during construction in a manner approved by the Engineer. Equipment damaged, stolen or vandalized while stored on site, either before or after installation, shall be repaired or replaced by the Contractor at his own expense.

24. SCAFFOLDING, RIGGING AND HOISTING

A. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for erection and delivery onto the premises of any equipment and apparatus furnished. All such temporary appurtenances shall be set up in strict accord with OSHA Standards and Requirements. Remove same from premises when no longer required.

25. BROKEN LINES AND PROTECTION AGAINST FREEZING

A. No conduits, piping, troughs, etc. carrying water or any other fluid subject to freezing shall be installed in any part of the building where danger of freezing may exist without adequate protection being given by the Contractor whether or not insulation is specified or indicated on the particular piping. All damages resulting from broken and/or leaking lines shall be replaced or repaired at the Contractor's own expense. If in doubt, contact the Engineer. Do not install piping across or near openings to the outside whether they are carrying static or moving fluids or not. Special Note: Insulation on piping does not necessarily ensure that freezing will not occur.

26. CLEANING

A. The Contractor shall, at all times, keep the area of his work presentable to the public and clean of rubbish and debris caused by his operations; and at the completion of the work, shall remove all rubbish, debris, all of his tools, equipment, temporary work and surplus materials from and about the premises, and shall leave the area clean and ready for use. If the Contractor does not attend to such cleaning upon request, the Engineer may cause cleaning to be done by others and charge the cost of same to the Contractor. The Contractor shall be responsible for all damage from fire which originates in, or is propagated by, accumulations of his rubbish or debris.

B. After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of piping, equipment, fixtures and all other associated or adjacent fabrication.

27. CONCRETE WORK

A. The Contractor shall be finally responsible for the provisions of all concrete work required for the installation of any of his systems or equipment. He may, at his option, arrange with the others to provide the work. This option, however, will not relieve the Contractor of his responsibilities relative to dimensions, quality of workmanship, locations, etc. In the absence of other concrete specifications, all concrete related to Mechanical work shall be 3000 psi minimum compression strength at 28 days curing and shall conform to the standards of the American Concrete Institute Publication AC1-318. Heavy equipment shall not be set on pads for at least seven (7) days after pour. Insert 6-inch steel dowel rods into floors to anchor pads.

B. All mechanical equipment (tanks, heaters, chillers, boilers, pumps, air handling units, etc.) shall be set on a minimum of 4” tall concrete pads. Pads shall be taller where required for condensate traps. All concrete pads shall be complete with all pipe sleeves, anchor bolts, reinforcing steel, concrete, etc. as required. Pads larger than 18” in width shall be reinforced with ½” round bars on 6” centers both ways. Bars shall be approximately 3” above the bottom of the pad. All parts of pads and foundations shall be properly rodded or vibrated. If exposed parts of the pads and foundations are rough or show honeycomb after removing forms, all surfaces shall be rubbed to a smooth surface. Chamfer all square edges one-half inch.

28. NOISE, VIBRATION OR OSCILLATION

A. All work shall operate under all conditions of load without any sound or vibration which is objectionable in the opinion of the Engineer. In case of moving machinery, sound or vibration noticeable outside of room in which it is installed, or annoyingly noticeable inside its own room, will be considered objectionable. Sound or vibration conditions considered objectionable by the Engineer shall be corrected in an approved manner by the Contractor at his expense.

B. All equipment subject to vibration and/or oscillation shall be mounted on vibration supports whether indicated or not suitable for the purpose of minimizing noise and vibration transmission, and shall be isolated from external connections such as piping, ducts, etc. by means of flexible connectors, vibration absorbers, or other approved means. Unitary equipment, such as small room heating units, small exhaust fans, etc., shall be rigidly braced and mounted to wall, floor or ceiling as required and tightly gasketed and sealed to mounting surface to prevent air leakage and to obtain quiet operation. Flush and surface mounted equipment such as diffusers, grilles, etc., shall be gasketed and affixed tightly to their mounting surface.

C. The Contractor shall provide supports for all equipment furnished by him. Supports shall be liberally sized and adequate to carry the load of the equipment and the loads of attached equipment, piping, etc. All equipment shall be securely fastened to the structure either directly or indirectly through supporting members by means of bolts or equally effective means. If strength of supporting structural members is questionable, contact Engineers.

29. ACCESSIBILITY

A. The Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall

cooperate with all others whose work is in the same space. Such spaces and clearances shall, however, be kept to the minimum size required.

B. The Contractor shall locate and install all equipment so that it may be serviced, and maintained as recommended by the manufacturer. Allow ready access and removal of the entire unit and/or parts such as valves, filters, fan belts, motors, prime shafts, etc.

C. The Contractor shall provide access panels for each concealed valve, control damper or other device requiring service as shown on engineer's plans or as required. Locations of these panels shall be identified in sufficient time to be installed in the normal course of work.

30. RESTORATION OF NEW OR EXISTING SHRUBS, PAVING, SURFACES, ETC.

A. The Contractor shall at his expense restore to their original conditions all paving, curbing, surfaces, drainage ditches, structures, fences, shrubs, existing or new building surfaces and appurtenances, and any other items damaged or removed by his operations. Replacement and repairs shall be in accordance with good construction practice and shall match materials employed in the original construction of the item and shall be to the satisfaction of the Architect and/or Engineer.

31. MAINTENANCE OF EXISTING UTILITIES AND LINES

A. The locations of all piping, conduits, cables, utilities and manholes existing, or otherwise, that comes within the contract construction site, shall be subject to continuous uninterrupted service with no other exception than the Owner of the utilities permission to interrupt same temporarily.

B. Utilities and lines, where known, are indicated on the drawings. Locations and sizes are approximate. Prior to any excavation being performed, the Contractor shall ascertain that no utilities or lines are endangered by new excavation. Exercise extreme caution in all excavation work.

C. If utilities or lines occur in the earth within the construction site, the Contractor shall probe and locate the lines prior to machine excavation or blasting in the respective area. Electromagnetic utility locators and acoustic pipe locators shall be utilized to determine where metallic and non-metallic piping is buried prior to any excavation.

D. Cutting into existing utilities and services where required shall be done in coordination with and only at times designated by the Owner of the utility.

E. The Contractor shall repair to the satisfaction of the Engineer, any surfaces or subsurface improvements damaged during the course of the work, unless such improvement is shown to be abandoned or removed.

F. Machine excavation shall not be permitted with ten feet of electrical lines or lines carrying combustible and/or explosive materials. Hand excavate only.

G. Protect all new or existing lines from damage by traffic, etc. during construction. Repairs or replacement of such damage shall be at the sole expense of the party responsible.

32. SMOKE AND FIRE PROOFING

A. The Contractor shall fire and smoke stop all openings made in fire or smoke rated walls, chases, ceilings and floors in accord with the KBC. Patch all openings around ductwork and piping with appropriate type material to stop smoke at smoke walls and provide commensurate fire rating at fire walls, floors, ceilings, roofs, etc. Back boxes in rated walls shall be a minimum distance apart as

allowed by code to maintain the rating. If closer provide rated box or fireproofing in code approved manner.

33. MOTORS

A. Motors shall be built in accordance with the latest standards of NEMA and as specified. Motors shall be tested in accordance with standards of A.S.A. C50, conforming to this and all applicable standards for insulation resistance and dielectric strength.

B. Each motor shall be provided by the equipment supplier, installer or manufacturer with conduit terminal box, and N.E.C. required disconnecting means as specified or required. Three-phase motors shall be provided with external thermal overload protection in their starter units. Single-phase motors shall be provided with thermal overload protection, integral to their windings or external, in control unit. All motors shall be installed with NEMA-rated starters as specified and shall be connected per the National Electrical Code.

C. The capacity of each motor shall be sufficient to operate associated driven devices under all conditions of operation and load and without overload, and at least of the horsepower indicated or specified. Each motor shall be selected for quiet operation, maximum efficiency and lowest starting KVA per horsepower. Motors producing excessive noise or vibration shall be replaced by the responsible contractor. See Division 26 of Specifications for further requirements related to installation of motors.

34. CUTTING AND PATCHING

A. The Contractor shall provide his own cutting and patching necessary to install his work. Patching shall match adjacent surfaces and shall be to the satisfaction of the Architect and Engineer.

B. No structural members shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

C. When installing conduit, pipe, or any other work in insulated concrete form (ICF) walls, the responsible subcontractor for the work shall provide spray foam insulation to patch the rigid insulation to maintain full integrity of the insulating value of the wall after the mechanical and electrical work is complete. Furthermore, all new work shall NOT be installed in concrete center of wall. All mechanical and electrical installations shall be on the interior side of the concrete.

35. CURBS, PLATES, ESCUTCHEONS & AIR TIGHT PENETRATIONS

A. In all areas where ducts are exposed and ducts pass thru floors, the opening shall be surrounded by a 4-inch-high by 3-inch-wide concrete curb.

B. Escutcheon plates shall be provided for all pipes and conduit passing thru walls, floors and ceilings. Plates shall be nickel plated, of the split ring type, of size to match the pipe or conduit. Where plates are provided for pipes passing thru sleeves which extend above the floor surface, provide deep recessed plates to conceal the pipe sleeves.

C. Seal all duct, pipe, conduit, etc., penetrations through walls and floors air tight. If wall or floor assembly is rated then use similarly rated sealing method.

36. WEATHERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Engineer before work is done. The Contractor shall furnish all necessary sleeves, caulking and flashing required to make openings permanently watertight.

37. OPERATING INSTRUCTIONS, MAINTENANCE MANUALS AND PARTS LISTS

A. Upon completion of all work tests, the Contractor shall instruct the Owner or his representative(s) fully in the operations, adjustment and maintenance of all equipment furnished. The time and a list of representatives required to be present will be as directed by the Engineer. Turn over all special wrenches, keys, etc., to the owner at this time.

B. The Contractor shall furnish three (3) complete bound sets for delivery to the Engineer of typewritten and/or blueprinted instructions for operating and maintaining all systems and equipment included in this contract prior to substantial completion. All instructions shall be submitted in draft, for approval, prior to final issue. Manufacturer's advertising literature or catalogs alone will not be acceptable for operating and maintenance instructions.

C. The Contractor, in the instructions, shall include a preventive maintenance schedule for the principal items of equipment furnished under this contract and a detailed, parts list and the name and address of the nearest source of supply.

D. Per University standards, provide as part of the IOM, an equipment schedule list on 8.5x11 inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the specification section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

E. Per University standards, provide as part of IOM, a detailed valve schedule list. Refer to valve identification specification for details.

F. The Contractor shall frame under Lexan in the main mechanical room all temperature control diagrams and all piping diagrams.

G. Per University standards, IOM information shall include a complete copy of the reviewed TAB report.

38. PAINTING

A. In general, all finish painting shall be accomplished under the Painting Section of the specifications by the Contractor; however, unless otherwise specified under other sections of these specifications, the following items shall be painted:

(1) All exposed piping, valve bodies and fittings (bare and insulated), including hangers, platforms, etc.

(2) All mechanical equipment not factory finished. Aluminum and stainless-steel equipment, motors, identification plates, tags, etc. shall not be painted. All rust and foreign matter shall be thoroughly removed from surfaces prior to painting. All baked enamel factory finish of equipment which may have been scratched or chipped shall be touched up with the proper paint as recommended and supplied by the manufacturer.

(3) All ductwork exposed in finished areas (bare and insulated), all grilles, diffusers, etc. not factory finished. Paint the inside surfaces of all interior duct surfaces visible from any register, grille or diffuser opening on all jobs; surfaces shall receive one (1) prime coat of Rustoleum 1225 red "galvinoleum" or other approved equivalent primer and rust inhibitor and one (1) coat of

Rustoleum 1579 jet black "Speedy Dry" enamel or approved equivalent applied in accordance with the manufacturer's recommendations.

(4) All insulated piping, ductwork and equipment shall be properly prepared for painting by the Contractor where mechanical items are to be painted. In the case of externally insulated duct and pipe, the Contractor shall provide 6 oz. canvas jacket with fire retardant lagging. The jacket shall be allowed to dry properly before applying paint to avoid shrinking after painting and exposing unpainted surfaces. The Contractor, at his option, may provide double wall ductwork in lieu of externally insulated ductwork with canvas jacket and lagging.

39. ELECTRICAL CONNECTIONS

A. The Contractor shall furnish and install all (1) temperature control wiring; (2) equipment control wiring and (3) interlock wiring. The Contractor shall furnish and install all power wiring complete from power source to motor or equipment junction box, including power wiring thru starters, and shall furnish and install all required starters not factory mounted on equipment.

B. The Contractor shall, regardless of voltage, furnish and install all temperature control wiring and all associated interlock wiring, all equipment control wiring and conduit for the equipment that the Contractor furnishes. He may, at his option, employ at his own expense, the Electrical Contractor to accomplish this work.

C. After all circuits are energized and completed, the Contractor shall be responsible for all power wiring, and all control wiring shall be the responsibility of the Contractor. Motors and equipment shall be provided for current characteristics as shown on the drawings.

D. The Contractor shall furnish motor starters of the type and size required by the manufacturer for all equipment provided by him, where such starters are necessary. Starters shall have overloads for each phase.

40. FINAL CONNECTIONS TO EQUIPMENT

A. The Contractor shall finally connect to mechanical services, any terminal equipment, appliances, etc., provided under this and other divisions of the work. Such connections shall be made in strict accord with current codes, safety regulations and the equipment manufacturer’s recommendations. If in doubt, contact the Engineers prior to installation.

41. REQUIRED CLEARANCE FOR ELECTRICAL EQUIPMENT

A. The NEC has specific required clearances above, in front, and around electrical gear, panels etc. The Contractor shall not install any piping, ductwork, etc., in the required clearance. If any appurtenance is located in the NEC required clearance, it shall be relocated at no additional cost.

42. INDEMNIFICATION

A. The Contractor shall hold harmless and indemnify the Engineer, employees, officers, agents and consultants from all claims, loss, damage, actions, causes of actions, expense and/or liability resulting from, brought for, or on account of any personal injury or property damage received or sustained by any person, persons, (including third parties), or any property growing out of, occurring, or attributable to any work performed under or related to this contract, resulting in whole or in part from the negligence of the Contractor, any subcontractor, any employee, agent or representative.

43. HAZARDOUS MATERIALS

A. The Contractor is hereby advised that it is possible that asbestos and/or other hazardous materials are or were present in this building(s). Any worker, occupant, visitor, inspector, etc., who encounters any material of whose content they are not certain shall promptly report the existence and location of that material to the Contractor and/or Owner. The Contractor shall, as a part of his work, ensure that his workers are aware of this potential and what they are to do in the event of suspicion. He shall also keep uninformed persons from the premises during construction. Furthermore, the Contractor shall ensure that no one comes near to or in contact with any such material or fumes therefrom until its content can be ascertained to be non-hazardous.

B. CMTA, Inc., Consulting Engineers, have no expertise in the determination of the presence of hazardous materials. Therefore, no attempt has been made by them to identify the existence or location of any such material. Furthermore, CMTA nor any affiliate thereof will neither offer nor make any recommendations relative to the removal, handling or disposal of such material.

C. If the work interfaces, connects or relates in any way with or to existing components which contain or bear any hazardous material, asbestos being one, then, it shall be the Contractor's sole responsibility to contact the Owner and so advise him immediately.

D. The Contractor by execution of the contract for any work and/or by the accomplishment of any work thereby agrees to bring no claim relative to hazardous materials for negligence, breach of contract, indemnity, or any other such item against CMTA, its principals, employees, agents or consultants. Also, the Contractor further agrees to defend, indemnify and hold CMTA, its principals, employees, agents and consultants, harmless from any such related claims which may be brought by any subcontractors, suppliers or any other third parties.

44. ABOVE-CEILING AND FINAL PUNCH LISTS

A. The Contractor shall review each area and prepare a punch list for each of the subcontractors, as applicable, for at least two stages of the project:

(1) For review of above-ceiling work that will be concealed by tile or other materials well before substantial completion.
(2) For review of all other work as the project nears substantial completion.

B. When all work from the Contractor's punch list is complete at each of these stages and prior to completing ceiling installations (or at the final punch list stage), the Contractor shall request that the Engineer develop a punch list. This request is to be made in writing seven days prior to the proposed date. After all corrections have been made from the Engineer's punch list, the Contractor shall review and initial off on each item. This signed-off punch list shall be submitted to the Engineer. The Engineer shall return to the site once to review each punch list and all work prior to the ceilings being installed and at the final punch list review.

Phone: 859 253-0892 Fax: 859 231-8357

The following is CMTA's guide for Division 20-25 required information relative to the Schedule of Values. Please utilize all items that pertain to this project and add any specialized system as required. A thorough and detailed schedule of values will allow for fair and equitable Pay Application approval and minimize any discrepancies as to the status of the job.

DIVISION 20-25 – MECHANICAL **Field Representative:** _____
Project Engineer: _____

Description of Work	Scheduled Value	Labor	Material
Shop Drawings			
Mobilization/Permits			
Demolition			
Plumbing Underslab			
Sanitary Above Slab Rough-in			
Plumbing Fixtures			
Plumbing Inspections			
Sprinkler Plan Submittals			
Fire Protection Exterior			
Fire Protection Vault			
Fire Protection Interior			
Storm Piping Exterior			
Storm Piping Interior			
Plumbing Shop Drawings			
Mechanical Shop Drawings			
Domestic Water Piping			

Domestic Water Insulation			
Hydronic Piping			
Steam Piping			
HVAC Sheet Metal			
VAV Boxes			
Lab Airflow Control Valves			
Humidifier			
Lab Exhaust fans			
Grilles & Diffusers			
Insulation			
Controls			
Air Balance			
Water Balance			
Chemical Treatment			
Factory Start-Up Reports			
Owner Training			
Record Drawings			
O & M Manuals			
Punchlist/Closeout			
Controls Check-out			

END OF SECTION 200100

SECTION 200200- SCOPE OF THE MECHANICAL WORK

1. GENERAL

A. The Mechanical work for this Contract shall include all labor, materials, equipment, fixtures, excavation, backfill and related items required to completely install, test, place in service and deliver to the Owner the complete mechanical systems in accordance with the accompanying plans and all provisions of these specifications. This work shall primarily include, but is not necessarily limited to the following:

(1) The AHU's, Exhaust and Return fans, and Variable Frequency Drives are being issued as a RFP direct by the Owner. The successful bidders shall be responsible for providing the Specified Equipment, delivering them to the project site, completing the factory start-up when requested by the project Contractor, and shall be responsible for a maintaining a one year warranty on the equipment from the date of Substantial Completion. This Contractor is responsible for receiving the equipment at the site and installing it per the Contract Documents. This Contractor will be responsible for labor associated with the start-up, commissioning, and one year warranty repairs.

(2) Interior domestic hot, cold and recirculating hot water system.

(3) Interior soil, waste and vent systems.

(4) Roof drainage system.

(5) All plumbing equipment, fixtures and fittings.

(6) 100% automatic sprinkler system.

(7) All mechanical exhaust systems.

(8) All insulation associated with mechanical systems.

(9) Condensate drainage systems.

(10) Complete heating, ventilation and air conditioning systems.

(11) Final connection of all mechanical equipment furnished by others (e.g., lab equipment, ice maker).

(12) Complete balancing of air and water systems.

(13) All applicable services and work specified in Section 200100; General Provisions - Mechanical.

(14) Comply with the University of Kentucky's Design Standards including the refrigerant management and installation required in 230500. Fill out the required forms for all equipment containing refrigerant and submit to the University.

(15) All specified or required control work.

(16) Provide all required motor starters, etc. not provided under the electrical sections.

(17) One year guarantee of all mechanical equipment, materials and workmanship.

(18) Thorough instruction of the owner's maintenance personnel in the operation and maintenance of all mechanical equipment.

(19) Thorough coordination of the installation of all piping, equipment and any other material with other trades to ensure that no conflict in installation.

(20) Approved supervision of the mechanical work.

(21) Excavation, backfilling, cutting, patching, sleeving, concrete work, etc., required to construct the mechanical systems.

(22) Prior to submitting a bid, the Contractor shall contact all serving utility companies to determine exactly what each utility company will provide and exactly what is required of the Contractor and shall include such requirements in his base bid.

(23) Procurement of all required permits and inspections, including fees for all permits and inspection services and submission of final certificates of inspection to the Engineers (Plumbing, Boiler, HVAC, etc.).

(24) All necessary coordination with gas, water, and sewer utility companies, etc., to ensure that work, connections, etc., that they are to provide is accomplished.

(25) Factory start-up of all major equipment (including terminal HVAC equipment) and submission of associated factory start-up reports to the Engineer.

END OF SECTION 200200

SECTION 200400 - DEMOLITION AND SALVAGE

1. GENERAL

   A. The Contractor's attention is directed to the General and Special Conditions, General Conditions-Mechanical and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section and which are hereby made a part of the work specified in this section.

2. DEMOLITION

   A. INTENT

      It is the intent of this section to completely remove all components of any existing mechanical system no longer in use that will be open to view in, or will interfere with the operations of the completed building, or which will, in any way, interfere with project construction. Components of the existing mechanical systems which do not meet the above criteria, may be abandoned in place in a safe, workmanlike, code approved manner.

   B. PLUMBING

      (1) All existing piping not to be reused, shall be removed when located in accessible chases, accessible ceiling spaces, crawl spaces, mechanical rooms, exposed, etc.

      (2) Unless otherwise indicated, the Contractor shall be responsible for patching and repairing all holes, etc. in the ceilings, walls, and floors where plumbing piping is removed.

      (3) All lines abandoned in place shall be made safe in compliance with the Kentucky Plumbing Code.

   C. HVAC

      (1) Remove from the project area all piping not to be reused and hangers, specialties, etc. that are accessible or that become accessible during construction and/or interfere in any way with any part of the construction or would be exposed in the completed building.

      (2) Remove all temperature controls and related items that are accessible or become accessible during construction. Refer to Salvage spec below and coordinate with UK UEM group on any required control equipment salvage.

      (3) Remove all existing heating and ventilating equipment not indicated to be reused from the building.

      (4) The Contractor shall be responsible for the removal and/or relocation of any HVAC piping, equipment, fittings, valves, etc. which may, in the course of construction, interfere with the installation of any new and/or relocated Architectural, Structural, Mechanical or Electrical Systems at no increase in the contract price.

      (5) Unless otherwise indicated, the Contractor shall be responsible for the patching and repairing of all holes, etc. in the ceiling, wall and floors where HVAC equipment is removed.

(6) Unless otherwise noted, when removing equipment sitting on a concrete pad, also remove the concrete pad and patch and repair floor to match adjacent surfaces.

3. SALVAGE

A. It is the intent of this section to deliver to the owner all components of any mechanical system which may be economically reused by him. The Contractor shall make every effort to remove reusable components without damage and deliver them to a location designated by the Owner.

B. Components to be delivered to the owner shall be specifically identified by the owner's representative prior to beginning the demolition. These components shall include, but are not limited to the following:

(1) All DDC controllers.
(2) Unit Heaters

C. Other items become the property of the Contractor and are to be removed from the site.

END OF SECTION 200400

SECTION 230200 - HVAC EQUIPMENT AND HYDRONIC SPECIALTIES

1. GENERAL

    1. The Contractor's attention is directed to the General and Special Conditions, General Conditions-Mechanical and to all other Contract Documents as they apply to this branch of the work. Attention is also directed to all other sections of the Contract Documents which affect the work of this section and which are hereby made a part of the work specified herein.

    2. The Contractor shall provide in complete working order the following heating, ventilation and air conditioning equipment located as indicated and installed, connected and placed in operation in strict accordance with the manufacturer's recommendations. All equipment shall be factory painted and, where applicable, factory insulated and shall, where such standards exist, bear the label of the Underwriters Laboratory.

    3. Each subcontractor shall be responsible for their own completion of System Verification Checklists/Manufacturer’s Checklist.

    4. Factory startup is required for all HVAC equipment. In general, as part of the verification process, equipment suppliers shall perform start-up by their factory authorized technicians and shall complete and submit start-up reports/checklists. This shall include air handling units, boilers, chillers, cooling towers, VFDs, etc.

    5. All HVAC equipment shall comply with the latest provisions of ASHRAE Standard 90 and/or International Energy Conservation Code 2012, whichever is more stringent.

    6. Installation of all heating, ventilating and air conditioning systems shall be performed by a master HVAC contractor licensed in the state the work will be performed.

    7. Note to Suppliers and Manufacturers Representative furnishing proposals for equipment for the project:

        (1) Review the Controls Section of these Specifications (if applicable) to determine controls to be furnished by the equipment manufacturer, if any. The Contractor shall provide all controls with equipment unless specifically listed otherwise.

        (2) Review the section of these specifications entitle: SHOP DRAWINGS, DESCRIPTIVE LITERATURE, MAINTENANCE MANUALS, PARTS LISTS, SPECIAL KEYS, TOOLS, ETC., and provide all documents called for therein.

        (3) Ensure that the equipment which you propose to furnish may be installed, connected, placed in operation and easily maintained at the location and in the space allocated for it.

        (4) Determine from the Bid Documents the date of completion of this project and ensure that equipment delivery schedules can be met so as to allow this completion date to be met.

        (5) Where manufacturers’ temperature controls are specified, they shall be in full compliance with International Mechanical Code Section 606 including automatic smoke shut down provisions.

        (6) Provide factory start-up on site by a factory representative (not a third-party contractor) for all HVAC equipment, including fan coil units etc. Submit factory start-up reports to the Engineer.

(7) Provide training to the Owner by a factory representative for each type of equipment. Training shall be a minimum of eight (8) hours on site and the Engineer shall be notified one (1) week in advance of the training. Training shall only occur when the systems are complete and 100% functional. All training shall be video taped.

(8) Review the Section on Motor Starters and Electrical Requirements for Mechanical Equipment.

(9) All condensate producing equipment shall be provided with a condensate trap as recommended by the equipment manufacturer and a condensate overflow switch.

(10) Provide low ambient and all required controls and accessories on all HVAC equipment to ensure they can provide cooling during the winter season.

(11) Provide a complete air tight enclosure with opening door that seals air tight for all filters on air moving equipment.

(12) All equipment shall be furnished for a single point electrical connection unless specifically excluded as a requirement.

(13) AHU's, FANS, and VFD's are being provided by the OWNER. The specifications for this equipment is included here for reference only.

2. EQUIPMENT

A. CUSTOM AIR HANDLING UNIT- LAB UNIT

1. QUALIFICATIONS

(1) AIR HANDLING UNITS SHALL BE BID DIRECT TO THE OWNER. THIS EQUIPMENT SHALL BE BID AS A STAND-ALONE PACKAGE AND THE MANUFACTURER IS RESPONSBILE FOR A ONE YEAR WARRANTY, EQUIPMENT START-UP, AND DELIVERY TO THE SITE. The RFP selection shall be based upon the bid and the lead time for the equipment. Provide the delivery date to the site within the bid documents.

(2) Manufacturer shall be a company specializing in the design and manufacture of commercial / industrial custom HVAC equipment. Manufacturer shall have been in production of custom HVAC equipment for a minimum of 5 years.

(3) Each unit shall bear an ETL or UL label under UL Standard 1995 indicating the complete unit is listed as an assembly. ETL or UL listing of individual components, or control panels only, is not acceptable.

(4) Manufacturer shall have at least 10 unique installations of fan array (minimum 4 fans in fan array) air handling units.

2. WARRANTY

(1) The complete unit shall be covered by a parts and labor warranty issued by the manufacturer covering the first year of operation. This warranty period shall start upon substantial completion.

3. ACCEPTABLE MANUFACTURERS

(1) Provide custom air handling units as manufactured by:

1) NOTE: AIR HANDLING UNITS ARE OWNER PURCHASED, CONTRACTOR INSTALLED. CONTRACTOR SHALL BE RESPONSIBLE FOR RECEIVING DELIVERY OF THE UNIT, INSTALLATION, AND COORDINATION OF THE START-UP PROCESS.

b. Climatecraft
c. CES Group (Governair, HuntAir, etc.)
d. York Custom
e. Trane Custom
f. Air Flow Equipment

4. GENERAL

(1) NOTE: THIS UNIT IS DESIGNED TO OPERATE AS A 100 PERCENT OUTSIDE AIR UNIT IN THE FUTURE AS THE SPACE IT SERVES WILL EVENTUALLY BE CONVERTED TO ALL LAB SPACE. FOR THE CURRENT OPERATION, THE UNIT WILL SERVE ONE FLOOR OF LABS AND TWO FLOORS OF CLASSROOMS. THE RESULT OF THIS IS THE UNIT WILL OPERATE AT A REDUCED LOAD WHEN FIRST INSTALLED. FOR EXAMPLE, THE CLASSROOM VAV BOXES WILL CLOSE OFF AT NIGHT SO ONLY THE LAB FLOOR WILL HAVE AIRFLOW. THIS WILL REQUIRE THE AHU TO OPERATE AT 15,000 CFM. DURING OCCUPIED HOURS AT INITIAL START-UP, IT IS EXPECTED THAT APPROXIMATELY 50 PERCENT OF THE AIRFLOW WILL BE RETURN AIR WHICH ALSO WILL REDUCE THE HEATING AND COOLING LOADS. THE CHILLED WATER AND STEAM COILS SHALL INCLUDE AUTOMATIC MEANS OF ISOLATING COILS TO SERVE THE BUILDING IN LOW LOAD OPERATION. THIS INCLUDES PROVIDING MULTIPLE COILS WITH SEPARATE PIPING CONNECTIONS AND DAMPERS AT EACH OF THE COILS TO ALLOW ALL OF THE AIRFLOW TO BE DIRECTED TO ACTIVE COILS.

(2) VFD’s shall be provided under a separate RFP. Coordinate sizing with VFD Vendors prior to bid.

(3) Install where shown on the plans, custom air handling units construction features as specified below. The units shall be provided and installed in strict accordance with the specifications. All units shall be complete with all components and accessories as specified. Any exceptions must be clearly defined. The contractor shall be responsible for any additional expenses that may occur due to any exception made.

(4) Air Handling units shall be shipped in modules that can be installed into the building through the louver openings. Coordinate with drawings for module sizes.

a. The unit shall be tested by a certified testing agency at the factory prior to shipping. All testing shall be the responsibility of the unit manufacturer. Provide all testing equipment and instrumentation needed for the testing.
b. The manufacturer shall include a field inspection of the unit once it has been shipped and assembled by the Contractor.

5. ON SITE/FACTORY TESTING AND QUALITY CONTROL

(1) Factory Tests: The fans shall be factory run tested to ensure structural integrity and proper RPM. All electrical circuits shall be tested to ensure correct operation before shipment of unit. Units shall pass quality control and be thoroughly cleaned prior to shipment.

(2) The unit manufacturer shall provide a leak test after the unit has been constructed. This shall be performed by a certified company in accordance with AMCA Standard 210. The cabinet shall be tested at 1.5 times the static pressure of differential static pressure across the cabinet exterior walls) for both the high and low pressure sides. Cabinet leakage shall not exceed 0.5% of design airflow. All supply and return air openings shall be sealed. The air shall then be pumped into the unit until the appropriate operating pressures are achieved. Air flow measurements shall be performed in compliance with AMCA Standard 210. The unit shall also be tested to show that the specified airflow is produced at the specified static pressure for both supply and return fans.

(3) Panel Deflection Testing: The unit manufacturer shall provide a deflection test on one unit at 8" of differential static pressure across the cabinet exterior walls. A deflection limit of L/200 will be demonstrated at this time. "L" is defined as the height panel on the side of the unit. Measurements shall be at midpoint of "L" along the vertical seam of the largest panel on one side.
Height of panel = H x (.005) = inches deflection allowed

a. The manufacturer shall notify contractor and/or owner 10 days prior to test for witnessing. Owner's representative shall select one unit to be tested at the time of release. A written test report shall be prepared by the manufacturer and issued to the Owner's representative. This test shall be performed when the factory leak test is performed.

(4) Acoustic Requirements: The equipment manufacturer shall furnish calculations showing the estimated sound power levels at the supply and, return connections, as well as unit casing radiation for each air conditioning unit. Calculations shall be based on fan sound power levels which were determined in accordance with AMCA Standard 300 and 301. These shall meet or exceed the sound power levels indicated on the drawings. Sound data from a single fan or group of fans shall not be acceptable. Sound calculation shall calculate resultant sound valves entering or leaving the unit.

(5) The basin shall be tested for leakage. The base sections shall be filled with 2" of water and must hold for 24" hours. Any leaks shall be repaired and the basin re-tested.

6. UNIT CONSTRUCTION

(1) Provide factory-fabricated air handling unit with capacity as indicated on the schedule. Units shall have overall dimensions as indicated and fit into the space available with adequate clearance for service as determined by the Engineer. Units shall be completely assembled in the factory before being palletized and shipped to site. Units shall be furnished with sufficient gasket and bolts for reassembly in the field by the contractor. The manufacturer/contractor shall assure the unit can fit in the mechanical room with all required current spatial limitations.

(2) Unit manufacturer shall provide certified ratings conforming to the latest edition of AMCA 210, 310, 500 and ARI 410. All electrical components and assemblies shall comply with NEMA standards. Unit internal insulation must have a flame spread rating not over 25 and smoke developed rating no higher than 50 complying with NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems." Units shall comply with NFPA 70, "National Electrical Code," as applicable for installation and electrical connections of ancillary electrical components of air handling units. Tags and decals to aid in service or indicate caution areas shall be provided. Electrical wiring diagrams shall be attached to

the control panel access doors. Operation and maintenance manuals shall be furnished with each unit. Units shall be UL or ETL listed.

(3) Unit Base - Floor: Unit perimeter base shall be completely welded and fabricated using heavy gauge structural steel tubing. (C-Channel cross supports shall be welded to perimeter base steel tubing and located on maximum 24 IN centers to provide support for internal components. Base rails shall include lifting lugs welded to perimeter base at the corner of the unit or each section if de-mounted. Entire base frame is to be painted with a phenolic coating for long term corrosion resistance. Internal walk-on floor shall be 10 gauge aluminum tread plate and shall be turned up the wall 4" and welded. Caulk joints are not acceptable. The outer sub-floor of the unit shall be made from 20 gauge galvanized steel. The 4 IN double wall floor shall be insulated. Floor seams shall be gasketed for thermal break and sealed for airtight / watertight construction. Single wall floors with glued and pined insulation and no sub floor are not acceptable.

(4) The base and unit frame shall be painted with a lacquer resisting gray phenolic corrosion inhibitive primer. All drain pans shall be stainless steel IAQ type and have a rigid 12 IN wide safety tread plate walk bridge stretched across the unit width. Walk bridge shall be of the same material type and thickness as the unit floor. The walk bridge and support system shall be suspended above the drain pan (not in contact with the drain pan bottom) and shall be easily removable for drain pan cleaning. A galvanized steel liner shall be attached to the underside of the unit base and cross members, ensuring that the floor insulation is completely encapsulated.

(5) All gasket and necessary assembly hardware shall ship loose with unit. Junction boxes with a factory supplied numbered terminal strip shall be supplied for field wiring.

(6) Unit Casing – The construction of the air handling unit shall consist of a (1 x 2) steel frame with formed 16 gauge G-90 galvanized steel exterior casing panels. The exterior casing panels shall be attached to the gasketed (1 x 2) steel frame with corrosion resistant fasteners.

(7) All casing panels shall be completely removable from the unit exterior without affecting the unit’s structural integrity. (Units without framed type of construction shall be considered, provided the exterior casing panels are made from 14 gauge galvanized steel, maximum panel center lines are less than 20 inches and deflection is less than L/200 @ 8 IN positive pressure).

(8) The air handling unit casing shall be of the “no-through-metal” design. The casing shall incorporate insulating thermal breaks as required so that, when fully assembled, there’s no path of continuous unbroken metal to metal conduction from inner to outer surfaces. Provide necessary support to limit casing deflection to L/200 of the narrowest panel dimension. If panels cannot meet this deflection, additional internal reinforcing is required.

(9) All panel seams shall be caulked and sealed for an airtight unit. Leakage rates shall be less than 0.5% at 8 IN W.C. Note: If manufacturer cannot provide thermal break (no through metal) and or removable exterior panel construction it must be noted as an exception on the bid.

a. As an option to steel panels, all panels may be double wall all-aluminum construction with minimum 0.040 IN exterior and interior skin thicknesses. Interior finish to be smooth, mill finish; exterior finish to be a low-reflective textured mill finish. Each panel shall contain an integral frame or be properly supported by a structural framing

system. Panel shall have continuous tight seal at the interior and exterior skins completely encapsulating the insulation.

(10) Insulation - Entire unit (walls, roof, doors, and floor) to be insulated with a min 3” thick insulation. The insulation shall have a minimum effective thermal resistant ® of 20 and a noise reduction coefficient (NRC) of 0.70 / per inch thick (based on a type "A" mounting). Insulation shall meet the erosion requirements of UL 181 facing the air stream and fire hazard classification of 25/50 (per ASTM-84 and UL 723 and CAN/ULC S102-M88). All insulation edges shall be encapsulated within the panel. All perforated sections shall have Tuf-Skin or equal insulation with black acrylic coating as manufactured by Johns Manville or approved equal. Panels shall be insulated with minimum 3-PCF high density polyisocyanurate foam insulation. Fiberglass insulation in panels shall not be acceptable.

(11) Access Doors - The unit shall be equipped with a solid double wall insulated, hinged access doors as shown on the plans. The doorframe shall be extruded aluminum with a built in thermal break barrier and full perimeter gasket. The door hinge assembly shall be die cast zinc with stainless steel pivot mechanism, completely adjustable. There shall be a minimum of two heavy duty handles per door. Provide ETL, UL 1995, and CAL-OSHA approved tool operated safety latch on all fan section access doors. Note: If manufacturer cannot provide thermal break door design it must be noted as an exception on the bid.

a. Access doors in the fan section shall be provided with a 10 x 10 dual thermal pane safety glass window. Provide sufficient test ports to be able to measure DP across each section.

1) Provide IAQ drain pans in segments as indicated on the schedule. IAQ drain pans shall comply with ASHRAE Standard 62-2007, Section 5.

(a) The IAQ pans shall be triple sloped, positive draining stainless steel pan. Pan design shall ensure that water drains freely from the pan whether the fan is in operation or stagnant. P-Trap guidelines shall be affixed to the unit. P-Trap components shall be provided and installed by the jobsite contractor.

(b) Coat IAQ drain pans with a anti-microbial coating to reduce microbial growth contaminating the air stream.

(c) Drain connection shall be located at the lowest point(s) of the pan, per ASHRAE 62-2007 Section 5. Drain connection shall be of like material as liner, draining to one side of the unit.

(d) IAQ drain pan shall allow visual inspection and physical cleaning, including underneath coils, without removal of the coil.

7. UNIT COMPONENT DESCRIPTION

(1) Fan Array:

a. The fan array shall consist of multiple, direct driven, arrangement plenum fans spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air way tunnel cross section and components contained therein. The Fan array shall be constructed per AMCA requirements for the duty specified, (Class I, II, or III). All fans shall be selected to deliver design air flow at the specified operating TSP at the specified motor speed and as scheduled. The Fan array shall be selected to operate at a system Total Static Pressure that does not exceed 90% of the specified fan’s peak static pressure producing capability at the specified fan speed.

b. All motors shall be IEEE inverter duty, premium efficiency TEAO T-frame motors selected at the specified operating voltage, RPM, and efficiency as specified or scheduled elsewhere. Each motor shall be provided with an AEGIS bearing protection ring to prevent Electrical Discharge Machining (EDM) damage to the motor bearings.

c. Each fan/motor assembly shall be dynamically balanced to meet AMCA standard 204-96, category BV-2.5, Grade 1.0 with peak to peak deflection equal to or less than 0.8 mil at the design operating speed for the fan/motor cartridge.
   1) The Discharge and Inlet bare fan sound power levels for each individual octave band shall NOT exceed the values specified or scheduled for the Fan array.
   2) Each fan motor shall be individually wired to a unit mounted control panel. Wire sizing shall be determined, and installed, in accordance with applicable NEC standards. All VFD's to be provided by the Controls sub-contractor and are not part of this bid.
   3) Motor Current Sensors for each individual motor, factory wired to terminal strip(s) for field connection By Others to BAS/BMS interfaces.
   4) Fan array shall be sized such that the unit is capable of producing 100% of scheduled airflow at design static pressure after losing one fan. Selection showing this shall be included in the submittal.
   5) Fan motors shall not exceed 15 hp.
   6) Provide hoisting system internal to unit to be able to remove one complete fan/motor assembly.
   7) Provide one blank off plate per unit that allows service personal to prevent re-entrainment of air through a non-functional fan.
   8) Each fan shall be test run at their operating speed or at the maximum RPM for the particular fan's construction class prior to shipment. The fans are to be balanced and records maintained of the readings in the axial, vertical, and horizontal direction on each of the fan's bearings. Final peak velocity measurements shall not exceed 0.1 in/sec.
   9) Each fan in the fan array shall be provided with pitot tubes installed to a control panel on the exterior of the AHU. The pressure transducers shall be provided by the Controls Contractor. The AHU shall include adequate space for the pressure transducer to be installed in an control panel on the exterior of the unit.
   10) Coordinate minimum quantities of supply fans with the schedule indicated on the drawings.

d. Fan Array Electrical:
   1) Provide a complete electrical system required to run the Fan array system including all equipment, material, electrical enclosure and electrical components. All electrical conduit and wiring shall be installed to allow the complete remove of the wall panel. Horizontal conduit alongside walls is not permitted. **VFDs to be BID SEPARATELY.**
   2) Fan array Electrical designs shall be in accordance with the NEC, UL 508A, and Local Codes.

e. Motor Circuit Protection:
   1) All motors in the Fan array shall be provided with individual Motor Protection for thermal overload protection. All motor circuit protectors shall be located in main enclosure.
   2) If required by design, all motor circuit protectors shall be mounted and located in a remote motor circuit protector panel as needed that is separate from the main enclosure. Motor circuit protector enclosure must be located and mounted at a minimal distance from motors in the Fan array.

f. Fan Array Control:
   1) As required by system design, one Variable Frequency Drive with a redundant drive shall be installed by the controls sub-contractor.

8. HEAT TRANSFER COILS – WATER COIL

(1) All coil assemblies shall be leak tested under water at 315 PSIG and PERFORMANCE is to be CERTIFIED under ARI Standard 410. Coils exceeding the range of ARI standard rating conditions shall be noted.

(2) COOLING COIL FOR THIS AHU ONLY SHALL BE A COONEY COIL. Cooling coils shall be mounted on stainless steel support rack to permit coils to slide out individually from the unit. Provide intermediate drain pans on all stacked cooling coils. The intermediate pan shall drain to the main drain pan through a copper downspout. Water coils shall be constructed of seamless copper tubing mechanically expanded into fin collars. All fins shall be continuous within the coil casing to eliminate carryover inherent with a split fin design. Fins are die formed Plate type.

(3) Headers are to be seamless copper with die formed tube holes.

(4) Connections shall be male pipe thread (MPT) Schedule 40 Red Brass with 1/8" vent and drain provided for complete coil drainage. All coil connections shall be extended to the exterior of the unit casing by the manufacturer. Coils shall be suitable for 250 PSIG working pressure. Intermediate tube supports shall be supplied on coils over 44 IN fin length with an additional support every 42" multiple thereafter. Grooved pipe connections are acceptable.

(5) Water coils shall have the following construction:
Standard 5/8 IN:

(6) 5/8 IN o.d. x 0.035" wall copper tube with .028 return bends.

(7) .010 IN aluminum fins

(8) 16 gauge galvanized steel casing

9. HEAT TRANSFER COIL- STEAM

(1) Distributing type steam coils shall be of the high efficiency, plate fin, extended surface type. Outer tubes shall be 5/8” OD seamless copper with a 0.035” minimum wall thickness. Outer tubes shall be mechanically expanded into the fin collars to provide a permanent mechanical bond. The secondary surface shall be formed of 0.010” aluminum fins with integral spacing collars that cover the tube surface. Coil connections shall be red brass MPT. Supply and return connections shall be extended to the exterior of the air handling unit. All vent & drain connections shall be extended to the cabinet exterior. Connection exit locations shall be sealed airtight at the factory. Steam coils shall include vertical tube integral face and bypass coils. Note that the due to the AHU being sized for 100% outside air in the future and operating with return air currently, the steam coils must be sectioned off to provide heating in both full load and part load conditions. This will require two separate steam piping connections and condensate connections.

10. HUMIDIFIER

(1) The humidifier dispersion tubes shall be provided by the humidifier manufacturer and field installed. Manufacturer shall provide a field inspection once the humidifier is installed.

11. Filters - Provide filters of the type indicated on the schedule. Factory fabricated filter sections shall be of the same construction and finish as the unit. Face loaded pre and final filters shall have Type 8 frames as manufactured by AAF, FARR or equal. Side service filter sections shall include hinged access doors on both sides of the unit. Internal blank-offs shall be provided by the air unit manufacturer as required to prevent air bypass around the filters. The filters shall be as manufactured by Farr, Purolator, AAF or equal. Filters shall be in compliance with ANSI/UL 900 – Test Performance of Air Filters.

(1) Filter Gauge: Each Filter bank shall be furnished with: (Magnehelic / Photohelic) filter gauge with a 4 3/4 IN OD white static pressure dial with black figures and zero pointer adjustment. / Dwyer Series 2000 Air filter gauge Dwyer Mark 25 Inclined manometer (DWYER 250 AF).

(2) Flat Racks - Filter racks shall be completely factory assembled and designed for industrial applications. Filter racks shall be fabricated from no less than 16 gauge galvanized steel. Filter racks shall be applied in low efficiency filter applications and will be upstream accessible. Upstream access filter racks shall have one central access cover per row of filters centered in the unit for easy access. Filter racks over 72 IN in length shall require an angle center reinforcement support. Filter racks shall be designed for a maximum of 500 fpm, or meet or exceed the area specified in the mechanical schedule.

(3) Medium Efficiency Pleated Filters - Filters shall be 2 IN thick, 30% efficient. Filter media shall be 100% synthetic. The filter shall have an average efficiency of 25-30% and an average arrestance of 90-92%. The filters shall be listed as Class II under UL Standard 900. Filters shall be tested per ASHRAE Standard 52-76. The effective media shall not be less than 4.6 square feet of media per 1.0 square foot of filter face area, and shall contain not less than 15 pleats per linear foot. Initial resistance at 500 fpm approach shall not exceed 0.28 IN wg. Filters shall be 24”x24” or 12”x24” only. Filter clips shall be Camfil Farr Type C-78-2 or similar.

(4) High Efficiency Rigid Filters - Filters shall be 4 IN deep high performance, pleated, totally rigid and totally disposable type. Each filter shall consist of high density glass fiber media; media support grid, contour stabilizers and enclosing frame. Filter media shall be laminated to a non-woven synthetic backing to form a lofted filter blanket. The filter media shall have an average efficiency of 95%. The media support shall be a metal grid with an effective open area of not less than 95%. The metal grid shall be bonded to the filter media to eliminate the possibility of media oscillation and media pull-away. The metal grid shall be formed in such a manner that it affects a tapered radial pleat design. The grid shall be designed to support the media both vertically and horizontally. Filters shall be listed Class II under UL Standard 900. Filters shall be tested per ASHRAE Standard 52.1-76. Contour stabilizers shall be permanently installed on both entering air and exit air sides of the filter media pack to ensure that the tapered radial pleat configuration is maintained throughout the life of the filter. The filter shall be capable of withstanding a 10 IN wg pressure drop without noticeable distortion of the media pack. The enclosing frame shall be constructed of galvanized steel. It shall be constructed and assembled in such a manner that a rigid and durable enclosure for the filter pack is affected. The periphery of the filter pack shall be continuously bonded to the inside of the enclosing frame, thus eliminating the possibility of air bypass. The enclosing frame shall be equipped with protective diagonal support members on both the entering air and air exit sides of the filters. Filters shall be 24”x24” or 12”x24” only. Filter Clip shall be AAF type L-40 or similar.

(5) Control Dampers – Industrial grade control dampers meeting the following construction standards: Frame shall be minimum 8" deep x 2" flanged 14 gage, galvanized steel channel. Blades shall be double skin airfoil design, maximum 8" wide and minimum 16 gage galvanized steel. Axles shall be minimum 1/2" diameter plated steel rod. Bearing shall be stainless steel sleeve pressed into frame. Oil impregnated bronze or synthetic bearings are not acceptable. Linkage shall be located in jamb out of airstream and constructed of minimum 10 gage steel clevis arms with 3/16" x 3/4" plated steel tie bars pivoting on 3/8" diameter stainless steel pivot pins with lock type retainers. Submittal data must include leakage, pressure drop and maximum pressure data based on AMCA Standard 500 testing. Data shall be for full range of damper sizes. Data from one size sample test is not acceptable. Damper shall be Ruskin model CD80AF1 Control Damper.

a. Provide air foil double T hinges opposed blade damper.
b. Braced and sized to withstand (+/-) 12 inches w.g.
c. Maximum leakage shall be 8 CFM per square foot at 48”x48” size.
d. Damper shall be provided with operator.

e. Provide additional structure as required to meet deflection criteria.

12. ELECTRICAL POWER AND CONTROLS

(1) All electrical and automatic control devices not previously called out or listed below are to be furnished and installed in the field by OTHERS. All electrical conduit and wiring shall be installed to allow the complete remove of the wall panel. Horizontal conduit alongside walls is not permitted.

(2) All wiring and electrical connections shall be of copper wires, copper bus bars, and copper fittings throughout, except internal wire of the control transformer may be aluminum, if copper termination is provided. Identify power supply terminals with permanent markers. The maximum temperature of terminals shall not exceed 167°F (75°C) when the equipment is tested in accordance with its rating.

(3) The unit shall feature a mounted permanent nameplate displaying at a minimum the manufacturer, serial number, model number, date of manufacture, and current and voltage readings. The unit must have an ETL or UL Listing and bear the appropriate mark.

(4) Provide permanent schematic and connection wiring diagrams indicating how the unit motors, starters, controls, etcetera are wired. The controls diagram shall follow recognized industry standards and shall feature line and terminal numbers.

(5) The unit shall bear warning alerting personnel of arc flash hazard and the need for PPE.

(6) Conduit shall consist of a combination of EMT or flexible metal conduit as required. Liquidtite flexible metal conduit may be used outside the air tunnel for wet locations. Electrical connection boxes shall be galvanized steel with knockouts. In wet locations the connection boxes shall be Nema 4 epoxy coated.

(7) Unit Convenience Features

a. Each access section shall be equipped with a vapor- proof 64 watt vapor proof fluorescent light fixtures with low temperature ballast for service.

b. Each light shall have its own light switch mounted adjacent to the access door.

c. Furnish a 120 volt GFI duplex convenience outlet on the exterior of each unit.

d. Lights, switches and outlets shall be wired through a transformer and external light disconnect. Lights shall be wired to remain functional whether the main power disconnect is in the on or off position.

13. FAN MOTOR REMOVAL TROLLEY SYSTEM

(1) Provide unit with I beam trolley system inside of fan section. Provide on exterior of unit a cantilever beam with swing arm that shall handle a minimum lifting weight of 250 lbs. Swing angle of swing arm shall be 200 degrees.

B. CUSTOM AIR HANDLING UNIT- NON-LAB UNIT

1. QUALIFICATIONS

(1) Manufacturer shall be a company specializing in the design and manufacture of commercial / industrial custom HVAC equipment. Manufacturer shall have been in production of custom HVAC equipment for a minimum of 5 years.

(2) Each unit shall bear an ETL or UL label under UL Standard 1995 indicating the complete unit is listed as an assembly. ETL or UL listing of individual components, or control panels only, is not acceptable.

(3) Manufacturer shall have at least 10 unique installations of fan array (minimum 4 fans in fan array) air handling units.

2. WARRANTY
   (1) The complete unit shall be covered by a parts and labor warranty issued by the manufacturer covering the first year of operation. This warranty period shall start upon substantial completion.

3. ACCEPTABLE MANUFACTURERS

   (1) Provide custom air handling units as manufactured by:
      1) NOTE: AIR HANDLING UNITS ARE OWNER PURCHASED, CONTRACTOR INSTALLED. CONTRACTOR SHALL BE RESPONSIBLE FOR RECEIVING THE UNITS, INSTALLATION AND COORDINTATION OF START-UP.

   b. Climatecraft
   c. CES Group (Governair, HuntAir, etc.)
   d. York Custom
   e. Trane Custom
   f. Air Flow

4. GENERAL

   (1) Install where shown on the plans, custom air handling units construction features as specified below. The units shall be provided and installed in strict accordance with the specifications. All units shall be complete with all components and accessories as specified. Any exceptions must be clearly defined. The contractor shall be responsible for any additional expenses that may occur due to any exception made.

   (2) VFD's will be provided under a separate RFP from the Owner and installed by the Controls Contractor.

   (3) Air Handling units shall be shipped in modules that can be installed into the building through the louver openings. Coordinate with drawings for module sizes.

   a. The unit shall be tested by a certified testing agency at the factory prior to shipping. All testing shall be the responsibility of the unit manufacturer. Provide all testing equipment and instrumentation needed for the testing.
   b. The manufacturer shall include a field inspection of the unit once it has been shipped and assembled by the Contractor.

5. ON SITE/FACTORY TESTING AND QUALITY CONTROL

   (1) Factory Tests: The fans shall be factory run tested to ensure structural integrity and proper RPM. All electrical circuits shall be tested to ensure correct operation before shipment of unit. Units shall pass quality control and be thoroughly cleaned prior to shipment.

   ~~(2)~~ The unit manufacturer shall provide a leak test after the unit has been constructed. This shall be performed by a certified company in accordance with AMCA Standard 210**.** The cabinet shall be tested at 1.5 times the static pressure of differential static pressure across the cabinet exterior walls) for both the high and low pressure sides. Cabinet leakage shall not exceed 0.5% of design airflow. All supply and return air openings shall be sealed. The air shall then be pumped into the unit until the appropriate operating

pressures are achieved. Air flow measurements shall be performed in compliance with AMCA Standard 210. The unit shall also be tested to show that the specified airflow is produced at the specified static pressure for both supply and return fans.

(3) Panel Deflection Testing: The unit manufacturer shall provide a deflection test on one unit at 8” of differential static pressure across the cabinet exterior walls. A deflection limit of L/200 will be demonstrated at this time. “L” is defined as the height panel on the side of the unit. Measurements shall be at midpoint of “L” along the vertical seam of the largest panel on one side.
Height of panel = H x (.005) = inches deflection allowed

a. The manufacturer shall notify contractor and/or owner 10 days prior to test for witnessing. Owner’s representative shall select one unit to be tested at the time of release. A written test report shall be prepared by the manufacturer and issued to the Owner’s representative. This test shall be performed when the factory leak test is performed.

(4) Acoustic Requirements: The equipment manufacturer shall furnish calculations showing the estimated sound power levels at the supply and, return connections, as well as unit casing radiation for each air conditioning unit. Calculations shall be based on fan sound power levels which were determined in accordance with AMCA Standard 300 and 301. These shall meet or exceed the sound power levels indicated on the drawings. Sound data from a single fan or group of fans shall not be acceptable. Sound calculation shall calculate resultant sound valves entering or leaving the unit.

(5) The basin shall be tested for leakage. The base sections shall be filled with 2" of water and must hold for 24" hours. Any leaks shall be repaired and the basin re-tested.

6. UNIT CONSTRUCTION

(1) Provide factory-fabricated air handling unit with capacity as indicated on the schedule. Units shall have overall dimensions as indicated and fit into the space available with adequate clearance for service as determined by the Engineer. Units shall be completely assembled in the factory before being palletized and shipped to site. Units shall be furnished with sufficient gasket and bolts for reassembly in the field by the contractor. The manufacturer/contractor shall assure the unit can fit in the mechanical room with all required current spatial limitations.

(2) Unit manufacturer shall provide certified ratings conforming to the latest edition of AMCA 210, 310, 500 and ARI 410. All electrical components and assemblies shall comply with NEMA standards. Unit internal insulation must have a flame spread rating not over 25 and smoke developed rating no higher than 50 complying with NFPA 90A, “Standard for the Installation of Air Conditioning and Ventilating Systems.” Units shall comply with NFPA 70, “National Electrical Code,” as applicable for installation and electrical connections of ancillary electrical components of air handling units. Tags and decals to aid in service or indicate caution areas shall be provided. Electrical wiring diagrams shall be attached to the control panel access doors. Operation and maintenance manuals shall be furnished with each unit. Units shall be UL or ETL listed.

(3) Unit Base - Floor: Unit perimeter base shall be completely welded and fabricated using heavy gauge structural steel tubing. (C-Channel cross supports shall be welded to perimeter base steel tubing and located on maximum 24 IN centers to provide support for internal components. Base rails shall include lifting lugs welded to perimeter base at the

corner of the unit or each section if de-mounted. Entire base frame is to be painted with a phenolic coating for long term corrosion resistance. Internal walk-on floor shall be 10 gauge aluminum tread plate and shall be turned up the wall 4" and welded. Caulk joints are not acceptable. The outer sub-floor of the unit shall be made from 20 gauge galvanized steel. The 4 IN double wall floor shall be insulated. Floor seams shall be gasketed for thermal break and sealed for airtight / watertight construction. Single wall floors with glued and pined insulation and no sub floor are not acceptable.

(4) The base and unit frame shall be painted with a lacquer resisting gray phenolic corrosion inhibitive primer. All drain pans shall be stainless steel IAQ type and have a rigid 12 IN wide safety tread plate walk bridge stretched across the unit width. Walk bridge shall be of the same material type and thickness as the unit floor. The walk bridge and support system shall be suspended above the drain pan (not in contact with the drain pan bottom) and shall be easily removable for drain pan cleaning. A galvanized steel liner shall be attached to the underside of the unit base and cross members, ensuring that the floor insulation is completely encapsulated.

(5) All gasket and necessary assembly hardware shall ship loose with unit. Junction boxes with a factory supplied numbered terminal strip shall be supplied for field wiring.

(6) Unit Casing – The construction of the air handling unit shall consist of a (1 x 2) steel frame with formed 16 gauge G-90 galvanized steel exterior casing panels. The exterior casing panels shall be attached to the gasketed (1 x 2) steel frame with corrosion resistant fasteners.

(7) All casing panels shall be completely removable from the unit exterior without affecting the unit's structural integrity. (Units without framed type of construction shall be considered, provided the exterior casing panels are made from 14 gauge galvanized steel, maximum panel center lines are less than 20 inches and deflection is less than L/200 @ 8 IN positive pressure).

(8) The air handling unit casing shall be of the "no-through-metal" design. The casing shall incorporate insulating thermal breaks as required so that, when fully assembled, there's no path of continuous unbroken metal to metal conduction from inner to outer surfaces. Provide necessary support to limit casing deflection to L/200 of the narrowest panel dimension. If panels cannot meet this deflection, additional internal reinforcing is required.

(9) All panel seams shall be caulked and sealed for an airtight unit. Leakage rates shall be less than 0.5% at 8 IN W.C. Note: If manufacturer cannot provide thermal break (no through metal) and or removable exterior panel construction it must be noted as an exception on the bid.

a. As an option to steel panels, all panels may be double wall all-aluminum construction with minimum 0.040 IN exterior and interior skin thicknesses. Interior finish to be smooth, mill finish; exterior finish to be a low-reflective textured mill finish. Each panel shall contain an integral frame or be properly supported by a structural framing system. Panel shall have continuous tight seal at the interior and exterior skins completely encapsulating the insulation.

(10) Insulation **-** Entire unit (walls, roof, doors, and floor) to be insulated with a min 3" thick insulation. The insulation shall have a minimum effective thermal resistant ® of 20 and a noise reduction coefficient (NRC) of 0.70 / per inch thick (based on a type "A" mounting). Insulation shall meet the erosion requirements of UL 181 facing the air stream and fire hazard classification of 25/50 (per ASTM-84 and UL 723 and CAN/ULC S102-M88). All

insulation edges shall be encapsulated within the panel. All perforated sections shall have Tuf-Skin or equal insulation with black acrylic coating as manufactured by Johns Manville or approved equal. Panels shall be insulated with minimum 3-PCF high density polyisocyanurate foam insulation. Fiberglass insulation in panels shall not be acceptable.

(11) Access Doors - The unit shall be equipped with a solid double wall insulated, hinged access doors as shown on the plans. The doorframe shall be extruded aluminum with a built in thermal break barrier and full perimeter gasket. The door hinge assembly shall be die cast zinc with stainless steel pivot mechanism, completely adjustable. There shall be a minimum of two heavy duty handles per door. Provide ETL, UL 1995, and CAL-OSHA approved tool operated safety latch on all fan section access doors. Note: If manufacturer cannot provide thermal break door design it must be noted as an exception on the bid.

a. Access doors in the fan section shall be provided with a 10 x 10 dual thermal pane safety glass window. Provide sufficient test ports to be able to measure DP across each section.

1) Provide IAQ drain pans in segments as indicated on the schedule. IAQ drain pans shall comply with ASHRAE Standard 62-2007, Section 5.

(a) The IAQ pans shall be triple sloped, positive draining stainless steel pan. Pan design shall ensure that water drains freely from the pan whether the fan is in operation or stagnant. P-Trap guidelines shall be affixed to the unit. P-Trap components shall be provided and installed by the jobsite contractor.

(b) Coat IAQ drain pans with a anti-microbial coating to reduce microbial growth contaminating the air stream.

(c) Drain connection shall be located at the lowest point(s) of the pan, per ASHRAE 62-2007 Section 5. Drain connection shall be of like material as liner, draining to one side of the unit.

(d) IAQ drain pan shall allow visual inspection and physical cleaning, including underneath coils, without removal of the coil.

7. UNIT COMPONENT DESCRIPTION

(1) Fan Array:

a. The fan array shall consist of multiple, direct driven, arrangement plenum fans spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air way tunnel cross section and components contained therein. The Fan array shall be constructed per AMCA requirements for the duty specified, (Class I, II, or III). All fans shall be selected to deliver design air flow at the specified operating TSP at the specified motor speed and as scheduled. The Fan array shall be selected to operate at a system Total Static Pressure that does not exceed 90% of the specified fan's peak static pressure producing capability at the specified fan speed.

b. All motors shall be IEEE inverter duty, premium efficiency TEAO T-frame motors selected at the specified operating voltage, RPM, and efficiency as specified or scheduled elsewhere. Each motor shall be provided with an AEGIS bearing protection ring to prevent Electrical Discharge Machining (EDM) damage to the motor bearings.

c. Each fan/motor assembly shall be dynamically balanced to meet AMCA standard 204-96, category BV-2.5, Grade 1.0 with peak to peak deflection equal to or less than 0.8 mil at the design operating speed for the fan/motor cartridge.

1) The Discharge and Inlet bare fan sound power levels for each individual octave band shall NOT exceed the values specified or scheduled for the Fan array.

2) Each fan motor shall be individually wired to a unit mounted control panel. Wire sizing shall be determined, and installed, in accordance with applicable NEC standards.

3) Motor Current Sensors for each individual motor, factory wired to terminal strip(s) for field connection By Others to BAS/BMS interfaces.
4) Fan array shall be sized such that the unit is capable of producing 100% of scheduled airflow at design static pressure after losing one fan. Selection showing this shall be included in the submittal.
5) Fan motors shall not exceed 15 hp.
6) Provide hoisting system internal to unit to be able to remove one complete fan/motor assembly.
7) Provide one blank off plate per unit that allows service personal to prevent re-entrainment of air through a non-functional fan.
8) Each fan shall be test run at their operating speed or at the maximum RPM for the particular fan's construction class prior to shipment. The fans are to be balanced and records maintained of the readings in the axial, vertical, and horizontal direction on each of the fan's bearings. Final peak velocity measurements shall not exceed 0.1 in/sec.
9) Each fan in the fan array shall be provided with pitot tubes installed to a control panel on the exterior of the AHU. The pressure transducers shall be provided by the Controls Contractor. The AHU shall include adequate space for the pressure transducer to be installed in an control panel on the exterior of the unit.
10) Coordinate minimum quantities of supply fans with the schedule indicated on the drawings.

d. Fan Array Electrical:
1) Provide a complete electrical system required to run the Fan array system including all equipment, material, electrical enclosure and electrical components. All electrical conduit and wiring shall be installed to allow the complete remove of the wall panel. Horizontal conduit alongside walls is not permitted.
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1) All motors in the Fan array shall be provided with individual Motor Protection for thermal overload protection. All motor circuit protectors shall be located in main enclosure.
2) If required by design, all motor circuit protectors shall be mounted and located in a remote motor circuit protector panel as needed that is separate from the main enclosure. Motor circuit protector enclosure must be located and mounted at a minimal distance from motors in the Fan array.

f. Fan Array Control:
1) As required by system design, one Variable Frequency Drive for normal operation and a second Variable Frequency Drive for Redundant Backup operation shall be provided by the controls sub-contractor.

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(1) All coil assemblies shall be leak tested under water at 315 PSIG and PERFORMANCE is to be CERTIFIED under ARI Standard 410. Coils exceeding the range of ARI standard rating conditions shall be noted.
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b. Each light shall have its own light switch mounted adjacent to the access door.
c. Furnish a 120 volt GFI duplex convenience outlet on the exterior of each unit.
d. Lights, switches and outlets shall be wired through a transformer and external light disconnect. Lights shall be wired to remain functional whether the main power disconnect is in the on or off position.

11. FAN MOTOR REMOVAL TROLLEY SYSTEM

(1) Provide unit with I beam trolley system inside of fan section. Provide on exterior of unit a cantilever beam with swing arm that shall handle a minimum lifting weight of 250 lbs. Swing angle of swing arm shall be 200 degrees.

C. LAB EXHAUST FANS

(1) Lab exhaust fans and return fan shall be bid as a separate bid package- Owner Furnished and Contractor installed. For the exhaust and return fan, the RFP decision shall be made on both the bid price and the stated delivery date to the project site.

(2) Fans shall be Type BAF-SW Airfoil Arrangement 3; Class II fans as manufactured by Twin City Fan & Blower, Greenheck, Loren Cook or approved equivalent.

(3) PERFORMANCE - Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG).

(4) Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA Standard 99.

(5) HOUSING - BAF fan housings are to be of heavy gauge, continuously welded construction. Housings with lock seams or partially welded construction are not acceptable. Discharge flanges are to be provided for rigidity and duct connection. Housings shall be suitably braced to prevent vibration or pulsation. Housings shall have tapered spun, aerodynamically designed inlet cones or shrouds providing stable flow and high rigidity.

(6) WHEEL - BAF airfoil wheels shall be die-formed airfoil blade type, continuously welded to the rim and back plate. Smaller sizes may use extruded aluminum blades. Partial welding will not be acceptable on airfoil blades. All wheels shall be statically and dynamically balanced.

(7) SHAFT - Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed.

(8) BEARINGS - Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum average bearing life (AFBMA L-50) in excess of 200,000 hours at the maximum fan RPM.

(9) DRIVE - Motor sheaves shall be cast iron, variable pitch on applications 20 HP and smaller, and fixed pitch on 25 HP and larger. Drives and belts shall be located external to the fan casing and rated for 150% of the required motor HP.

(10) FINISH AND COATING - The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be unpainted.

(11) ACCESSORIES - Provide belt guards, access door, companion flanges, Unitary bases with one inch deflection spring isolators and piezometer flow measurement rings factory mounted.

(12) SHAFT GROUNDING RINGS

a. Provide shaft grounding rings mounted on the motors at the factory.

(13) FACTORY RUN TEST - All fans prior to shipment shall be completely assembled and test run as a unit specified operating speed or maximum RPM allowed for the particular construction type. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

(14) GUARANTEE - The manufacturer shall guarantee the workmanship and materials for its fans for at least one (1) year from Substantial Completion.

D. RETURN FANS

(1) Lab exhaust fans and return fan shall be bid as a separate bid package.

(2) Fans shall be manufactured by Twin City Fan & Blower, Greenheck, Loren Cook or approved equivalent.

(3) PERFORMANCE - Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG).

(4) Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA Standard 99.

(5) HOUSING - fan housings are to be of heavy gauge, continuously welded construction. Housings with lock seams or partially welded construction are not acceptable. Discharge flanges are to be provided for rigidity and duct connection. Housings shall be suitably braced to prevent vibration or pulsation. Housings shall have tapered spun, aerodynamically designed inlet cones or shrouds providing stable flow and high rigidity.

(6) WHEEL - airfoil wheels shall be die-formed airfoil blade type, continuously welded to the rim and back plate. Smaller sizes may use extruded aluminum blades. Partial welding will not be acceptable on airfoil blades. All wheels shall be statically and dynamically balanced.

(7) SHAFT - Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed.

(8) BEARINGS - Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum average bearing life (AFBMA L-50) in excess of 200,000 hours at the maximum fan RPM.

(9) DRIVE - Motor sheaves shall be cast iron, variable pitch on applications 20 HP and smaller, and fixed pitch on 25 HP and larger. Drives and belts shall be located external to the fan casing and rated for 150% of the required motor HP.

(10) FINISH AND COATING - The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be unpainted.

(11) ACCESSORIES - Provide belt guards, access door, companion flanges, Unitary bases with one inch deflection spring isolators and piezometer flow measurement rings factory mounted.

(12) SHAFT GROUNDING RINGS

a. Provide shaft grounding rings mounted on the motors at the factory.

(13) FACTORY RUN TEST - All fans prior to shipment shall be completely assembled and test run as a unit specified operating speed or maximum RPM allowed for the particular construction type. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

(14) GUARANTEE - The manufacturer shall guarantee the workmanship and materials for its BAF fans for at least one (1) year from Substantial Completion.

(15) TRAINING: Training of the owner's operation and maintenance personnel is required in cooperation with the Commissioning Authority. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans.

E. HUMIDIFIER- STEAM TO STEAM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1.DRI-STEEM® Corporation, STS model humidifier for use with pressurized steam

2.Armstrong

3.Neptronic

B. Related Items:

1.Pressurized steam connections: Division 23

2.Electrical: Division 26

1.02 REFERENCES

A. Certifications:

1.ETL, C-ETL

2.CE

3.OSHPD Special Seismic Pre-approval

1.03 SUBMITTALS

A. Comply with Submittal Procedures and Execution and Closeout Requirements in General Requirements

B. Submit product data (manufacturer's specifications and technical data including performance, construction, and fabrication) for each manufactured component.

1.04 WARRANTY

A. Product shall be warranted to be free from defects in materials and fabrication for a period of two years after installation or 27 months from ship date.

1.05 COMMISSIONING: This section specifies a system or a component of a system being commissioned as defined in Section 01 91 00 Commissioning. Testing of these systems is required, in cooperation with the Owner and the Commissioning Authority. Refer to Section 01 91 00 Commissioning for detailed commissioning requirements.

PART 2 – PRODUCTS

1.01 SUMMARY

12. Fabrication Requirements:

(1) Tank and cover: 14 gauge, 304 stainless steel with Heli-arc welded seams

(2) Removable cover with ¼” screws (M6)

(3) Easily accessible cleanout plate

(4) Steam outlet on top of tank confirgured to connect to hose, pipe, or flange connection

(5) Tubular copper heat exchangers and header with nickel coating

13. Mounting:

(1) Humidifier shall be mounted on painted H-legs (Models STS 200-800 only).

14. Water Requirements: The humidifier shall be capable of generating steam from tap, softened, or DI/RO water.

15. Drain: An electric operated drain valve shall be mounted on the humidifier assembly to allow tank to drain automatically at the end of a humidification season.

16. Steam trap and strainer: Humidifier shall include a float/thermostatic steam trap and steam supply line strainer.

2.02 HUMIDIFIER OPTIONS

A. Fabrication Options:

(1) Factory Insulation: Humidifier shall be covered with 1” thick (25mm) rigid, foil-faced fiberglass insulation. All surfaces except front face panel shall have insulation.

2.03 HUMIDIFIER CONTROLS

A. Control Cabinet: Control cabinet shall be shipped loose and shall be a UL/CSA listed JIC enclosure. Control devices shall be mounted on a subpanel within the cabinet. A wiring diagram shall be included in the control cabinet.

B. Vapor-Logic4 microprocessor controller with the following features or functions:

1) Web Interface and server, included standard on all models:

a. Web interface shall have same functionally as Vapor-logic4 keypad/display
b. Web interface shall allow multiple remotely located users to simultaneously view system operation and/or change system parameters.
c. Web interface shall have password-protected secure access.
d. Web interface shall connect directly to a personal computer or through a system network via Ethernet cable.
1) Automatic cable configuration shall allow straight-through or crossover cables.

(2) Interoperable with any Modbus network
(3) Full modulating (0% to 100%) control of humidifier outputs
(4) PID control capability with field-adjustable settings
(5) Water level control for softened or hard water:
a. Automatic refill, low water cutoff, field-adjustable skimmer bleedoff functions and automatic drain-down of humidifier. System shall consist of:
1) A water level sensing unit comprised of three metallic probes screwed into a threaded probe head. Probe head shall incorporate probe isolation chamber to eliminate short-circuiting between probes caused by mineral coating of probe head. Probe head shall be mounted on the humidifier assembly.
2) A solenoid operated fill valve factory mounted on the humidifier assembly.
3) End of season drain automatically drains humidifier tank after a user-defined period of system inactivity.

(6) Temperature sensor: A factory mounted sensor, with a temperature range of -40 to 248°F (-40 to 120°C) mounted on the humidifier to enable the following functions:
a. Maintain the evaporating chamber water temperature above freezing
b. Maintain a user-defined preset evaporating chamber water temperature
c. Allow rapid warm-up of water in evaporating chamber after a call for humidity, proving 100% operation until steam production occurs

(7) USB port on the control board for software updates, data backups, and data restoration
(8) Up-time optimizer function to keep humidifier(s) operating through conditions such as fill, drain, or run-time faults, as long as safety conditions are met, minimizing production down-time
(9) Real-time clock to allow time-stamping alarm/message tracking, and scheduled events
(10) Factory commissioning of humidifier and control board, including system configuration as ordered
(11) Keypad/display operable within a temperature range of 32 to 158°F (0 to 70°C), and that provide backlighting for viewing in low light
(12) Alarms, unit configuration, and usage timer values shall remain in nonvolatile memory indefinitely during a power outage.
(13) The capability to monitor, control, and/or adjust the following parameters:
a. Relative humidity (RH) set point, actual conditions in the space (from humidity transmitter), RH offset.
b. Dew point set point, actual conditions in the space (from dew point transmitter), dew point offset.
c. Relative humidity (RH) duct high limit set point (switch) and actual conditions.
d. Relative humidity (RH) duct high limit set point, actual conditions (from transmitter), high limit span, and high limit offset.
e. Total system demand in % of humidifier capacity.
f. Total system output in lbs/hour (kg/h).
g. Drain/flush duration.
h. End of season drain status (on standard water systems and if ordered as a DI water option) and hours humidifier is idle before end of season draining occurs.
i. Window glass surface temperature (in % RH offset application using sensor ordered as an option) with programmable offset.

j. Air temperature or other auxiliary temperature monitoring with programmable offset (using sensor ordered as an option).
k. System alarms and system messages, current and previous
l. Adjustable water skim duration
m. Programmable outputs for remote signaling of alarms and/or messages, device activation (such as a fan), or for signaling tank heating and/or steam production
n. System diagnostics that include:
    1) Test outputs function to verify component operation
    2) Test humidifier function, by simulating demand to validate performance
    3) Data collection of RH, air temperature, water use, energy use, alarms, and service messages for viewing from the keypad/display or Web interface
o. Service notification scheduling
p. Password protected system parameters
q. Keypad/display or Web interface displays in English
r. Numerical units displayed in inch-pound or SI unit

2.04 HUMIDIFIER CONTROL OPTIONS

A. Interoperability using BACnet®

B. Control cabinet mounted: Control cabinet shall be a UL/CSA listed NEMA-1 enclosure. Control devices shall be mounted on a subpanel within the cabinet. A wiring diagram shall be included in the control cabinet. Control cabinet shall be factory attached to the side of humidifier with all wiring between cabinet and humidifier completed at factory.

C. Valve options:

D. Cabinet door interlock switch: The control cabinet shall have an interlock control switch with manual override to remove control voltage when door is opened.

E. Control input accessory options:

1. Airflow proving switch, pressure tape: Airflow proving switch shall be diaphragm operated with pitot tube for field installation. Switch shall have an adjustable control point range of 0.05” to 12” wc (12.5 Pa to 2,998 Pa). Operating temperature range -40°F to 180°F (-40°C to 82°C). Compatible with 24, 120, and 240 VAC.

2.05 HUMIDIFIER ACCESSORIES

A. Drane-kooler™: A thermostatically controlled water valve shall meter an amount of cold water into a stainless steel mixing chamber to temper 212°F (100°C) water with a 6 gpm (0.38 L/s) in-flow rate to a 140°F (60°C) discharge temperature to sanitary system.

2.06 HUMIDIFIER DISPERSION OPTIONS

A. Ultra-sorb® steam dispersion panel:

1. The factory assembled steam dispersion panel shall include the following components:

a. Steam supply header/separator.
b. Condensate collection header.

c. Closely spaced steam dispersion tubes spanning the distance between the two headers.

2. Each dispersion tube shall be fitted with two rows of steam discharge tubelets inserted into the tube wall, centered on the diametric line, and spaced 1 ½" (38mm) apart. Each tubelet shall be made of a thermal-resin material designed for high steam temperatures. The two rows of tubelets in each dispersion tube shall discharge steam in diametrically opposite directions, perpendicular to airflow.
3. Each tubelet shall extend through the wall of and into the center of the dispersion tube and contain a steam orifice sized for its required steam capacity.
4. The humidifier shall provide absorption characteristics that preclude water accumulation on any in-duct surface with 10" (254 mm) of the humidifier tube panel while maintaining conditions of 50% maximum relative humidity at a minimum of 55°F (13°C) in the duct airstream.
5. Air pressure loss across the humidifier panel shall not exceed 0.007" water column (2 Pa) at a duct velocity of 630 fpm (3m/s).
6. Each packaged humidifier panel assembly of tubes and headers shall be contained within a galvanized metal casing to allow convenient duct mounting, or to facilitate the stacking of and/or the end-to-end mounting of multiple humidifier panels in ducts or air handler casings. When so designated, the humidifier panel shall be shipped unassembled.
7. All tubes and headers shall be 304 stainless steel and be Heli-arc welded.
8. Tubes shall be joined to headers with slip-fit couplings.
9. Option: Insulated dispersion tubes. Dispersion tubes shall be insulated with a plenum-approved insulating material for in-duct installation and have an R-value not less than 0.5 at a thickness not more than 0.125" (3.2mm), for minimal increase in dispersion tube diameter.
   a. Airstream heat gain shall not exceed the values as scheduled; the values shall be supported by the manufacturer's published data.
   b. Insulating material shall meet the following criteria at 0.125" (3.2mm) thickness:
   1) Fire/smoke index shall be 0/0 per any of the following test procedures: - UL 723 fire/smoke index (Test for Surface Burning Characteristics of Building Materials) 0 NFPA 255 (Standard Method of Test of Surface Burning Characteristics of Building Materials) – ASTM E84 (Surface Burning Characteristics for Materials Used in Plenums)
   2) Stable up to 300°F (148°C) continous – to prevent material degradation, hardening, or crumbling at high temperatures.
   3) Closed –cell construction does not absorb water or support microbial growth – to negate the need for vapor barriers and jackets.
   4) Non-toxic and pure as documented in manufacturer's data – to prevent off-gassing and to facilitate use in clean rooms, pharmaceutical applications, and food industries.
   5) Will not degrade when exposed to UVC light – to negate the need for UV wraps.
   6) Continuous, seam-welded, and held in place without bands or clamps, - to minimize surfaces for the accumulation of particulate matter

F. LAB AIRFLOW CONTROL VALVES

The Lab Airflow Control Valve System shall be manufactured by Phoenix (sole source) as this is an extension of the existing system installed through the rest of the Jacob Science building. The Mechanical Contractor shall be responsible for providing a complete and working system coordinated with the LACS manufacturer and Building Management System installer.

A LACS shall be furnished and installed to control the airflow into and out of laboratory rooms. The exhaust flow rate of a laboratory fume hood shall be controlled precisely to maintain a constant average face velocity into the fume hood at either a standard/in-use or standby level based on an operator's presence in front of the fume hood. The laboratory control system shall vary the amount of make-up/supply air into the room to operate the laboratories at the

lowest possible airflow rates necessary to maintain temperature control, achieve minimum ventilation rates and maintain laboratory pressurization in relation to adjacent spaces (positive or negative). The LACS shall be capable of operating as a standalone system or as a system integrated with the Building Management System (BMS). An optional locally mounted user interface terminal shall be available to allow room-level control variables to be displayed, and where appropriate, edited to adjust control operation.

COMPONENTS

a. USAGE BASED CONTROL® EQUIPMENT
    1) For variable air volume (VAV) systems, a sash sensor shall be provided to measure the height of each vertically moving fume hood sash. A sash sensor shall also be provided to measure the opening of horizontal overlapping sashes. Control systems employing sidewall-mounted or through the wall (TTW) velocity sensors to control the fume hood exhaust airflow shall be unacceptable. Sidewall-mounted or through the wall (TTW) sensors shall only be used as a reference or to provide a secondary alarm indication relative to operating face velocity.

b. A Zone Presence Sensor (ZPS) shall be provided to determine an operator's presence in front of a hood by detecting the presence and/or motion of an operator, and to command the LACS from an in-use operating face velocity (e.g., 100 fpm) to a standby face velocity (e.g., 60 fpm) and vice versa.

    i. The sensor shall define an adjustable detection zone that extends approximately 20 inches (50 cm) from the front of the fume hood. If the sensor does not detect presence and/or motion in its detection zone within 30 to 3,000 seconds, it shall command the system to the user-adjustable standby face velocity. When the sensor detects the presence and/or motion of an operator within the detection zone, it shall command the system to the in use face velocity within 1.0 second.
    ii. The sensor shall sense an inanimate object when placed in the detection zone and remain in the standard mode of operation for 30 to 3,000 seconds, after which it will return to a standby mode. Operators shall enter and leave the zone with the unit adjusting automatically between in-use and standby modes. If the inanimate object is moved or taken out of the zone, the unit shall adapt to the change automatically.
    iii. The sensor shall have an adjustable detection zone capable of covering a fume hood up to eight feet wide and be mounted from six to 12 feet above the floor surface.
    iv. The sensor shall be configurable for varying levels of lighting intensity and motion sensitivity.
    v. The sensor shall have the ability to operate on either AC or DC power sources.
    vi. Wide area motion detectors (on the hood or at the room level) shall be unacceptable.

c. Motion detectors that rely solely on Doppler shift radar or similar technology for motion detection shall be unacceptable.
d. The airflow at the fume hood shall vary in a linear manner between two adjustable minimum and maximum flow set points to maintain a constant face velocity throughout this range. A minimum volume flow shall be set to assure flow through the fume hood even with the sash fully closed.

AIRFLOW CONTROL DEVICE – GENERAL

c. The airflow control device shall be a Phoenix Controls Accel II pressure independent venturi valve.
d. The valve assembly manufacturer's Quality Management System shall be registered to ISO 9001:2008.

e. Airflow control device shall be OSHPD tested and certified per 2013 CBC, 2012, IBC, ASCE 7-10, and ICC-ES-AC-156.
f. All Components of the valve, its controllers, and wiring shall be ROHS compliant.
g. The airflow control device shall be mechanically pressure independent over its specified differential static pressure operating range. An integral pressure independent assembly shall respond and maintain specific airflow within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change (within product specifications) or quantity of airflow controllers on a manifolded system.
h. The airflow control device shall maintain accuracy within ±5% of signal to set point over an airflow turndown range of no less than:
    (1) 12.5 to 1 (medium pressure all valve sizes)
    (2) 16 to 1 (medium pressure w/o 14” valve)
    (3) 7 to 1 (low pressure all valve sizes)
    (4) 11 to 1 (low pressure w/o 14” valve)
    (5) 8 to 1 (medium pressure shut-off all valve sizes)
    (6) 14 to 1 (medium pressure shut-off w/o 14” valve)
    (7) 5 to 1 (low pressure shut-off all valve sizes)
    (8) 9 to 1 (low pressure shut-off w/o 14” valve)
i. No minimum entrance or exit duct diameters shall be required to ensure accuracy and/or pressure independence.
j. No rotational/axial orientation requirements shall be required to ensure accuracy and/or pressure independence.
k. The airflow control device shall maintain pressure independence regardless of loss of power. “Electronically pressure independent” devices will not be acceptable.
l. Airflow control devices utilizing ASHRAE 130 minimum operating pressure as a rating for minimum design pressure at required flow will not be acceptable on basis on minimum operating pressure alone. Valve manufacturer will provide minimum required differential pressure in writing for each size valve they offer.
m. Airflow control device shall be able to achieve its maximum turndown ratio at its stated minimum operating differential pressure. I.E. if minimum operating pressure is 0.6” wc dp, a 10” air valve must be able to achieve its minimum of 50cfm and its maximum of 1000 cfm at stated 0.6” wc dp. Devices that require duct static pressure to be increased to achieve maximum flow shall not be acceptable.
n. The airflow control device shall be constructed of one of the following four types:
    i. Class A—The airflow control device for non-corrosive airstreams, such as supply and general exhaust, shall be constructed of 16-gauge aluminum. The device's shaft and internal “S” link shall be made of 316 stainless steel. The shaft support brackets shall be made of galvaneal (non shutoff valves) or 316 stainless steel (shutoff valves). The pivot arm shall be made of aluminum (for non shutoff valves) and 303/304 stainless (for shut off valves). The pressure independent springs shall be a spring-grade stainless steel. All shaft bearing surfaces shall be made of a PP (polypropylene) or PPS (polyphenylene sulfide) composite. Sound attenuating devices used in conjunction with general exhaust or supply airflow control devices shall be constructed using 24 gauge galvanized steel or other suitable material used in standard duct construction. No sound absorptive materials of any kind shall be used.
    ii. Class B—The airflow control device for corrosive airstreams, such as fume hoods and biosafety cabinets, shall have a baked-on, corrosion-resistant phenolic coating. The device's shaft shall be made of 316 stainless steel with a Teflon coating. The shaft support brackets shall be made of 316 stainless steel. The pivot arm and internal “S” link shall be made of 316 or 303 stainless steel. The pressure independent springs shall be a spring-grade stainless steel. The internal nuts, bolts and rivets shall be stainless steel. All shaft bearing surfaces shall be made of PP (polypropylene) or PPS (polyphenylene sulfide) composite.

Note: Airflow Control Devices utilizing vortex shedding sensors and installed in fume hoods or corrosive environments MUST be constructed with Stainless steel bodies, and MUST have stainless steel Vortex Shedding sensors. PolyCarbonate Vortex Shedding sensors will NOT be acceptable in corrosive environments.

o. Actuation

i. For high speed electrically actuated VAV operation, a CE certified, UL Listed, IP56 rated for dust and water, electronic actuator shall be factory mounted to the valve. Loss of main power shall cause the valve to position itself in an appropriate failsafe state. Options for these failsafe states include: normally open-maximum position, normally closed-minimum position and fail-to-last position. This position shall be maintained constantly without external influence, regardless of external conditions on the valve (within product specifications).

ii. In fail safe conditions the Airflow Control Device must remain pressure independent and in control of airflow at its failed position. I.E. if a device fails in position at 500 cfm, the airflow control device must remain pressure independent regardless of having power/controller operating and will deliver the 500cfm at that given control point regardless of duct pressure. Airflow control devices with single or dual blades that fail in position or fail open will not be acceptable as the airflow delivered cannot be guaranteed due to device not being mechanically pressure independent.

iii. During normal operation, the high speed actuated airflow control device shall initiate valve movement and achieve the commanded airflow value with no more than 5% overshoot or undershoot within 1 second or less.

iv. For Standard Speed electrically actuated VAV operation, a CSA certified, UL recognized (IP54 rating and CE certification optional on single valves, standard on dual valves) electronic actuator shall be factory mounted to the valve. The fail-safe state for standard speed operation valves shall be fail to last position unless otherwise noted.

v. In fail-safe conditions the Airflow Control Device must remain pressure independent and in control of airflow at its failed position. I.E. if a device fails in position at 500 cfm, the airflow control device must remain pressure independent regardless of having power/controller operating and will deliver the 500cfm at that given control point regardless of duct pressure. Airflow control devices with single or dual blades that fail in position or fail open will not be acceptable as the airflow delivered cannot be guaranteed due to device not being mechanically pressure independent.

vi. During normal operation, the standard speed actuated airflow control device shall initiate valve movement and achieve the commanded airflow value with no more than 5% overshoot or undershoot within 60 seconds (90 seconds for a shutoff valve from shutoff to maximum flow or vice Versa).

vii. Standard speed actuation should not be used for valves that are connected to VAV fume hoods.

viii. Standard speed actuation can be used on 2-state fume hoods or vented cabinets or snorkels with on/off conditions.

viiii Constant volume valves do not require actuators.

p. The controller for the airflow control devices shall be microprocessor based and operate using peer-to-peer control architecture. The room-level airflow control devices shall function as a standalone network. The room-level control network shall utilize a LonTalk communications protocol.
q. There shall be no reliance on external or building-level control devices to perform room-level control functions. Each laboratory control system shall have the capability of performing fume hood control, pressurization control, standard and advanced temperature control, humidity control, and implement occupancy and emergency mode control schemes. A Room controller or PLC performing these functions shall not be acceptable.
r. The LACS shall have the option of digital integration with the BMS or BAS. If digital integration device, room controller, laboratory space controller or similar is lost or offline or fails then the valve controllers shall have distributed controllability and will keep the basic room functions of zone balance, temperature, humidity control, offset control, etc. operating to maintain a safe and comfortable zone. NVLAP Accreditation (Lab Code 200992-0)
s. Each airflow control device shall be factory characterized on air stations NVLAP Accredited (a program administered by NIST) to ISO/IEC 17025:2005 standards.
t. Each airflow control device shall be factory characterized to the job specific airflows as detailed on the plans and specifications using NVLAP Accredited air stations and instrumentation having a combined uncertainty of no more than ±1.4% of signal (4,200 to 250cfm), ±2.5% of signal (249 to 100cfm) and ±4% of signal (199 to 35cfm). Electronic airflow control devices shall be further characterized and their accuracy verified to ±5% of signal at a minimum of 48 different airflows across the full operating range of the device.
u. Each airflow control device shall be marked with device-specific factory characterization data. At a minimum, it should include the room number, tag number, serial number, model number, eight-point characterization information (for electronic devices), date of manufacture and quality control inspection numbers. All information shall be stored by the manufacturer for use with as-built documentation. Characterization data shall be stored indefinitely by the manufacturer and backed up off site for catastrophic event recovery.

EXHAUST AND SUPPLY AIRFLOW DEVICE CONTROLLER

1. The airflow control device shall be a microprocessor-based design and shall use closed loop control to linearly regulate airflow based on a digital control signal. The device shall generate a digital feedback signal that represents its airflow.
2. During normal operation the airflow control device shall initiate valve movement and achieve the commanded airflow value with no more than 5% overshoot or undershoot within:
   a. 1 second or less with high speed actuation.
   b. 60 seconds for standard speed actuation (90 seconds from shutoff to max flow and vice versa).
3. The airflow control device shall store its control algorithms in non-volatile, re-writeable memory. The device shall be able to stand-alone or to be networked with other room-level digital airflow control devices using an industry standard protocol.
4. Room-level control functions shall be embedded in and carried out by the airflow device controller using distributed control architecture. Critical control functions shall be implemented locally; no separate room-level controller shall be required.
5. The airflow control device shall use industry standard 24 VAC power.
6. The airflow control device shall have provisions to connect a Phoenix Controls Workbench (WKB100) commissioning tool and every node on the network shall be accessible from any point in the system.
7. The airflow control device shall have built-in integral input/output connections that address fume hood control, temperature control, humidity control occupancy control, emergency control, and non-network sensors switches and control devices. At a minimum, the airflow controller shall have:
   a. Three universal inputs capable of accepting 0 to 10 VAC, 4 to 20 mA, 0 to 65 K ohms, or Type 2 or Type 3 10 K ohm @ 25 degree C thermistor temperature sensors.
   b. One digital input capable of accepting a dry contact or logic level signal input.

c. Two analog outputs capable of developing either a 0 to 10 VAC @ 1 mA (10Kohm min) or 4 to 20 mA (500 ohm max) linear control signal.
d. One Form C (SPDT) relay output capable of driving up to 1 A @ 24 VAC/VAC.

8. The airflow control device shall meet FCC Part 15 Subpart J Class A, CE, and CSA Listed per file #228219.
9. The airflow control device shall be ROHS compliant.

TWO-POSITION EXHAUST AIRFLOW CONTROL DEVICE

1. The airflow control device shall maintain a factory characterized fixed maximum and minimum flow set point based on a remote contact/sash switch for electronic valves or a switched 0 to 20 psi pneumatic signal for pneumatic valves. Two-position devices requiring feedback shall generate a 0 to 10 volt feedback signal that is linearly proportional to its airflow. All two-position devices shall be either networked or hard-wired into the room-level network to be considered under pressurization control.

CONSTANT VOLUME AIRFLOW CONTROL DEVICE

1. The airflow control device shall maintain a constant airflow set point. It shall be factory characterized and set for the desired airflow. It shall also be capable of field adjustment for future changes in desired airflow.

2. Constant volume valves must be 100% mechanically pressure independent, and require no actuation to maintain set point.

3. Constant volume valves shall have no required electronics to maintain set point.

4. LACS suppliers not employing constant volume venturi airflow control valves shall provide pneumatic tubing or electrical wiring as required for their devices.

FUME HOOD DISPLAY

1. The display screen shall be a Phoenix Controls Sentry 3.2” (diagonal) color LCD resistive touch screen (240 x 320 RGB).
2. The touch screen shall support input configurations for fume hood operational parameters done at t3he touch panel and at a minimum including:
   a. Sash Dimensions
   b. Hood ID
   c. Hood Certification Reminder
   d. Hood Occupancy Status
   e. Stopwatch/Timer
   f. Message Display

3. Hood configuration for the following properties shall be viewable and editable from the touch display:
   g. Sash Dimensions
   h. Hood ID
   i. Hood Certification Reminder
   j. Hood Occupancy Status
   k. Stopwatch/Timer
   l. Message Display

4. The enclosure shall be made from material that is resistant to chemicals that are typically used in the lab for wipe down with non-solvent cleaning agents.

5. The unit's exposed surfaces shall be chemically resistant to vaporized hydrogen peroxide (VHP), formaldehyde, chloride dioxide (clidox), percholoric acid, sodium hypochloride/hypochlorite 3-6% (bleach), and quaternary ammonium 7% in 1:128 tap water (ammonia).

6. Two mechanical membrane buttons shall be provided at the front panel of the display to enable users to quickly activate emergency exhaust mode and mute without having to remove protective gloves.

7. Flush mount or recess mount shall be installation options.

8. A USB port shall be provided to support firmware and software upgrades and shall be covered to protect against moisture or corrosion.

9. A timer feature shall be provided to enable users to set specific durations for experiments and provide visual and audible alarms when the set time is expired.

10. The fume hood display shall have an available I/O at its associated valve controller which may be used to receive a 0 – 10 volt signal from a Through-The-Wall (TTW) sensor. The TTW shall not control the valve but provide a drift alert to indicate when the TTW sensor reading is out of range relative to the sash position face velocity value.

POWER

1. The device shall be powered by 24 VAC ± 15% at 10VA, 50/60 Hz.

CONFIGURATION

1. Configuration shall be performed from the touch display and/or manufacturer's software tools.

2. The device shall be capable of being added to an existing LON communication network.

3. The device shall display fume hood performance data based on control logics embedded inside the valve controller.

COMMUNICATION

1. The fume hood display unit shall connect to LON communication and link directly to a specific valve controller associated with the hood it is mounted on.

2. The device shall display fume hood performance data based on sash movements and valve controller performance over LON.

ALARMS

1. The device shall have the ability to show alarms on the main screen using visual and audible alerts.

2. The main screen background color shall change to flashing red with text stating the type of alarm.

3. In alarm state, the visual indication shall remain active until the event that triggered the alarm is removed or fixed.

4. The audible alarm tone shall be cleared only when the event that triggered the alarm is removed or fixed.

5. The device shall have an Alarm Muting option, which silences the audible alarm for an adjustable time period when the mute button is pushed. If another alarm is generated during the mute period, the new alarm shall override the mute delay and the alarm shall sound again.

6. The device shall have the ability to customize audible alarms levels and customize mute duration.

7. Users shall have the ability to change the volume of the alarm tone to low, medium, or high.

8. The device shall have the ability to show Diversity alarm.

    i. Diversity alarm shall be generated by the valve or from the BMS system.

    ii. No audible tone for diversity alarm shall be generated at the fume hood display.

G. VARIABLE FREQUENCY DRIVES (TO BE BID SEPARATELY VIA RFP, OWNER FURNISHED CONTRACTOR INSTALLED)

(1) Manufacturers

a. Eaton, Yaskawa, ABB, or approved equal. All manufacturers shall include ship dates with bids. The RFP decision shall be based upon both price and delivery date.

(2) General

a. Furnish complete variable frequency VFDs as specified herein for the fans and pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA enclosure of type according to the installation and operating conditions at the job site. The VFD's UL listing shall allow mounting in plenum or other air handling compartments. If a NEMA 12 enclosure is required for the plenum rating, the manufacturer must supply a NEMA 12 rated VFD.

b. The VFD shall have integral disconnecting means to disconnect power to device in accordance with NEC.

c. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control and to eliminate the need for motor derating.

d. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.

e. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.

f. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Assembly of the option panels

by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel. When these VFDs are to be located in Canada, CSA or C-UL certifications shall apply. Both VFD and option panel shall be manufactured in ISO 9001 certified facilities.

g. The VFD shall have a dual 5% DC link reactor on the positive and negative rails of the DC bus to minimize power line harmonics and protect the drive from power line transients. The reactor shall be non-saturating (linear) to provide full harmonic filtering throughout the entire load range. VFDs with saturating (non-linear) DC link reactors shall require an additional3% AC line reactor to provide acceptable harmonic performance at full load, where harmonic performance is most critical.

h. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.

i. The VFD shall be able to provide full torque at any selected frequency from 29 Hz to base speed to allow driving direct drive fans without derating.

j. An automatic energy optimization selection feature shall be provided standard in the VFD. This feature shall automatically and continually monitor the motor's speed and load and adjust the applied voltage to maximize energy savings and provide up to an additional 3% to 10% energy savings.

k. Input and output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD. Switching rate may be up to 1 time per minute on the input and unlimited on the output.

l. An automatic motor adaptation test algorithm shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to run the motor or de-couple the motor from the load to run the test.

m. Galvanic and/or optical isolation shall be provided between the VFD's power circuitry and control circuitry to ensure operator safety and to protect connected electronic control equipment from damage caused by voltage spikes, current surges, and ground loop currents. VFDs not including either galvanic or optical isolation on both analog I/O and discrete I/O shall include additional isolation modules.

n. VFD shall minimize the audible motor noise through the used of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.

o. VFD supplier shall coordinate with motor supplier to ensure that all motors 20 horsepower and greater are provided with grounding bushings.

(3) Protective Features

a. A minimum of Class 20 I^2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.

b. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable.

c. Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 164 V AC for 208/230-volt units, 313 V AC for 460-volt units, and 394 volts for 600 volts units.

d. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.

e. VFD package shall include semi-conductor rated input fuses to protect power components.

f. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the VFD manufacturer must ensure that inverter rated motors are supplied.

g. VFD shall include a “signal loss detection” circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.

h. VFD shall function normally when the keypad is removed while the VFD is running and continue to follow remote commands. No warnings or alarms shall be issued as a result of removing the keypad.

i. VFD shall catch a rotating motor operating forward or reverse up to full speed.

j. VFD shall be rated for 100,000 amp interrupting capacity (AIC).

k. VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.

l. VFD shall continue to operate without faulting until input voltage reaches 300 V AC on 208/230-volt units, 539 V AC on 460-volt units, and 690 volts on 600-volt units.

(4) Interface Features

a. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference.

b. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.

c. The VFD shall provide digital manual speed control. Potentiometers are not acceptable.

d. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away using standard 9-pin cable.

e. The keypads for all sizes of VFDs shall be identical and interchangeable.

f. To set up multiple VFDs, it shall be possible to upload all setup parameters to the VFD’s keypad, place that keypad on all other VFDs in turn and download the setup parameters to each VFD. To facilitate setting up VFDs of various sizes, it shall be possible to download from the keypad only size independent parameters.

g. Display shall be programmable to display in 9 languages including English, Spanish and French.

h. The display shall have four lines, with a minimum of 20 characters on three lines and a minimum of eight large characters on one line.

i. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.

j. A quick setup menu with factory preset typical HVAC parameters shall be provided on the VFD eliminating the need for macros.

k. As a minimum, the following points shall be controlled and/or accessible:

    1) VFD Start/Stop
    2) Speed reference
    3) Fault diagnostics
    4) Meter points
        (a) Motor power in HP
        (b) Motor power in kW
        (c) Motor kW-hr
        (d) Motor current
        (e) Motor voltage
        (f) Hours run
        (g) Feedback signal #1
        (h) Feedback signal #2
        (i) DC link voltage
        (j) Thermal load on motor
        (k) Thermal load on VFD
        (l) Heatsink temperature

l. Four additional Form C 230-volt programmable relays shall be available for factory or field installation within the VFD.

m. Two set-point control interface (PID control) shall be standard in the unit. VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.

n. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.

o. Four simultaneous displays shall be available. They shall include frequency or speed, run time, output amps and output power. VFDs unable to show these four displays simultaneously shall provide panel meters.

p. Sleep mode shall be provided to automatically stop the VFD when its speed drops below set “sleep” level for a specified time. The VFD shall automatically restart when the speed command exceeds the set “wake” level.

q. The sleep mode shall be functional in both follower mode and PID mode.

r. Run permissive circuit shall be provided to accept a “system ready” signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.

s. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and Motor Speed in engineering units per application (in GPM, CFM, etc.). VFD will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.

t. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (^{0}F) for a cooling tower application.

u. VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.

v. If the temperature of the VFD's heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFD's heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.

w. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.

x. The VFD shall store in memory the last 10 faults and related operational data.

y. Eight programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

z. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.

aa. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltages (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.

bb. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.

cc. Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

dd. On motors connected to variable frequency drives, 20hp or greater in size. Provide grounding bushings to prevent arcing.

(5) Interface with Building Automation System/Direct Digital Control System

a. VFD manufacturer shall provide an interface to the BAS/DDC system. Manufacturer shall coordinate as required with the Controls Contractor. Provide Bacnet interface required for a complete and operational system.

b. Provide mode of operation to BAS/DDC system (hand, off, auto, etc.). BAS/DDC graphic shall highlight or produce pop-up graphic when VFD is in hand or off. Also, provide all points to BAS/DDC identified in section (4).K of this Specification.

(6) Adjustments

a. VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.

b. Sixteen preset speeds shall be provided.

c. Four acceleration and four deceleration ramps shall be provided. Accel and decel time shall be adjustable over the range from 0 to 3,600 seconds to base speed. The shape of these curves shall be automatically contoured to ensure no-trip acceleration and deceleration.

d. Four current limit settings shall be provided.

e. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: under voltage, overvoltage, current limit and inverter overload.

f. The number of restart attempts shall be selectable from 0 through 20 or infinitely and the time between attempts shall be adjustable from 0 through 600 seconds.

g. An automatic “on delay” may be selected from 0 to 120 seconds.

(7) Service Conditions

a. Ambient temperature, -10 to 40°C (14 to 104°F), without derating.

b. 0 to 95% relative humidity, non-condensing.

c. Elevation to 3,300 feet without derating.

d. AC line voltage variation, -10 to +10% of nominal with full output.

e. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

(8) Quality Assurance

a. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and speed and shall be cycled during the test.

b. All optional features shall be functionally tested at the factory for proper operation.

(9) Submittals

a. Submit manufacturer’s performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD’s FLA rating, certification agency file numbers and catalog information.

The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.

a. Harmonic filtering. The seller shall, with the aid of the buyer’s electrical power single line diagram, providing the data required by IEEE-519, perform an analysis to initially demonstrate the supplied equipment will met the IEEE standards after installation. If, as a result of the analysis, it is determined that additional filter equipment is required to meet the

IEEE recommendations, then the cost of such equipment shall be included in the bid. A harmonic analysis shall be submitted with the approval drawings to verify compliance with the latest version of IEEE-519 voltage and current distortion limits as shown in table 10.2 and 10.3 at the point of common coupling (PCC). The PCC shall be defined as the consumer–utility interface or primary side of the main distribution transformer.

(10)Start-Up Service

a. The manufacturer shall provide on-site start-up commissioning of the VFD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system. Provide start-up report to Engineer.

(11)Warranty

a. The VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VFD manufacturer.

(12)Examination

a. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.

b. The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

H. CONSTANT AND VARIABLE VOLUME TERMINAL UNITS

(1) Qualifications
  a. Manufacturer: The company manufacturing the products specified in this section shall have a minimum of ten years experience producing products of this type.
(2) System Responsibility
  a. The Contractor shall be responsible for any and all costs associated with any and all changes resulting from the use of a supplier other than the listed acceptable manufacturers.
(3) Warranty
  a. Provide parts and labor warranty for one year.
(4) Manufacturers
  a. General
    1) Manufacturer shall participate in the ARI Certification program. Unit performance data shall be rated in accordance with ARI Standard 880. The manufacturer shall display the ARI Symbol on all units.
    2) Single and dual duct terminal units shall be UL listed as an entire assembly.
    3) Acceptable Manufacturers
      (a) Nailor
      (b) Trane
      (c) Titus
      (d) Environmental Technologies

(e) Johnson Controls

4) Manufactured Units
   (a) Single duct terminal units.
      i. Ceiling mounted primary air control terminal units for connection to a single medium pressure duct of a central air distribution system. Terminals units will be provided with controls. Heating coils shall be separate duct mounted coils.
   (b) Single duct terminal units.
      i. Identify each terminal unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory-set air flow, minimum factory-set air flow, and coil type. Double wall construction is required.
5) Fabrication
   (a) Casings: Units shall be completely factory-assembled, manufactured of corrosion protected steel, and fabricated with a minimum of 18-gauge metal on the high pressure (inlet) side of the terminal unit damper and 22-gauge metal on the low pressure (outlet) side and unit casing.
   (b) Insulation – Completely enclosed - The interior surface of unit casing is acoustically and thermally lined with a minimum of 1” (one) inch, 1.0 lb./cu. ft. density glass fiber enclosed by interior sheet metal wall (26 gauge minimum). The insulation R-Value shall be a minimum of 3.8.
   (c) Assembly: Primary air control damper, airflow sensor, fans, controls and optional heating coil in single cabinet.
   (d) Rectangular Supply Air Outlet Connections: Rectangular outlet connections for single duct units shall be slip and drive type.
6) Primary Air Control Damper Assembly
   (a) Locate primary air control damper assembly inside unit casing. Construct the damper assembly from extruded aluminum and/or a minimum 20 gauge galvanized steel components. Maximum damper leak rate shall not exceed 1% of damper nominal CFM at 4 inch wg. differential.
   (b) Provide damper assembly with integral flow sensor. Flow sensor shall be provided regardless of control type. Flow sensor shall be a multi-point, averaging, ring or cross type. Bar or single point sensing type is not acceptable.
7) Heating Coils – Duct Mounted, refer to separate specification below.
8) Direct Digital VAV Controls
   (a) Direct Digital Controls
      i. Multi-point, multi-axis flow ring or cross sensor to be furnished and mounted by terminal unit manufacturer. Single point or flow bar sensors are not acceptable. Flow sensing device shall be capable of maintaining airflow to within +/- 5 percent of rated unit airflow setpoint when installed with 1.5 duct diameters straight duct, of the same size as the primary airflow inlet, upstream from the unit.
   (b) Variable Air Volume (VAV) Terminal Unit Calibration
      i. The VAV terminal units shall be individually controlled by a DDC VAV controller per VAV terminal unit.
9) Testing Verification
   (a) Factory set and check all controllers to within 5% of scheduled maximum and minimum settings. Base performance on tests conducted in accordance with ARI 880.
   (b) Maximum Casing Leakage: 1 percent of nominal air flow at 0.5 in wg inlet static pressure.
   (c) Maximum Damper Leakage: 1 percent of design air flow at 4 in wg inlet static pressure.
10) All VAV boxes and control valves must have, at minimum, a 24" x 24" access

space for maintenance, damper arms, reheat valves, etc. Space must be maintained to top of acoustical ceiling grid.

I. REHEAT COILS

(1) Coils shall consist of aluminum plated fins and seamless copper tubes. Fins shall have full fin collars to provide accurate fin spacing and maximum fin-to-tube contact. Tubes shall be mechanically expanded into the fin collars. Coils shall be leak tested under water to 450 psig pressure. Supply and return water connections shall be on the same side of the coil.

(2) Capacity: Provide coils in capacities as scheduled on the drawings. All coils shall be 2-row minimum.

(3) Control Valves - All reheat valves for terminal heating are to be ball type valves with upper thrust bearing, resilient seat. The valve is to be rated for 300°F max temperature and 175 psig max pressure with a carbon steel body and stainless steel ball. The valves are to be equipped with an electric modulating actuator. Actuators or output transducers shall accept proportional milliamp, millivolt or voltage. Use of floating or incremental open loop control actuators or pneumatic transducers that do not provide positive position feedback to the DDC controller shall be unacceptable.

(4) Control valves must have, at minimum, a 24" x 24" access space for maintenance. Space must be maintained to top of acoustical ceiling grid.

(5) Installation

a. Install in accordance with manufacturer's instructions.

b. Insulate exterior of hot water coils.

J. EXHAUST FAN/RETURN FAN

(1) Fans shall be Type BAF-SW Airfoil Arrangement 3; Class II fans as manufactured by Twin City Fan & Blower, Greenheck, Loren Cook or approved equivalent. Verify arrangement of fan with the Contract Drawings and coordinate with the Mechanical Contractor and their Coordination Drawings prior to Submittal of Shop Drawings.

(2) Refer to Drawings for which fans serve lab exhaust systems. Any fan that serves lab exhaust shall be provided with a coating specifically designed to operate in a lab exhaust system. Heresite Coating or approved equivalent.

(3) PERFORMANCE - Performance ratings shall conform to AMCA Standard 205 (fan efficiency grade), 211 (air performance) and 311 (sound performance). Fans shall be tested in accordance with ANSI/AMCA Standard 210 (air performance) and 300 (sound performance) in an AMCA accredited laboratory. Fans shall be licensed to bear the AMCA certified ratings seal for both sound and air, and fan efficiency grade (FEG).

(4) Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation. Fans shall have a non-overloading design with self-limiting horsepower characteristics and shall reach a peak in the normal selection area. All fans shall be capable of operating over the minimum pressure class limits as specified in AMCA Standard 99.

(5) HOUSING - BAF fan housings are to be of heavy gauge, continuously welded construction. Housings with lock seams or partially welded construction are not acceptable. Discharge flanges are to be provided for rigidity and duct connection. Housings shall be suitably braced to prevent vibration or pulsation. Housings shall have tapered spun, aerodynamically designed inlet cones or shrouds providing stable flow and high rigidity.

(6) WHEEL - BAF airfoil wheels shall be die-formed airfoil blade type, continuously welded to the rim and back plate. Smaller sizes may use extruded aluminum blades. Partial welding will not be acceptable on airfoil blades. All wheels shall be statically and dynamically balanced.

(7) SHAFT - Shafts shall be AISI 1040 or 1045 hot rolled steel, accurately turned, ground, polished, and ring gauged for accuracy. Shafts shall be sized for the first critical speed of at least 1.43 times the maximum speed.

(8) BEARINGS - Bearings shall be heavy duty, grease lubricated, anti-friction ball or roller, self-aligning, pillow block type and selected for a minimum average bearing life (AFBMA L-50) in excess of 200,000 hours at the maximum fan RPM.

(9) DRIVE - Motor sheaves shall be cast iron, variable pitch on applications 20 HP and smaller, and fixed pitch on 25 HP and larger. Drives and belts shall be located external to the fan casing and rated for 150% of the required motor HP.

(10) FINISH AND COATING - The entire fan assembly, excluding the shaft, shall be thoroughly degreased and deburred before application of a rust-preventative primer. After the fan is completely assembled, a finish coat of paint shall be applied to the entire assembly. The fan shaft shall be coated with a petroleum-based rust protectant. Aluminum components shall be unpainted.

(11) ACCESSORIES - Provide belt guards, access door, companion flanges, Unitary bases with one inch deflection spring isolators and piezometer flow measurement rings factory mounted.

(12) SHAFT GROUNDING RINGS

a. Provide shaft grounding rings mounted on the motors at the factory.

(13) FACTORY RUN TEST - All fans prior to shipment shall be completely assembled and test run as a unit specified operating speed or maximum RPM allowed for the particular construction type. Each wheel shall be statically and dynamically balanced in accordance with ANSI/AMCA 204-96 "Balance Quality and Vibration Levels for Fans" to Fan Application Category BV-3, Balance Quality Grade G6.3. Balance readings shall be taken by electronic type equipment in the axial, vertical, and horizontal directions on each of the bearings. Records shall be maintained and a written copy shall be available upon request.

(14) GUARANTEE - The manufacturer shall guarantee the workmanship and materials for its BAF fans for at least one (1) year from Substantial Completion.

(15) COMMISSIONING: This section specifies a system or a component of a system being commissioned as defined in Section 01 91 00 Commissioning. Testing of these systems is required, in cooperation with the Owner and the Commissioning Authority. Refer to Section 01 91 00 Commissioning for detailed commissioning requirements.

(16) QUALITY CONTROL/STARTUP: Major equipment and system startup and operational tests shall be scheduled and documented in accordance with Section 01 91 00 Commissioning.

(17) FUNCTIONAL PERFORMANCE TESTS: System functional performance testing is part of the Commissioning Process as specified in Section 01 91 00. Functional performance testing shall be performed by the contractor and witnessed and documented by the Commissioning Authority.

(18) TRAINING: Training of the owner's operation and maintenance personnel is required in cooperation with the Commissioning Authority. The instruction shall be scheduled in coordination with the Commissioning Authority after submission and approval of formal training plans. Refer to Demonstration and Training, Section 01 79 00, for contractor training requirements. Refer to Section 01 91 00 and the Commissioning Plan for further contractor training requirements.

K. FAN COIL UNIT

(1) Provide single zone unit consisting of draw-thru fan section, hot/chilled water coil section, filter-mixing box, adjustable fan motor mounting, drain pan, filter frames, return plenums with perforated liners as specified and detailed.

(2) Provide reinforced points of support for either setting or hanging units.

(3) Provide stainless steel drain pan located under entire coil section extensive enough to catch condensate leaving coil and moisture carry over at the unit operating velocities. Provide drain connection on side of unit. The pan shall be pitched in two planes to ensure complete drainage.

(4) Cover casing and frame with protective finish on all sides.

(5) Water Coils

a. Provide heating/cooling and reheat coils of scheduled capacity, mounted in unit in manner permitting removal.

b. Construct coils with copper tubing primary surface and aluminum secondary surface mechanically bonded to tubes by method approved by specified manufacturer.

(6) Fan Section

Provide fans specifically designed and suitable for class or service indicated. Provide adjustable motor base, adjusted with mounting bolts or provide variation in center distance. Provide locking nuts or similar devices to secure base in proper position. Provide belt driven fans with adjustable pitch pulley permitting fan speed to be varied. Select pulley for mid-point of adjustable range. Design fan shafts so as not to pass through first critical speed when unit comes up to rated RPM. Provide grease lubricated fan bearings with remote externally accessible fittings for lubrication. Statically and dynamically balanced fan assemblies in fan housing after final assembly. Provide flexible connection between fan housing and unit casing.

(7) Fan motors shall be provided with code approved motor starters. Motor starter shall contain an adjustable time delay relay, adjustable 0-60 seconds.

(8) Insulation

Insulate unit casing from air entrance to fan section, to air outlet from unit. Insulate framing angles exposed to air stream. Securely attach 2" thick, 3# density insulation minimum or of sufficient thickness and density to prevent condensation from forming on unit casing. Protect insulation against deterioration from air currents. Provide insulation with fire-retarding characteristics, complying with ANSI/NFPA 90A. Insulate drain pans as required to prevent condensate formation on unit exterior at ambient conditions to be encountered.

(9) Vibration Isolators

Provide high efficiency housed spring type vibration isolators to isolate the fan and motor section from the unit casing.

(10) Selection

Refer to the schedule on the plans.

L. HYDRONIC SPECIALTIES

(1) Manufacturers

Subject to compliance with the specified and scheduled requirements the following manufacturers will be considered, but not limited to:

Hoffman
Amtrol/Thrush
Armstrong/Aurora
Bell & Gossett
Patterson
Taco
Wheatley

(2) Manual Air Vents

Provide, where shown on the plans, at each rise in piping and where required a manual air vent.

(3) Automatic Air Vents

Provide, where shown on the plans, automatic air vents.

(4) Expansion Loops

Expansion loops shall be Metaflex Metra loops or Engineer approved equivalent. Install with pipe guides and anchors as recommended by the manufacturer in all piping runs 75 feet long or greater and also where indicated on the plans.

Alternatively, in water piping systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and as required for the elimination of expansion loops. (In accordance with Victaulic recommendations and as approved by the Engineer). Where expansion loops are required in Victaulic piping systems, use Victaulic flexible couplings on the loop(s).

2. FACTORY START-UP REPORTS

A. Provide factory start-up on site by a factory representative (not a third-party contractor) for all HVAC equipment, including pumps, VFD's, AIR HANDLING UNITS, RETURN AND EXHAUST FANS, etc. Submit factory start-up reports to the Engineer. The Mechanical Contractor and the Controls Contractor shall have a representative on site to correct all deficiencies noted by the factory representative. For each deficiency noted, documentation of corrective action taken shall be submitted to Engineer.

B. At a minimum, the report submitted to the Engineer shall include the following data:

(1) Blower Coil and Fan Coil Units

a. Fan bearings lubrication
b. Fan not vibrating
c. Fan motor volts / amps
d. Fan belt tension, if applicable
e. Sheave alignment, if applicable
f. Coils clean
g. Filters clean
h. Fan rotation direction

3. HYDRONIC SYSTEM FLUSHING

A. GENERAL

3. HEATING/COOLING SYSTEM CLEANING

A. GENERAL
(1) Prior to connecting the new piping to the existing, a sample of the existing system shall be taken and tested by a chemical treatment contractor to determine if the system requires treatment at this time.
(2) Prior to any system flushing, the system shall be pressure tested at 1.5 times the system pressure.
(3) The contractor shall take samples of the existing hydronic loops prior to connecting in the new piping.
(4) The heating/cooling system for this contract is a VAV system with hot water reheat system with chilled water and steam piping to AHU's.

B. CLEANING AND FLUSHING HYDRONIC PIPING SYSTEMS
(1) During construction, extreme care shall be exercised to prevent all dirt and other foreign matter from entering the pipe or other parts of the system. Pipe stored on the project shall have the open ends capped and equipment shall have all openings fully protected. Before erection, each piece of pipe, fitting or valve shall be visually examined and all dirt removed.
(2) After the system is complete it shall be thoroughly cleaned before placing in operation to rid the system of dirt, biological contamination, piping compound, loose mill scale, oil and any and all other material foreign to the water.
(3) For all water, steam, and condensate systems provide flushing and drain connections for complete flushing and drainage of the entire system.
(4) Remove strainers, open all valves and continuously flush the system with clean domestic water until all foreign matter is removed. The Engineer shall be notified when this has occurred so the clean water can be witnessed prior to filling the system.
(5) Fill and vent the system, adding one pound trisodium phosphate for each fifty gallons of water. Circulate this solution for four hours, then drain and flush the system with clean domestic water.
(6) Replace the strainers and fill the system with clean water, circulate for one hour and test for alkalinity. If the system pH is below 7, add trisodium phosphate until the pH reads 7-8.
(7) Fill the system using water or steam from the permanent system once approved by the University and Engineer.

END OF SECTION 230200

SECTION 250200 – INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions, General Mechanical Provisions and General Requirements, Division 1 Specification Sections apply to the work specified in this section.

DESCRIPTION OF WORK:

Furnish a BACnet system compatible with existing University systems. All building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2001, BACnet. This system shall communicate with the University of Kentucky Facility Management's existing BACnet head-end software using BACnet/IP at the tier 1 level and BACnet/MSTP at the tier 2 level. No gateways shall be used for communication to controllers installed under section. BACnet/MSTP or BACnet/IP shall be used for all other tiers of communication. No servers shall be used for communication to controllers installed under this section. If servers are required, all hardware and operating systems must be approved by the Facilities Management Controls Engineering Manager and/or the Facilities Management Information Technology Manager.

All Building Automation Devices should be located behind the University firewall, but outside of the Medical Center Firewall and on the environmental VLAN.

Provide all necessary hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers. These must be in compliance with Front End systems PICS and BIBBS and attached Tridium PICS and BIBBS. Provide all hardware and software to backup, restore, troubleshoot and install system. Software, backups, unitary, and ASC files shall be delivered to UEM (Utilities & Energy Management) for archiving purposes.

It is the contractor's responsibility to insure that the University of Kentucky Facilities Management's head-end system's licensed device/point count is increased to accommodate the number of devices and/or points that are added to fulfill the contractor's obligation to meet the requirements of the project.

Prepare individual hardware layouts, interconnection drawings and software configuration from project design data.

Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.

Provide a comprehensive operator, administrator and technician training program as described herein.

Provide as-built documentation, programming software for use site wide, electronic copies of all diagrams, and all other associated project operational documentation (such as technical manuals on approved media, the sum total of which accurately represents the final system.

Furnish, install, and fit-up in complete working order, with all accessories required, the automatic temperature control and monitoring systems shown on the Drawings and specified herein. The systems shall be properly connected, piped and wired in a manner conforming to the laws, ordinances and codes now in force in the Commonwealth of Kentucky.

The controls and all listed I/O points from this project shall communicate with the University of Kentucky Facilities Management's existing BACnet software head-end station using BACnet/IP. All BACnet points shall be exposed to the University of Kentucky Facilities Management's head-end station. Graphics will be installed by UEM on the head-end system. All point and device names shall comply with the University Facilities Management standards and shall be approved before and included in the shop drawings submittal. Cooperate with the Owner (UEM) to ensure that all specified points and alarms communicate and operate on the head-end system. All point and device names shall comply with the University Facilities Management standards (format listed below, consult Utilities and Energy Management (UEM) for the correct abbreviations) and shall be included in the shop drawings submittal for review and approval. Point naming conventions and formats are listed further in this specification in the Direct Digital Controls Equipment section. Refer to University Standard 230553S02 for the AHU Naming Convention.

Related to the alarms, the contractor is to set up the alarm parameters specified by the system sequences of operations without enabling the alarms. Contractor is to provide a list of points containing alarm extensions to Owner (UEM). UEM will be responsible for doing the alarm names, alarm texts and enabling the alarm points provided on the list.

All work must be coordinated and scheduled with the UEM Controls group prior to any work being done on site.

Thermostats: Each terminal unit requires a thermostat for operation, unless specifically indicated on the Drawings to be slaved to another unit. Slaved terminal units shall be controlled to match the CFM and discharge air temperature of the master unit. Thermostat locations have been identified on the Drawings to the extent possible, but all such locations may not be shown. Provide the required thermostats whether or not shown on the Drawings. For those thermostats not shown on the Drawings, work out an acceptable location with the Architect/Engineer. Thermostats are to be provided with no doors.

Provide DDC controls for the air terminal units. Provide electronic operators controlled and monitored by direct digital control systems which shall include, but not be limited to, air handling systems, pumps, terminal units, etc.

The control equipment shall be complete and shall include, but not be limited to, all necessary valves, damper operators, pipe, fittings, etc.

Electronic Control System installer must physically demonstrate to Owner and Owner's representatives (UEM) via software simulations that the proposed building automation system and control sequences will function as outlined in the contract documents prior to field implementation.

VFD's will be purchased direct by the Owner and provided with the AHU's and Lab Exhaust fan and Return fan. This Contractor shall be responsible for the installation of the VFD's and all associated wiring and, start-up, programming.

The control and monitoring system for this project shall be made up using standard materials, equipment and components regularly manufactured for systems of this type. The system shall be complete in every respect and shall be a functioning system.

Electrical power wiring and interlock wiring for all controls, signal devices, equipment, alarms, etc., shall be in accordance with diagrams and instructions from the supplier of the systems. All power and control wiring, conduit and wiring connections required for the complete installation, including wiring to smoke dampers and combination fire/smoke dampers and their motors, shall be provided by this Contractor in accordance with Electrical specification requirements. Controls shall be on emergency power.

Refer to other Mechanical Division sections for installation of instrument wells, valve bodies, and dampers in mechanical systems; not work of this section.

QUALITY ASSURANCE:

Manufacturer: Subject to compliance with requirements, manufacturers offering controls that may be incorporated into the work at Tier 1 BACnet/IP include the following:

Vykon JACE 8000
JCI Niagara Powered Facility Explorer JACE 8000
Honeywell Cypher WEBs Series
Phoenix Niagara Powered PCI JACE 8000 for Lab Airflow Control Valves

Subject to compliance with requirements, manufacturers offering controls that may be incorporated into the work at Tier 2 BACnet/MSTP include the following:

Honeywell WEBs Series
JCI Facility Explorer PC Series or Extended Architecture
Distech ECB

Acceptable controls manufacturers shall include any controls manufacturers which utilize a BACnet protocol in accordance with the specification. If the bidding manufacturer is not listed above, documentation for approval as an equal must be submitted 10 days prior to the bid opening date to allow for evaluation by the university.

Installing Contractor: Installing controls contractors must comply with the following requirements:

The installing systems integration contractor has been in the business of installing BACnet controls for the last 5 years minimum. In addition, the installing systems integration contractor needs to demonstrate with documentation that they have provided the controls in a minimum of (3) hospital or university renovation projects of similar size and scope where they utilized a BACnet system.

The systems integration contractor must have on staff the following number of key personnel as a minimum, each with a minimum of 5 years of related BACnet controls installation experience: Project Manager - 2, Controls Applications Engineer - 2, Programmer - 2, Installation Supervisor - 2, Controls Technician - 5.

Prefer contractor staff to include Niagara Tridium AX/N4 certified technicians.

Contractor to have experience with successful integrations of controls with Niagara Tridium systems.

Contractor to have a minimum of 3 years of installation history with the brand of controls being bid.

Contractor must have a help desk operation or staff available for phone contact 24/7 for providing technical support to university staff. Call forward and emergency service numbers are not acceptable during normal business hours.

Codes and Standards:

Electrical Standards: Provide electrical components of pneumatic control systems which have been UL-listed and labeled, and comply with NEMA standards.

NFPA Compliance: Comply with NFPA 90A "Standard for the installation of Air Conditioning and Ventilating Systems" where applicable for controls and control sequences.

Kentucky Building Code: Comply with requirements where applicable for controls.

Provide products of the temperature control system with the following agency approvals:

UL-916; Energy Management Systems
UL-873; Temperature Indication and Regulating Equipment
UL-864; Subcategories UUKL, OUXX, UDTZ; Fire Signaling and Smoke Control Systems
CSA; Canadian Standards Association
FCC, Part 15, Subpart J., Class A Computing Devices

All products shall be labeled with the appropriate approval markings. System installation shall comply with NFPA, NEMA, NEC, Local and National Codes.

SUBMITTALS:

Product Data: Submit manufacturer's technical product data for each control device furnished, indicating dimensions, capacities, performance and electrical characteristics, and material finishes, also include installation and start-up instructions.

A. Shop Drawings, Product Data, and Samples

1. Each submittal shall have a cover sheet with the following information provided: submittal ID number; date; project name, address, and title; BAS Contractor name, address and phone number; BAS Contractor project manager, quality control manager, and project engineer names and phone numbers.
2. Each submittal shall include the following information.
    a. BAS riser diagram showing all DDC controllers, network repeaters, and network wiring.
    b. One-line schematics and system flow diagrams showing the location of all control devices.
    c. Points list for each DDC controller, including: Tag, Point Type, System Name, Object Name, Expanded ID, Display Units, Controller Type, Address, Cable Destination, Module Type, Terminal ID, Panel, Slot Number, Reference Drawing, and Cable Number. The initial shop drawing submittal for review needs to include all point names meeting the naming convention outlined in this specification for UEM approval at the shop drawing phase prior to the contractor beginning any programming.
    d. Vendor’s own written description for each sequence of operations, to include the following:
        - Sequences shall reference input/output and software parameters by name and description.

- The sequences of operations provided in the submittal by the BAS Contractor shall represent the detailed analysis needed to create actual programming code from the design documents.
- Points shall be referenced by name, including all software points such as programmable setpoints, range limits, time delays, and so forth.
- The sequence of operations shall cover normal operation and operation under the various alarm conditions applicable to that system.

e. Detailed Bill of Material list for each panel, identifying: quantity, part number, description, and associated options.

f. Control Damper Schedules. This spreadsheet type schedule shall include a separate line for each damper and a column for each of the damper attributes, including: Code Number, Fail Position, Damper Type, Damper Operator, Blade Type, Bearing Type, Seals, Duct Size, Damper Size, Mounting, and Actuator Type.

g. Control Valve Schedules. This spreadsheet type schedule shall include a separate line for each valve and a column for each of the valve attributes, including: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Calc CV, Design Pressure, Actual Pressure, and Actuator Type.

h. Cataloged cut sheets of all equipment used. This includes, but is not limited to, the following: DDC panels, peripherals, sensors, actuators, dampers, and so forth.

i. Range and scale information for all transmitters and sensors. This sheet shall clearly indicate one device and any applicable options. Where more than one device to be used is on a single sheet, submit two sheets, individually marked.

j. Hardware data sheets for all local access panels.

k. Software manuals for all applications programs to be provided as a part of the programming devices, and so forth for evaluation for compliance with the performance requirements of this Specification.

l. The controls contractor shall include their BACnet PICS and BIBB statements (as described in ASHRAE 135-2001) for each device.

3. BAS Contractor shall not order material or begin fabrication or field installation until receiving authorization to proceed in the form of an approved submittal. BAS Contractor shall be solely responsible for the removal and replacement of any item not approved by submittal at no cost to the Owner.

4. Submittal shall have approved point names.

Maintenance Data: Submit maintenance instructions and spare parts lists for each type of control device. Include that type data, product and shop drawings in maintenance manual.

Operation and Maintenance Instructions:

This contractor shall prepare an electronic Operations Manual entitled "Automatic Temperature Control and Monitoring Systems Operation and Maintenance Data." Manual shall be PDF files with separate PDFs for each of the items noted below.

Each manual shall contain the following information:

Name and address of Consulting Engineer, Contractor, and index of equipment, including vendor (name and address).

Complete brochures, descriptive data and parts list, etc., on each piece of equipment, including all approved shop drawings.

Complete maintenance and operating instructions, prepared by the manufacturer, on each major piece of equipment, including preventative maintenance instructions.

Complete shop drawing submittal on temperature and monitoring controls including control diagrams updated to reflect "as-built" conditions.

All wiring and component schematics necessary for Owner (UEM) to troubleshoot, repair and expand the system.

All manuals shall be submitted to the Engineer prior to final inspection of the building.

Provide a laminated copy mounted in a sleeve on the outside of the panels for the controls sequences pertinent to equipment supplied by that specific controls panel.

Controls Program Backup: At the end of the project, the contractor is to supply digital back-up copies of all final complete operating controls programs. These shall be delivered to UEM for archiving purposes.

DELIVERY, STORAGE AND HANDLING:

Provide factory shipping cartons for each piece of equipment and control device. Maintain cartons while shipping, storage and handling as required to prevent equipment damage and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

PART 2 - PRODUCTS

DIRECT DIGITAL CONTROL SYSTEM

General: This specification defines the minimum hardware and performance requirements for a computer-based building automation system to be furnished and installed.

SCOPE OF WORK:

System Requirements:

Contractor shall provide all equipment, engineering and technical specialist time to check the installation required for a complete and functioning system. The contractor shall furnish and install all interconnecting system components. Components to include, but not be limited to: power line conditioners, field panels, sensors, motor starter interfaces, and any other hardware items not mentioned above but required to provide the Owner with a complete workable system.

Any feature or item necessary for complete operation, trouble-shooting, and maintenance of the system in accordance with the requirements of this specification shall be incorporated, even though that feature or item may not be specifically described herein. This shall include hardware and software.

All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project. All systems and components shall be thoroughly tested and proven in actual use.

Input/Output Summary:

The system as specified shall monitor, control and calculate all of the points and functions as listed in the Input/Output Summary.

System Start-Up and Acceptance:

Upon completion of the installation, the BAS Contractor shall start-up the system and perform all necessary testing and debugging operations. An acceptance test in the presence of the Owner's representative shall be performed. The vendor shall check all sensors that exhibit any problems or faulty reading. When the system performance is deemed satisfactory in whole by UEM, the system parts will be accepted for beneficial use and placed under warranty. The BAS Contractor is to be available for system commissioning at the end of the installation when requested by the Engineer and/or Owner. The contractor is to also be available for seasonal commissioning for the other seasons beyond the initial commissioning.

This Contractor shall work with the Owner (UEM), who is developing the graphics, to ensure that all points report, function and alarm as required on the BACnet head-end system. The Contractor will also work with the Project Manager or CNS/MCIS to obtain all necessary IP’s and Ethernet drops needed for BACnet panel. The Owner (UEM) will assign all BACnet/IP instance numbers and all BACnet/MSTP network numbers for use by the Contractor. All BACnet/IP devices will report directly to the head-end system.

UEM will be performing their own complete point by point evaluation as part of this project, independently of the commissioning activity. This will occur during the warranty period of the project.

Facilities Management's Instruction:

The BAS Contractor shall provide two copies of an electronic version of the operator's manual describing all operating and routine procedures to be used with the system. This user's manual should contain subjects such as: standard operation, error message explanations, software usage, commands, system troubleshooting, etc. The Contractor shall also provide wiring schematics for all system components.

The BAS Contractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period. The duration of the instruction period shall be no less than eight (8) hours during two 4 hour sessions. These instructions are to be conducted during normal working hours at the Owner's convenience and are to be prearranged with the Owner. The owner can request this training any time within the one year warranty period and may request any number of classes adding up to the total number of hours. The contractor shall provide an hourly unit price for additional on-site training.

The instructions shall consist of both hands-on at the job site and classroom training at a classroom location on the University of Kentucky campus coordinated with the Project Manager and UEM.

Upon completion, the attendees shall be able to operate the system and implement system changes including start-up, boot load, add point to the data base, enter messages, and down line load field units.

Prior to the scheduling of the sessions, an agenda outlining the training topics must be submitted for approval. Agenda items shall include, but not be limited to, the following topics:

1) Explanation of control sequences. Include which sensors are used and how output device operates.
2) Explanation of control drawings and manuals, including symbols, abbreviations, and overall organization.
3) Walk-through of project to identify controller locations and general routing of network cabling.
4) Review of operation and maintenance of hardware devices including air compressor, air dryers, controllers, instruments, and sensors. Include schedule for routine maintenance.
5) Programming Application Specific Controllers
   (a) Backing up and Restoring Application Specific Programming
   (b) Adding/Deleting/Editing points on Application Specific controllers
   (c) Troubleshooting Application Specific controllers (inputs/outputs/logic/master – slave relationships/bus issues)
6) Programming Building Specific Controllers
   (a) Backing up and Restoring Building Specific Controllers Programming
   (b) Adding/Deleting/Editing points on Building Specific Controllers controllers
   (c) Troubleshooting Building Specific Controllers controllers (inputs/outputs/logic/network issues)
7) How to use tools and cables

Warranty:

The system including all hardware and software components shall be warranted for a period of one year when the system performance is deemed satisfactory in whole by UEM. The system parts will be accepted for beneficial use and placed under warranty at that time. A Certificate of Occupancy does not initiate the control system warranty. Any defects in materials and workmanship arising during this warranty period shall be corrected without cost to the Owner.

All applicable software as detailed in this specification shall be updated by the BAS Contractor free of charge during the warranty period. This will ensure that all system software will be the most up-to-date software available from the BAS Contractor.

DIRECT DIGITAL CONTROL (DDC) EQUIPMENT

System Software

All software required for monitoring, modifying, configuring and backup for the system shall be embedded in the controller and accessible via VT terminal, hyper-terminal or the web. This software shall allow any computer with access (and security) to the University's network to perform the work described above using a web browser or provided software. No software upgrades should be required unless provided at no additional cost to the customer. The software version used for installation of any new devices must either be at the current software version used on the University Facilities Management campus at the current JAVA version or the new software at the most current JAVA version must be installed on all devices and the current system prior to the installation of the new devices. All software is to also operate on the latest version of Microsoft Windows operating system. All configuration and programming tools required for the upgraded version must be provided at the time of installation.

Provide a USB, standard RS-232 9 pin female, Bluetooth, RJ11, RJ12 or RJ45 connection for on-site access.

BACnet Conformance

Building Controller shall as a minimum support MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

1. Clock Functional Group
2. Files Functional Group
3. Reinitialize Functional Group
4. Device Communications Functional Group
5. Event Initiation Functional Group

Please refer to end of this section for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data.

Standard BACnet object types supported shall include as a minimum: Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program and Schedule object types. Alarms should also be setup on this system with limits. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data.

The Building Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork. It must support interoperability on the campus area network and function as a BACnet Broadcast Management Device (BBMD) and/or a BACnet router.

Building Controller (B-BC)

General

Building Controller (B-BC) shall be minimum 16 bit microcomputer based, utilizing a multi-tasking, multi-user operating system.

The B-BC controllers shall permit the simultaneous operation of all control, communication facilities management and operator interface software, as programmed by the Contractor or User. Modification of the on-board B-BC controller database shall be performed on-line using the built-in software. Systems which require the B-BC to be removed from service while DDC control sequences are modified shall not be acceptable.

B-BC controllers shall utilize true floating point arithmetic capabilities.

All B-BC controllers shall have open licensing to connect to existing UK UEM Tridium BACnet BAS.

Databases and Memory Back-Up

All programming defining the functions to be performed by the B-BC, including but not limited to application programs and point database within each B-BC, shall be protected from loss due to power failure for a minimum of 72 hours. All database and backup shall be provided to the UK UEM Controls group.

Service Ports

B-BC controllers shall be equipped with a minimum of one operator service port for the connection of a laptop computer. The service port shall be either a built-in standard RS-232 data terminal port, USB port, CAT5 cable or RJ11/12 connection.

Connection of a service device, to a service port, shall not cause the B-BC controller to lose communications with its peers or other networked device controllers.

Display and Readout Capability

The B-BC controller shall additionally provide diagnostic LED indication of device transmit and receive data communications for all communication port and peripheral ports, normal operation, abnormal operation and control relay operation indication.

Manual/Auto Control and Notification

The B-BC controller shall provide commanded override capability from the built-in operator interface. Such overrides shall be annunciated to the head-end station. Such overrides shall be valid as long as power is applied to the controller.

Adjustments

Every control panel shall provide adjustments for the functions specified. In general, adjustments shall be provided for all setpoints used by controllers within each control panel. In addition, adjustments shall be provided for throttling ranges, mixed air damper minimum positions, or other items as specified. Adjustments shall be integral to each individual B-BC. The built-in operator interfaces shall allow the easy execution of the adjustment through named identifiers within the B-BC. From a single B-BC user interface, any other B-BC shall be accessible and full adjustment capabilities shall be provided.

B-BC Naming Convention

B-BC devices shall be named using the following naming convention:

> *B-BC devices shall be named using the following format:*
> *BuildingName_BuildingNumber_Floor_RoomNumber_B-BC Device Type* OR
> *BuidlingNumber_BuildingName_Floor_RoomNumber_B-BC Device Type*
>
> *All B-AAC points shall be named using the following format:*
> *Building_Floor_RoomNumber_Device Type_Equipment ShortName_Function*

Examples:

A B-BC device located in the Pavilion HA mechanical room HA4001 would be named as follows:

PAVHA_0293_04_HA4001_JACE

An exhaust fan status point for a fan in Pavilion HA mechanical room HA3001 fed directly from the above panel would be named as follows:

PAVHA_03_HA3001_HVA_EF1_STAT

For function short names and building short names and numbers, contact the University Controls Engineering Department.

Advanced Application Controller (B-AAC)

General

Controls shall be microprocessor based, Advanced Application Controllers (B-AAC's). B-AAC's shall be provided for Air Handling Units, packaged Rooftops, primary and secondary pumping loop systems and other applications as shown on the drawings. B-AAC's shall be based on a minimum 16 bit microprocessor working from software program memory which is physically located in the B-AAC. The application control program shall be resident within the same enclosure as the input/output circuitry which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10 bit A to D converter. All input points shall be universal in nature allowing their individual function definition to be assigned through the application software. All unused input points must be available as universally definable at the discretion of the owner. If the input points are not fully universal in nature, unused points must be equal in quantity between Analog Inputs and Digital Inputs.

All B-AAC controllers shall have open licensing to connect to existing UK UEM Tridium BACnet BAS.

Contractor shall provide a minimum of one B-AAC controller per air handling or mechanical system as shown on the drawings.

The BAS contractor shall provide and field install all B-AAC's specified under this section. Mechanical equipment manufacturers desiring to provide B-AAC' type controls as factory mounted equipment, shall provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the BAS/Temperature control contractor.

All input/output signals shall be directly hardwired to the B-AAC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). As a result of this intent, it is specified that power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.

B-AAC's shall be in continuous direct communication with the network which forms the facility wide Building Automation System. The B-AAC's shall communicate with the B-BC at a minimum baud rate of 9,600 baud.

Non-Volatile Memory

All control sequences programmed into the B-BC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the GDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The B-BC shall allow for the creation of unique application control sequences. Systems that only allow selection of sequences from a library or table are not acceptable.

All control sequences shall be fully programmable at the B-AAC, allowing for the creation and editing of an application control sequence, while at the unit.

The B-AAC shall be provided with an interface port (standard RS232 data terminal port or USB port) for a laptop computer. The interface port shall allow the laptop to have full functionality as described above. From the interface port or *network terminal, the laptop shall be able to directly access any B-AAC or B-ASC in the* network.

The B-AAC shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples, per Input/Output point. Each sample shall be taken on a user defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken. The samples shall be protected against loss due to power interruptions through a battery or capacitor backup method for a minimum of 30 days.

Systems unable to provide the above capability shall provide for the individual Input/Output point trending at the B-BC. Specifics as to how each B-AAC point will be trended, at the B-BC, shall be provided in the submittal documents. Included in the explanation shall be the sample intervals, the memory allocation in the B-BC and the number of B-AAC's per B-BC that can be expected.

The B-AAC shall provide LED indication of transmit/receive communications performance, as well as for the proper/improper operation of the controller itself.

The B-AAC shall be provided with a battery backed time clock that is capable of maintaining the time of day and calendar for up to thirty days, upon loss of power to the B-AAC, without loss of setting. The battery for the time clock shall be replaceable by the customer. The B-AAC shall be provided with integral time schedules; as a minimum, two seven day schedules with eight on/off periods per day shall be provided. Holiday override of weekly schedules shall be provided for pre-scheduling of holidays, for the year in advance.

Controller Location

To simplify controls and mechanical service troubleshooting, the B-AAC shall be capable of being mounted directly in or on the controls compartment of the air handling system. The B-AAC shall be housed in a NEMA 1 enclosure to accommodate direct mounting on the equipment to be controlled. The B-AAC shall be constructed in a modular orientation such that service of the failed components can be done quickly and easily. The modular construction should limit the quantities of printed circuit boards to a maximum of two. All logic, control system, power supply and input/output circuitry shall be contained on a single plug-in circuit board. When required to replace a printed circuit board, it shall not be necessary to disconnect any field wiring. This shall allow all controls maintenance and troubleshooting to be made while at the air handling unit. The B-AAC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.

Every controller and control panel shall be labeled with a lamacoid plate permanently secured to the device. Sticky tape or glued labels are not acceptable. The labeling shall describe the device and include related information such as MAC address, IP address, BACnet Instance numbers, etc.

All power feeds shall be clearly identified and shall include panel number, breaker and electrical panel location if not in the same room.

For compatibility to the environment of the air handling unit, B-AAC's shall have wide ambient ratings. B-AAC's shall be rated for service from -40 DegF (Degrees Fahrenheit) to 140 DegF.

Contractor shall submit description of location of B-AAC's on all mechanical and air handling equipment.

B-AAC Naming Convention

B-AAC devices shall be named using the following naming convention:

B-AAC devices shall be named using the following format:

Building_Floor_RoomNumber_B-AAC Device Type_Equipment Short Name

All B-AAC points shall be named using the following format:
Function

Examples:

An Air Handler controller in the Pavilion HA mechanical room HA4001 for AHU7 would be named as follows:

PAVHA_04_HA4001_HVA_AHU7

The mixed air temperature point for the above system would be named as follows:

MAT

Therefore, when this point is learned, the entire point name will be:

PAVHA_04_HA4001_HVA_AHU7_MAT

For function short names and building short names and numbers, contact the University Controls Engineering Department.

Application Specific Controller (B-ASC)

General

Controls shall be microprocessor based Application Specific Controller (B-ASC). B-ASC's shall be provided for Unit Ventilators, Fan Coils, Heat Pumps and other applications as shown on the drawings. B-ASC's shall be based on a minimum 16 bit microprocessor working from software program memory which is physically located in the B-ASC. The application control program shall be resident within the same enclosure as the input/output circuitry which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10 bit A to D converter.

Contractor shall provide a minimum of one B-ASC controller per unitary system as shown on the drawings.

The BAS contractor shall provide and install all B-ASC's specified under this section.

All input/output signals shall be directly hardwired to the B-ASC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). As a result of this intent, it is specified that power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.

B-ASC's shall be in continuous, direct communication with the network which forms the facility wide building automation system. The B-ASC's shall communicate with the B-BC at a baud rate of no less than 38,400 baud.

Non-Volatile Memory

All control sequences programmed into the B-ASC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the B-ASC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The B-ASC shall allow for the creation of unique application control sequences.

The B-ASC shall be provided with the ability to interface with a laptop computer. The interface port shall be provided at the wall sensor or within the unitary equipment. Connection to the wall sensor must be a standard RJ-45 or USB port.

The B-ASC shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples per Input/Output point. Each sample shall be taken on a user defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken.

Systems unable to provide the above capability shall provide for the individual input/output point trending at the B-BC. Specifics as to how each B-ASC point will be trended, at the B-BC, shall be provided in the submittal documents. Included in the explanation shall be the sample intervals, the memory allocation in the B-BC and the number of B-ASC's per B-BC that can be expected.

Controller Location

To simplify controls and mechanical service troubleshooting, the B-ASC shall be mounted directly in the controls compartment of the unitary system. The B-ASC shall be provided with a sheet metal or polymeric enclosure that is constructed of material allowing for the direct mounting within the primary air stream, as defined by UL-465. The direct mounting shall allow all controls maintenance and troubleshooting to be made while at the unitary equipment. The B-ASC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.

For compatibility to the environment of the unitary equipment, B-ASC shall have wide ambient ratings. B-ASC's shall be rated for service from 32 DegF (Degrees Fahrenheit) to 140 DegF.

Contractor shall submit description of location of B-ASC's on all mechanical and unitary equipment.

B-ASC Naming Convention

B-ASC devices shall be named using the following naming convention:

B-ASC devices shall be named using the following format:
Building_Floor_RoomNumber_B-ASC Device Type

All B-ASC points shall be named using the following format:
Function

Examples:

A VAV controller in the Pavilion HA room HA498 would be named as follows:

PAVHA_04_HA498_VAV

The discharge air temperature point for the above room would be named as follows:

DAT

Therefore, when this point is learned, the entire point name will be:

PAVHA_04_HA498_VAV_DAT

For function short names and building short names and numbers, contact the University Controls Engineering Department.

CONTROL PANELS

Panelboard shall contain all instruments and accessories. Provide each item of equipment with an engraved nameplate. Panelboard shall be wall-mounted or stand-mounted and shall be completely enclosed.

As far as is practical, the control components for each system shall be grouped. Provide each group of components with identification.

The entire panelboard shall be pre-wired and brought to a main terminal strip. All relays, switches, etc., shall be installed, furnished and wired on panelboard. Clearly mark each terminal strip as to which wire from which component is to be connected.

Fabricate panels of 0.06-inch- (1.5-mm-) thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer's standard shop-painted finish and color.

Panel-Mounted Equipment: Temperature and humidity controllers, relays, and automatic switches; except safety devices. Mount devices with adjustments accessible through front of panel.

Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.

Graphics: Color-coded graphic, laminated-plastic displays on doors, schematically showing system being controlled, with protective, clear plastic sheet bonded to entire door.

SENSORS

Electronic Sensors used in air ducts or liquid lines shall utilize non-adjustable RTD or thermostat sensing elements with + or -0.36°F, accuracy and stability of at least + or -0.05°F per year. All sensors used in liquid line shall be provided with separable stainless steel immersion wells. Averaging sensors shall be a minimum of five (5) feet in length, and shall be installed in such a manner so as to sense representative sample of the medium being controlled.

Equipment Operation Sensors: As follows:

> Status Inputs for Fans: Differential-pressure switch with adjustable range set to 175 percent of rated fan static pressure. A hawkeye sensor should also be provided so that the owner knows if belts are lost or fans are running backwards.
>
> Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

Digital-to-Pneumatic Transducers: Convert plus or minus 12-V dc pulse-width-modulation outputs (preference is 4-20mA or 0-10 Volts), or continuous proportional current or voltage to 0 to 20 psi (0 to 138 kPa).

Damper Position Indication: Potentiometer mounted in enclosure with adjustable crank-arm assembly connected to damper to transmit 0 to 100 percent damper travel.

SENSOR INPUT AND OUTPUT DEVICES:

The following sensors and devices, or their equivalents, shall be considered acceptable. Other sensors and devices required for this specification are outlined in their respective subsystem.

Analog sensing elements for remote indication shall be independent of local pneumatic sensors used for local control loops.

System Accuracy: The system shall maintain an end-to-end accuracy for one year from sensor to operator's console display for the application specified.

STANDARD	Temperature Sensors
TYPE	Electronic
APPLICATION	BAS, HVAC, BTU, Boiler Control
STANDARD	100 or 1000 ohm platinum wire wound RTD element Standard J (3 wire) configuration European curve, Alpha = .00385 Ohms/Ohm/deg.C., meets DIN SID 43760 Wire in conduit
MECHANICAL	1/4" stainless steel sheath
SPACE TEMPERATURE	Sensor housing to be similar in appearance to existing thermostats except that thermometers are not required. Similarity to be Owner's decision. Locate on an outside wall if possible.
DUCT TEMPERATURE	Standard lengths -- 5.5", 11.5" and 17.5" Other lengths with owner's written approval. Locate in central area of airstream at minimum of 18" from reheat coil. 1/2" NPT mounting thread and flange and conduit connection. Glass encapsulated element unless otherwise approved.
THERMOWELL	Drilled brass or stainless steel or brass fitting with stainless steel sheath built-up well with Owner approval. Glass encapsulated element unless otherwise approved. 3/4" process connection with drilled wells. 1/2" NPT process connection on built-up wells. Insertion into measured medium - 1" + 1/2" diameter of pipe. Cast iron connector head - 1/2" NPT process connection and conduit connection. Rated thermowell pressure = 250 psi.

ELEMENT ACCURACY must meet .1% DIN and the DIN 43760 standard.

OVERALL ACCURACY	+ 1 deg.F. General duct, space and thermowell temperatures. + .75 deg.F. for thermowell ele. on 4" or larger pipes. + .5 deg.F. for thermowell ele. on 8" or larger pipes.

OVERALL RANGE -20% to l20% of possible operating conditions.

GENERAL NOTE If wires from RTD probe to DGP are to be more than 200 feet long, provide extra large cast iron connector head (nominal size 2-11/16 x 1/4) or junction box to accommodate a resistance to 4-20 mA convertor transmitter.

STANDARD Pressure Sensor

TYPE Electronic with LVDT element.

APPLICATION
4-20 mA Output (2 wire)
Wire in conduit
Input voltage 10-35 volts DC
Loop resistance greater than or equal to 500 ohms

MECHANICAL
Linear variable differential transformer (LVDT) element
Allowable Standard Ranges 0- 30 PSI
0-100 PSI
0-200 PSI
Other ranges with Owner written approval
1/2" NPT input thread and conduit connection.
Provide differential inputs unless otherwise approved.
Provide an air filter on unused differential ports.
Provide with a NEMA 4 watertight enclosure unless otherwise approved.
Min. rate pressure - l50% FS proof and 450 PSI static.

OVERALL ACCURACY + 0.5% F.S. including Linearity, hysteresis and repeatability.

ACCURACY NOTE: If pressure transducer is used to calculate flow with a pilot tube, then the accuracy of the pressure sensor should be dictated by the overall accuracy requirement of the system and would probably require a high accuracy sensor.

This section covers all new transducers provided. All new transducers provided shall be of the following type:

	INPUT	OUTPUT
l.	Temperature (deg.F.) Temperature (deg.F.)	4-20 mA, 2 wire 100 ohm platinum wire RTD
2.	Pressure	4-20 mA, 2 wire
3.	Flow Instantaneous	4-20 mA, 2 wire
4.	Flow Integrated	Pulse 10 PPS Max A25 msec open (min.) 40 msec closed (min.)
5.	KW Instantaneous	4-20 mA, 2 wire
6.	KWH - Integrated	Pulse – 10 PPS Max A25 msec open (min.) 40 msec closed (min.)

Digital inputs from devices with isolated, dry type contacts (no grounds, no voltage) of either normally open (N.O.) or normally closed (N.C.) configuration. Live contact inputs, those that have voltage present, shall be provided with isolating devices to meet dry contact requirement.

THERMOSTATS:

Room Thermostats: Provide room thermostats that work in conjunction with the B-AAC and B-ASC terminal unit controllers. Thermostats shall have visible thermometers, setpoint indication and exposed setpoint adjustment in all areas except public spaces. Thermostats are to have push buttons on the front face for adjusting the temperature setpoints. Thermostats are to have no doors.

In cases where a single room sensor is to be shared by multiple controllers the slave box reheat control valves and dampers shall be individually controlled to track the discharge temperature of the master unit. The Master shall be identified locally and on the FMS.

An RJ-11 type connection to serial port shall allow a local portable operator or programmer’s terminal to access all program blocks and attributes for complete programmability.

Room Thermostat Accessories: As follows:

Insulating Bases: For all thermostat installations.

Thermostat Guards: Locking transparent-plastic mounted on separate base.

Adjusting Key: As required for device.

Aspirating Boxes: Where indicated for thermostats requiring flush installation.

DAMPERS:

Provide automatic control dampers as indicated, with damper frames not less than 13-gage galvanized steel. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16-gage galvanized steel, with maximum blade width of 8".

Secure blades to 1/2" diameter zinc-plated axles using zinc-plated hardware. Seal off against spring stainless steel blade bearings. Provide blade bearings of nylon and provide thrust bearings at each end of every blade. Construct blade linkage hardware of zinc-plated steel and brass. Submit leakage and flow characteristics plus size schedule for controlled dampers.

Do not exceed maximum 48"x48" damper size. For sizes larger then this maximum in either dimension, use multiple dampers with a separate operator for each damper. Do not link separate dampers together.

Operating Temperature Range: From -20 degrees to 200 degrees F. (-29 degrees to 93 degrees C.). The occupant shall have an operation local range of 68 degrees and 74 degrees on rooms with Occupancy sensors.

For standard applications as indicated, provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable steel blade edging, or replaceable rubber seals, rated for leakage less than 10 CFM/sq.ft. of damper area, at differential pressure of 4" w.g. when damper is being held by torque of 50 inch-pounds.

Smoke Dampers: Provide smoke and combination fire/smoke dampers in accordance with applicable requirements of Specification Section "Ductwork Accessories".

ACTUATORS:

Electric Valve and Damper Motors: Size each motor to operate dampers or valves with sufficient reserve power to provide smooth modulating action or 2-position action as specified.

For reheat coils in branch ductwork and heating coils for air terminal units and fan terminal units, provide non-spring return, fully proportional, floating valve actuators.

For all other applications, provide permanent split-capacitor or shaded pole type motors with gear trains completely oil-immersed and sealed. Equip spring-return motors, with integral spiral-spring mechanism. Furnish entire spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

Equip motors for outdoor locations and for outside air intakes with "O ring" gaskets designed to make motors completely weatherproof, and equip with internal heaters to permit normal operation at -40 degrees F. (-40 degrees C.)

Provide separate motor for each outside air, return air and exhaust air damper. Do not link dampers with different functions together on one damper motor.

Provide separate motor for each damper when overall damper size exceeds 48" in either dimension. Do not link different dampers together on one damper motor.

Binary backed-up motors are not acceptable.

MISCELLANEOUS:

Wells for Pipe Mounted Sensor: Wells shall have minimum working pressure of 150 WOG psig. Wells shall be brass or stainless steel.

Lightning Protection: All electric/electronic equipment supplied must be internally or externally lightning/transient surge voltage protected on all external power feeder and input/output connections which are subject to surge voltage transients. Provide high speed clamping elements which meet IEEE. STD. 472 (SWC) on all digital or analog date channels.

Pressure Transducers:

The Controls Contractor shall be responsible for provided pressure transducers for the lab exhaust fans, return fan, and each set of air handling fans (fanwall). These devices shall be field installed and calibrated. They shall measure the system airflow and export that data to the BMS. This device shall rely on solid state memory and not utilize a battery to maintain any programmed information.

Pressure Instruments:

Differential Pressure and Pressure Sensors: Sensors shall have 4-20 mA output proportional signal with provisions for field checking. Sensors shall withstand up to 150% of rated pressure, without damaging device. Accuracy shall be within 2% of full scale.

Pressure Switches: Pressure switches shall have repetitive accuracy of +2% of range and withstand up to 150% of rated pressure. Sensors shall be diaphragm or bourdon tube design. Switch operation shall be adjustable over operating pressure range. Switch shall have application rated Form C, snap-acting, self-wiping contact of platinum alloy, silver alloy or gold plating.

Current Sensing Relays: Relays shall monitor status of motor loads. Switch shall have self-wiping, snap-acting Form C contacts rated for application. Setpoint of contact operation shall be field adjustable.

Low Voltage Wiring: Control wiring for analog functions shall be 18 AWG minimum with 600 volt insulation, twisted and shielded, 2 or 3 wire to match analog function hardware.

Low Voltage Wiring: Wiring for electric or electronic circuits less than 25 volts shall be cabling manufactured for express use in air plenums. The plenum cable shall be 24 gauge or larger as required, tinned copper, Teflon insulated, twisted pairs, shielded or unshielded, as required, a color coded, overall tape wrap, with transparent Teflon jacket, 150V., NEC725, Class 2 classified for use in air plenum non-conduit signaling application.

Manual Override Switches: In case of failure of the DDC system, provide override switches to operate fans, pumps, air handling units, cooling tower, heat exchangers, etc., manually in local interface control panel. Also for temperature and pressure control provide switches to allow supply temperatures, water temperatures, supply air pressure and fans to be manually regulated. All switches shall be located in locked panel to prevent unauthorized use of the manual override switches.

PART 3 - EXECUTION

INSPECTION:

Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

INSTALLATION OF AUTOMATIC TEMPERATURE CONTROLS

General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on the Drawings.

CONTROL WIRING:

Contact the project manager for all required Ethernet connections for this project.

Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code. Install wiring in electrical conduit in all areas. All controls conduit shall be green in color.

Conceal conduit, except in mechanical rooms and areas where other conduit and piping are exposed.

Install all control wiring with color-coded wire in ¾” minimum size conduit. Wire gauge to be in accordance with National Electrical Code.

Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

POWER WIRING:

Provide power wiring and conduit to air terminal units.

Furnish and install power cabling and conduit for temperature controls panels and equipment from emergency power panels. Each temperature control panel shall be connected to a separate circuit. Conduits shall connect to panels at the locations directed by the Contractor under Division 26. Final connection in the power panels shall be by Temperature Control Contractor in coordination with Division 26 Contractor.

MISCELLANEOUS:

Software Programming: All software programs shall be programmed by this Contractor.

Installation of Mechanical Devices: Refer to Mechanical Division sections for installation of valve bodies, control wells and dampers; not work of this section.

ADJUSTMENT AND SERVICE:

After completion of the installation, the automatic temperature control manufacturer shall regulate and adjust all thermostats, control valves, motors, and other equipment provided under his contract and shall place them in complete operating condition, subject to approval by the Engineer and Owner.

This shall include but not be limited to “tuning” of all control systems. Systems shall be tuned for decaying wave response and minimal overshoot of setpoint. Contractor is to not leave any system in an Auto Tune mode.

Room temperature controls shall have one temperature setpoint with less than a 0.5˚F between calculated heating and cooling temperatures.

This Contractor shall work with Balancing Contractor to provide verification of CFM reading from the DDC terminal unit controllers.

Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.

After completion of installation, perform the following:

Installation.
Check proper installation and connection of each control device.
Verify electric power.
Verify each sensor and actuator connection to field computer.

Field Computer Operation.
Point Test.
- check of wiring of each sensor and actuator end-to-end
- verify calibration of each sensor.
- verify manual operation of each actuator.

Local loop control.
- bring each local loop under control.
- check response to upset, change in setpoint.
- check full and partial load operation.

Supervisory functions.
- verify time clock schedules.
- verify reset control.

Verify communication with each field device.
- perform end-to-end sensor and actuator checks.
- verify that the database is correct.

Test other software.
Trend Logging.

Report Generation.
Remote Access.
System Documentation.

Verify proper operation of every control point in the presence of the Engineer. Include point-by-point checkout.

The control manufacturer shall provide a period of free service extending through one complete heating season and one complete cooling season, after acceptance of the control system, and shall report the condition of the control equipment to the Owner and the Architect.

PART 4 - SEQUENCE OF OPERATION:

REFER TO THE DRAWINGS FOR SEQUENCES

BACnet Protocol Implementation Conformance Statement:
The controls contractor shall include their BACnet PICS and BIBB statements (as described in ASHRAE 135-2001) for their BACnet Interface with their shop drawings. The interface shall comply with the following as a minimum.

Vendor Name: Tridium, Inc.
Product Family: Niagara Framework, including N4 Web Supervisor, JACE 8000 at Release 4.10 or greater, all licensing at 4.12, using the most current version of HTML. All control work associated with this project must be fully compatible with this version of Tridium such that all alarms, points, etc. communicate and clear alarms seamlessly with the existing system.
Description: This product family provides bi-directional communication between the Tridium Niagara Framework and a BACnet system operating at BACnet Conformance Class 3, over Ethernet media.

BACnet Protocols are documented in Appendices A, B & C.

REQUIRED SUBMITTALS:

The following chart is supplied for the benefit of the Owner, Architect, Engineer and contractor to assure a complete submission of required information. It is a reference listing of documents required by the Specifications under this Section. Refer to Specifications Section - General Provisions for the general requirements of submittals.

ITEM	SHOP DRAWING	M&O MANUAL	PARTS LIST	WRITTEN DESCRIPTION
Control equipment	x	x	x	
Control systems	x			
Control sequence				x
“As-builts” drawings	x	x	x	
Frequency drives	x	x	x	
Air terminal units	x	x	x	
I/O Summary Charts	x			

Appendix A – Vykon Niagara Compatibility Statement (NiCS)

VYKON Niagara^{AX} Compatibility Statement (NiCS) Includes all VYKON branded JACE and Software Products

VYKON Niagara^{AX} Compatibility Statement (NiCS)

Includes all VYKON branded JACE and Software Products

The following information describes Tridium's VYKON branded Niagara^{AX} product licensing.

Tridium's VYKON AX branded products utilizes an open access licensing procedure. VYKON AX branded products can be connected to and managed by any Niagara based tools or systems without the need to modify the license. This means the end user does not have to authorize changes to a VYKON AX license for another systems integrator to gain access to the system. The end user does need to have the necessary user names and passwords installed by the original system integrator so they can be used by another Niagara trained system integrator.

The following is an explanation of the VYKON licensing scheme.

BrandID

Every licensed station and tool has a Brand Identifier (BrandID). This field holds a text descriptor that the OEM chooses as the identifier for its product line. Each station or tool can have only one BrandID entry.

Tridium's VYKON products have the following:

BrandID = VYKON

Station Compatibility In

This field is a list of brands that this local station will allow Niagara AX data to come in from. Simply stated from the point of view of a JACE, "this is the list of brands that can I can accept data from". Tridium's VYKON products contain:

Station Compatibility In = All (In the actual license ALL is define by an *)

Note: The compatibility fields can contain; a single brand "ABC", a list of multiple brands "ABC, XYZ", no brand

"None" or all brands "All".

Station Compatibility Out

This field is a list of brands that this local station will allow Niagara AX data to be shared with. Simply stated, "This is the list of brands that I can share data with". Tridium's VYKON products contain:

Station Compatibility Out = All

Tool Compatibility In

This field is a list of brands that this station will allow to be connected to it for engineering of its application. Simply stated, "This is the list of brands that can engineer me". Tridium's VYKON products contain:

Tool Compatibility In – All

Tool Compatibility Out

This field is a list of brands that this tool is allowed to connect to and engineer. Simply stated, "This is the list of brands that I can engineer". Tridium's VYKON products contain:

Tool Compatibility Out – All

As long as VYKON branded products are purchased by the end user any Tridium Certified (TCP) system integrator can provide support for the end user without the need for the owner to be involved in the licensing process. For more information on Niagara Connectivity and Security visit our website library at: http://www.vykon.com/cs/library/white_papers

Management Contacts:
Scott Boehm
Director, VYKON Automation Energy Security
Sboehm@tridium.com

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Director, VYKON Automation Energy Security
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3951 Westerre Parkway
Suite 350
Richmond, VA 23233
804-747-4771

www.vykon.com

Appendix B – Tridium Niagara 3.8 BACnet PICS

TRIDIUM
8951 Westerre Parkway, Suite 350
Richmond, Virginia 23233 USA
1.804.747.4771 Phone
1.804.747.5204 Fax

Powered by niagara AX FRAMEWORK

TRIDIUM NIAGARA AX 3.8
BACnet PICS

BACnet Protocol Implementation Conformance Statement

Date: August 31, 2016
Vendor Name: Tridium
Product Name: Niagara AX BACnet Integration
Product Model Number: Tridium JACE models
Application Software Version: 3.8.112 or higher
Firmware Revision: 3.8.112.1 or higher
BACnet Protocol Revision: 7

Product Description:
Niagara AX provides the ability to view, monitor, and control BACnet devices over IP, raw Ethernet, or MS/TP media. Devices, points, schedules, alarms, and logs can be learned and managed from Niagara AX. In addition, Niagara points, schedules, histories, and alarming can be exposed to BACnet for monitor and control by foreign BACnet clients.

BACnet Standardized Device Profile (Annex L):

☐ **BACnet Advanced Operator Workstation (B-AWS)**
☐ **BACnet Operator Workstation (B-OWS)**
☐ **BACnet Operator Display (B-OD)**
☒ **BACnet Building Controller (B-BC)**
☐ **BACnet Advanced Application Controller (B-AAC)**
☐ **BACnet Application Specific Controller (B-ASC)**
☐ **BACnet Smart Sensor (B-SS)**
☐ **BACnet Smart Actuator (B-SA)**

TRIDIUM
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Additional BACnet Interoperability Building Blocks Supported (Annex K):

Data Sharing DS-RP-A, B DS-RPM-A, B DS-WP-A, B DS-WPM-A, B DS-COV-A, B DS-COVU-A, B DS-V-A DS-M-A DS-COVP-B	**Device & Network Management** DM-DDB-A, B DM-DOB-A, B DM-DCC-B DM-RD-B DM-TS-B DM-UTC-B DM-LM-A, B DM-BR-B DM-ANM-A DM-ADM-A DM-ATS-A DM-MTS-A
Alarm & Event Management AE-N-A, -I-B AE-ACK-A, B AE-ASUM-B AE-ESUM-B AE-INFO-B AE-VN-A AE-VM-A	**Trending** T-VMT-A, I-B, -E-B T-ATR-A, B T-V-A
Scheduling SCHED-A, I-B, -E-B SCHED-VM-A SCHED-WS-I-B	**Network Management** NM-CE-A

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Segmentation Capability:

Feature	Supported	Window size
Transmit Segmented Messages	yes	10
Receive Segmented Messages	yes	any

Standard Object Types Supported:

- The CreateObject and DeleteObject services are not supported, so no objects are dynamically creatable or deletable through BACnet service requests, although these objects are dynamically creatable and deletable through Niagara.
- No general range restrictions exist; however, certain specific applications may have specific range restrictions.
- All potentially available properties are listed for each object type.
- Optional properties are listed in *italics*. Not all instances support all optional properties.
- Writable properties are listed in **bold**. Any range limitations are expressed in parentheses following the property name.

Notes from Table

1. The File_Size property of File objects is only writable if the underlying system file is changeable.
2. The Setpoint property of Loop objects is writable only if the setpoint is not linked from within Niagara.
3. The Recipient_List property of the Notification Class object will maintain entries that are internally configured within Niagara.
4. The List_Of_Object_Property_References property of the Schedule object will maintain entries that are internally configured within Niagara.
5. The Priority_For_Writing property of Schedule objects is not important for internal Niagara operation, as the priority at which a point is commanded is determined by the input to which the Schedule output is linked.
6. These Trend Log object properties are not writable if the backing history for the exported Trend Log is a Niagara-generated history. If the history is created as a BACnet Trend Log, then they are writable.
7. Trend Logs in Niagara use internal triggering and are either COV or Interval. So the Log_Interval property cannot be written from BACnet.

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Object Type	Properties	
Analog Input	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Units *Min_Pres_Value* *Max_Pres_Value*	*Resolution* ***COV_Increment*** ***Time_Delay*** *Notification_Class* ***High_Limit*** ***Low_Limit*** ***Deadband*** ***Limit_Enable*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Analog Output	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Units *Min_Pres_Value* *Max_Pres_Value* *Resolution*	Priority_Array **Relinquish_Default** ***COV_Increment*** ***Time_Delay*** *Notification_Class* ***High_Limit*** ***Low_Limit*** ***Deadband*** ***Limit_Enable*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Analog Value	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** Units *Priority_Array* ***Relinquish_Default***	***COV_Increment*** ***Time_Delay*** *Notification_Class* ***High_Limit*** ***Low_Limit*** ***Deadband*** ***Limit_Enable*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Object Type	Properties	
Binary Input	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Polarity ***Inactive_Text*** ***Active_Text***	*Change_Of_State_Time* ***Change_Of_State_Count*** (0) *Time_Of_State_Count_Reset* ***Elapsed_Active_Time*** (0) *Time_Of_Active_Time_Reset* ***Time_Delay*** ***Notification_Class*** ***Alarm_Value*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Binary Output	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Polarity ***Inactive_Text*** ***Active_Text*** *Change_Of_State_Time* ***Change_Of_State_Count*** (0)	*Time_Of_State_Count_Reset* ***Elapsed_Active_Time*** (0) *Time_Of_Active_Time_Reset* ***Minimum_Off_Time*** ***Minimum_On_Time*** Priority_Array **Relinquish_Default** ***Time_Delay*** ***Notification_Class*** *Feedback_Value* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Binary Value	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** ***Inactive_Text*** ***Active_Text*** *Change_Of_State_Time* **Change_Of_State_Count** *(0)* *Time_Of_State_Count_Reset*	***Elapsed_Active_Time*** (0) *Time_Of_Active_Time_Reset* ***Minimum_Off_Time*** ***Minimum_On_Time*** *Priority_Array* ***Relinquish_Default*** ***Time_Delay*** ***Notification_Class*** ***Alarm_Value*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

5 of 9 Tridium NiagaraAX-3.8 BACnet PICS August 31, 2016

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Object Type	Properties	
Calendar	Object_Identifier **Object_Name** Object_Type	***Description*** Present_Value **Date_List**
Device	Object_Identifier Object_Name Object_Type System_Status Vendor_Name Vendor_Identifier Model_Name Firmware_Revision Application_Software_Revision ***Location*** ***Description*** Protocol_Version Protocol_Revision Protocol_Services_Supported Protocol_Object_Types_Supported Object_List Max_APDU_Length_Accepted	Segmentation_Supported *Max_Segments_Accepted* *Local_Time* *Local_Date* *UTC_Offset* *Daylight_Savings_Status* *APDU_Segment_Timeout* APDU_Timeout Number_Of_APDU_Retries *Max_Master* *Max_Info_Frames* Device_Address_Binding Database_Revision *Configuration_Files* *Last_Restore_Time* ***Backup_Failure_Timeout*** *Active_COV_Subscriptions*
File (Stream Access Only)	Object_Identifier **Object_Name** Object_Type ***Description*** File_Type	**File_Size**[1] Modification_Date **Archive** Read_Only File_Access_Method

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Object Type	Properties	
Loop	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** Output_Units Manipulated_Variable_Reference Controlled_Variable_Reference Controlled_Variable_Value Controlled_Variable_Units Setpoint_Reference **Setpoint**[2] Action ***Proportional_Constant***	*Proportional_Constant_Units* ***Integral_Constant*** *Integral_Constant_Units* ***Derivative_Constant*** *Derivative_Constant_Units* ***Bias*** ***Maximum_Output*** ***Minimum_Output*** Priority_For_Writing ***COV_Increment*** ***Time_Delay*** *Notification_Class* ***Error_Limit*** *Event_Enable* *Acked_Transitions* *Notify_Type* *Event_Time_Stamps*
Multi-state Input	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service**	Number_Of_States ***State_Text*** ***Time_Delay*** ***Notification_Class*** ***Alarm_Values*** *Fault_Values* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Multi-state Output	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** *Device_Type* Status_Flags Event_State *Reliability* **Out_Of_Service** Number_Of_States	***State_Text*** Priority_Array **Relinquish_Default** ***Time_Delay*** ***Notification_Class*** *Feedback_Value* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Object Type	Properties	
Multi-state Value	Object_Identifier **Object_Name** Object_Type Present_Value ***Description*** Status_Flags Event_State *Reliability* **Out_Of_Service** Number_Of_States	***State_Text*** *Priority_Array* ***Relinquish_Default*** ***Time_Delay*** ***Notification_Class*** ***Alarm_Values*** *Fault_Values* *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*
Notification Class	Object_Identifier **Object_Name** Object_Type ***Description***	Notification_Class **Priority** **Ack_Required** **Recipient_List**[3]
Schedule	Object_Identifier **Object_Name** Object_Type ***Description*** **Effective_Period** ***Weekly_Schedule*** ***Exception_Schedule***	**Schedule_Default** **List_Of_Object_Property_References**[4] **Priority_For_Writing**[5] Status_Flags Reliability **Out_Of_Service**
Trend Log	Object_Identifier **Object_Name** Object_Type ***Description*** **Log_Enable**[6] ***Start_Time*** ***Stop_Time*** *Log_DeviceObjectProperty* ***Log_Interval***[6, 7] *COV_Resubscription_Interval* *Client_COV_Increment* Stop_When_Full Buffer_Size	Log_Buffer **Record_Count** (0)[6] Total_Record_Count *Notification_Threshold* *Records_Since_Notification* *Last_Notify_Record* Event_State ***Notification_Class*** *Event_Enable* *Acked_Transitions* ***Notify_Type*** *Event_Time_Stamps*

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Data Link Layer Options:

☒ BACnet IP, (Annex J)
☒ BACnet IP, (Annex J), Foreign Device
☒ ISO 8802-3, Ethernet (Clause 7)
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
☒ MS/TP master (Clause 9), baud rate(s): 9600, 19200, 38400, 76800
☐ MS/TP slave (Clause 9), baud rate(s): _____
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):_____
☐ Point-To-Point, modem, (Clause 10), baud rate(s): _____
☐ LonTalk, (Clause 11), medium: _____
☐ Other:

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☒Yes ☐ No

Networking Options:

☒ Router, Clause 6 – Routing configurations: Ethernet-IP, Ethernet-MS/TP, IP-MS/TP
☐ Annex H, BACnet Tunneling Router over IP
☒ BACnet/IP Broadcast Management Device (BBMD)
Does the BBMD support registrations by Foreign Devices? ☒ Yes ☐ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported simultaneously.

☒ ANSI X3.4	☐ IBM™/Microsoft™ DBCS	☒ ISO 8859-1
☒ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS C 6226

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:
This product supports communications between BACnet and any third-party system to which Niagara can connect. Contact Tridium for a list of supported protocols.

Appendix C – BACnet Testing Laboratories Product Listing

BACnet is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to the requirements of ASHRAE Standard 135 is the responsibility of BACnet International (BI). BTL is a registered trademark of BI.

BACnet Testing Laboratories Product Listing

This product has been tested at a qualified BACnet Testing Laboratory and found to comply with all the necessary interoperability requirements in place on the published test date. This listing represents the tested capability of the Listed Product. For information on additional functionality that was not covered in the test process, refer to the Manufacturer's PICS statement on the BI website.

Listing Information

Vendor		Listing Status
Tridium, Inc. 3951 Westerre Parkway, Suite 350 Richmond, VA 23233 USA		Listed Product
Test Requirements	**BACnet Protocol Revision**	**Date Tested**
Requirements as of July 2009	Revision 7 (135-2008)	July 2011

Product Name	Model Number(s)	Software Version
Niagara AX Supervisor with BACnet B-AWS	S-AX-AWS	3.6.35

Device Profiles

Profile	Model Numbers
BACnet Advanced Workstation (B-AWS)	S-AX-AWS

BIBBs Supported

Data Sharing	ReadProperty-A	DS-RP-A
	ReadProperty-B	DS-RP-B
	ReadPropertyMultiple-A	DS-RPM-A
	ReadPropertyMultiple-B	DS-RPM-B
	WriteProperty-A	DS-WP-A
	WriteProperty-B	DS-WP-B
	WritePropertyMultiple-A	DS-WPM-A
	WritePropertyMultiple-B	DS-WPM-B
	COV-A	DS-COV-A
	View-A	DS-V-A
	Advanced View-A	DS-AV-A
	Modify-A	DS-M-A
	Advanced Modify-A	DS-AM-A

Page 1 of 3

Alarm and Event Management	Alarm and Event-Notification-A	AE-N-A
	Alarm and Event-ACK-A	AE-ACK-A
	Alarm and Event-View Notifications-A	AE-VN-A
	Alarm and Event-Advanced View Notifications-A	AE-AVN-A
	Alarm and Event-View and Modify-A	AE-VM-A
	Alarm and Event-Advanced View and Modify-A	AE-AVM-A
	Alarm and Event-Alarm Summary View-A	AE-AS-A
	Alarm and Event-Event Log View and Modify-A	AE-ELVM-A

Scheduling	Scheduling-View and Modify-A	SCHED-VM-A
	Scheduling-Advanced View and Modify-A	SCHED-AVM-A
	Scheduling-Weekly Schedule-A	SCHED-WS-A

Trending	Trending-View-A	T-V-A
	Trending-Advanced View and Modify-A	T-AVM-A
	Automated Trend Retrieval-A	T-ATR-A

Device and Network Management	Dynamic Device Binding-A	DM-DDB-A
	Dynamic Device Binding-B	DM-DDB-B
	Dynamic Object Binding-A	DM-DOB-A
	Dynamic Object Binding-B	DM-DOB-B
	Automatic Device Mapping-A	DM-ADM-A
	Automatic Network Mapping-A	DM-ANM-A
	Time Synchronization-A	DM-TS-A
	Time Synchronization-B	DM-TS-B
	UTC Time Synchronization-A	DM-UTC-A
	UTC Time Synchronization-B	DM-UTC-B
	Automatic Time Synchronization–A	DM-ATS-A
	Manual Time Synchronization–A	DM-MTS-A
	DeviceCommunicationControl-A	DM-DCC-A
	DeviceCommunicationControl-B	DM-DCC-B
	ReinitializeDevice-A	DM-RD-A
	ReinitializeDevice-B	DM-RD-B
	Backup and Restore-A	DM-BR-A
	Restart-A	DM-R-A
	Object Creation and Deletion-A	DM-OCD-A
	List Manipulation-A	DM-LM-A
	List Manipulation-B	DM-LM-B

Object Type Support

Device		

Data Link Layer Options

Media	Options
BACnet/IP (Annex J)	BBMD
Ethernet	

Page 2 of 3

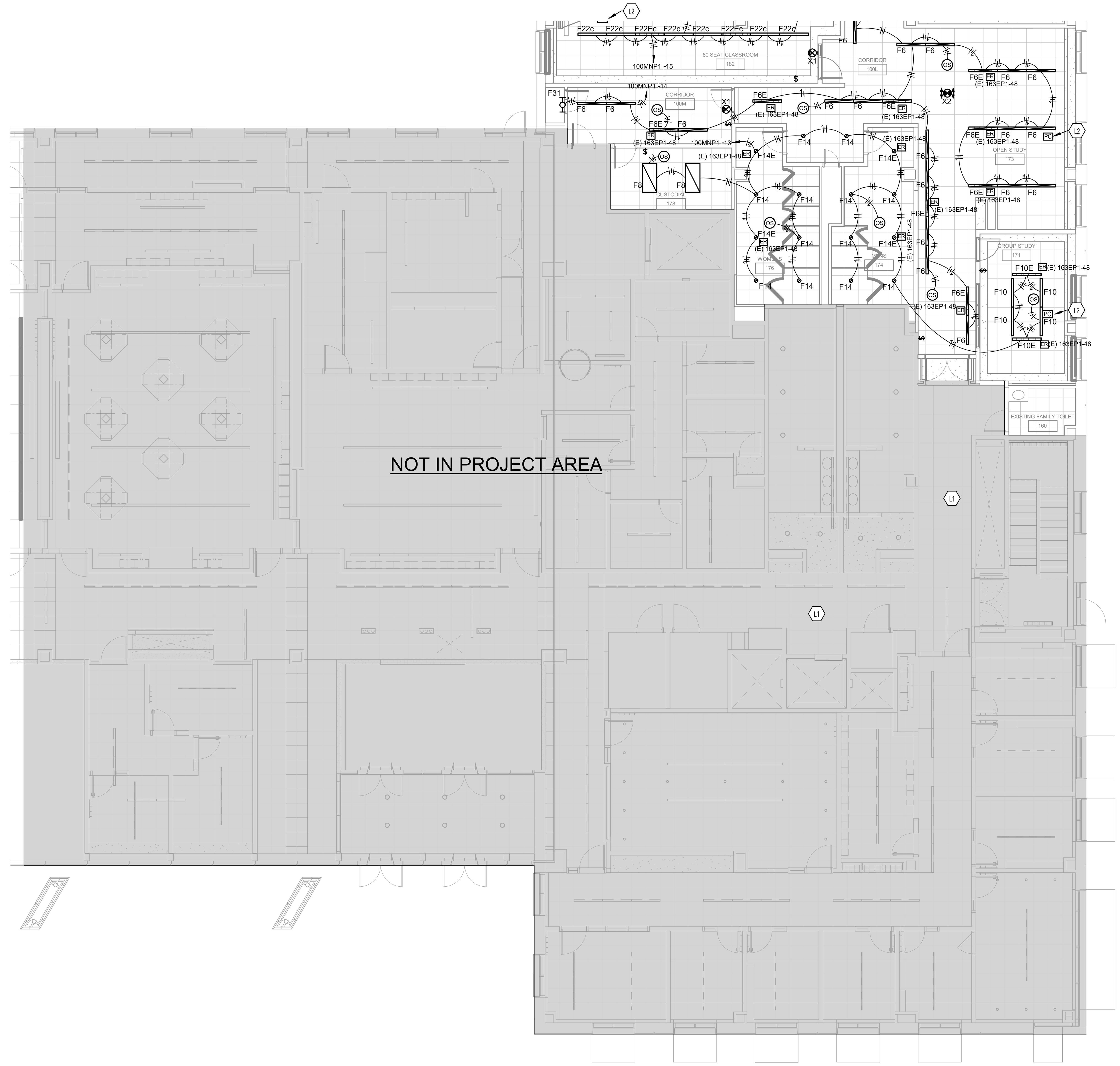
Networking Options

Networking Functionality	Media
Router	BACnet/IP (Annex J) – Ethernet

Character Set Support

ANSI X3.4 ISO 10646 (UCS-2)

END OF SECTION 250200



(A) **LIGHTING - FIRST FLOOR AREA 'C'**
1/8" = 1'-0"

ELECTRICAL LIGHTING NOTES

A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER N.E.C. #310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER N.E.C. #300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN N.E.C #100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. ALSO, MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D LOCATE CHAIN-HUNG INDUSTRIAL FIXTURES IN MECHANICAL ROOMS TO AVOID DUCTWORK AND PIPING, TO MAXIMIZE AVAILABLE LIGHT. SPACE AROUND EQUIPMENT, AIR HANDLERS, ETC. TO PROVIDE ADEQUATE LIGHTING TO ALL AREAS OF ROOM. PROVIDE ADDITIONAL FIXTURES OF SAME TYPE AS NEEDED TO FULFILL THIS REQUIREMENT.

E LOCATE EXIT SIGNS FOR MAXIMUM VIEWING AREA TO IDENTIFY EGRESS PATHS AS INDICATED ON PLANS. COORDINATE LOCATIONS SUCH THAT ARCHITECTURAL FEATURES OR EQUIPMENT FROM OTHER TRADES DO NOT OBSTRUCT VIEW.

F LUMINAIRES INDICATED WITH MULTI-LEVEL SWITCHING SHALL HAVE SIMILAR LAMPS CONTROLLED TOGETHER, I.E. INBOARD AND OUTBOARD LAMPS OR RIGHT AND LEFT HAND LAMPS.

G ALL LIGHTING FIXTURE LENSES, PARABOLIC LOUVERS, DOWNLIGHTING ALZAK CONES AND "PARACUBE" LOUVERS SHALL BE HANDLED WITH COTTON GLOVES DURING INSTALLATION AND LAMPING TO AVOID FINGERPRINTS OR DIRT DEPOSITS. IT IS PREFERRED THAT FIXTURES BE SHIPPED AND INSTALLED WITH CLEAR PLASTIC BAGS TO PROTECT LOUVERS. AT CLOSE OF PROJECT, AND AFTER CONSTRUCTION AIR FILTERS ARE CHANGED, REMOVE BAGS. ANY LOUVER OR CONE SHOWING DIRT OR FINGER PRINTS SHALL BE CLEANED WITH SOLVENT RECOMMENDED BY THE MANUFACTURER, OR REPLACED AS NECESSARY IN ORDER TO TURN OVER TO THE OWNER NEW FIXTURES AT OCCUPANCY.

H RECESSED LUMINAIRES SHALL BE SECURED SUCH THAT THE FORCE REQUIRED INSERTING LAMPS, TRIMS, LENSES, LOUVERS, OR DOOR FRAMES DOES NOT SHIFT HOUSING. ALL TRIMS SHALL BE COMPLETELY FLUSH WITH FINISHED CEILINGS AT COMPLETION OF CONSTRUCTION.

I CONTRACTOR SHALL PROVIDE UNSWITCHED CONDUCTOR TO ALL EXIT SIGNS, EMERGENCY INVERTER BATTERY PACKS, AND NIGHT LIGHTS AS REQUIRED.

TAGGED NOTES

##

L1 CONTRACTOR SHALL TEMPORARILY SUPPORT OR REMOVE/REINSTALL CEILING DEVICES AND FIXTURES AS NECESSARY TO ALLOW ABOVE-CEILING WORK OUTSIDE OF PROJECT BOUNDARY. WORK OUTSIDE OF THE PROJECT AREA MUST BE COORDINATED WITH BUILDING OPERATIONS AND MUST BE PERFORMED OUTSIDE OF NORMAL WORKING HOURS.

L2 PROVIDE DAYLIGHTING CONTROL PER IECC REQUIREMENTS.

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859.252.6781

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ALAN R. KELLUM
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LICENSED PROFESSIONAL ENGINEER

CMTA

RESERVED FOR AHJ STAMP

CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

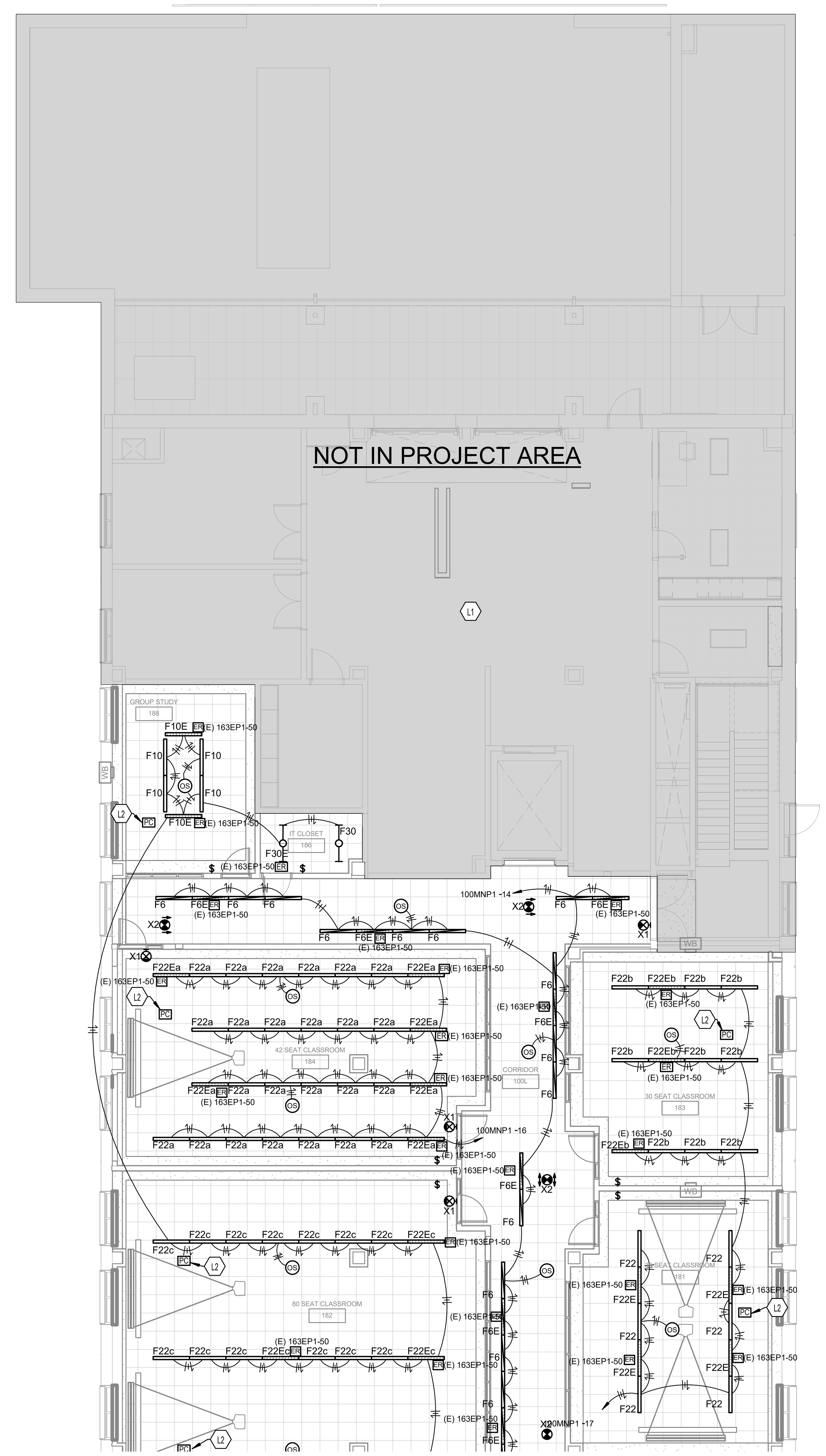
REVISIONS

No.	Description	Date

LIGHTING FIRST FLOOR - NEW WORK PLAN - AREA 'C'

E-121C

3/13/2023 7:26:43 PM



A LIGHTING - FIRST FLOOR AREA 'D'

1/8" = 1'-0"

ELECTRICAL LIGHTING NOTES

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TAGGED NOTES

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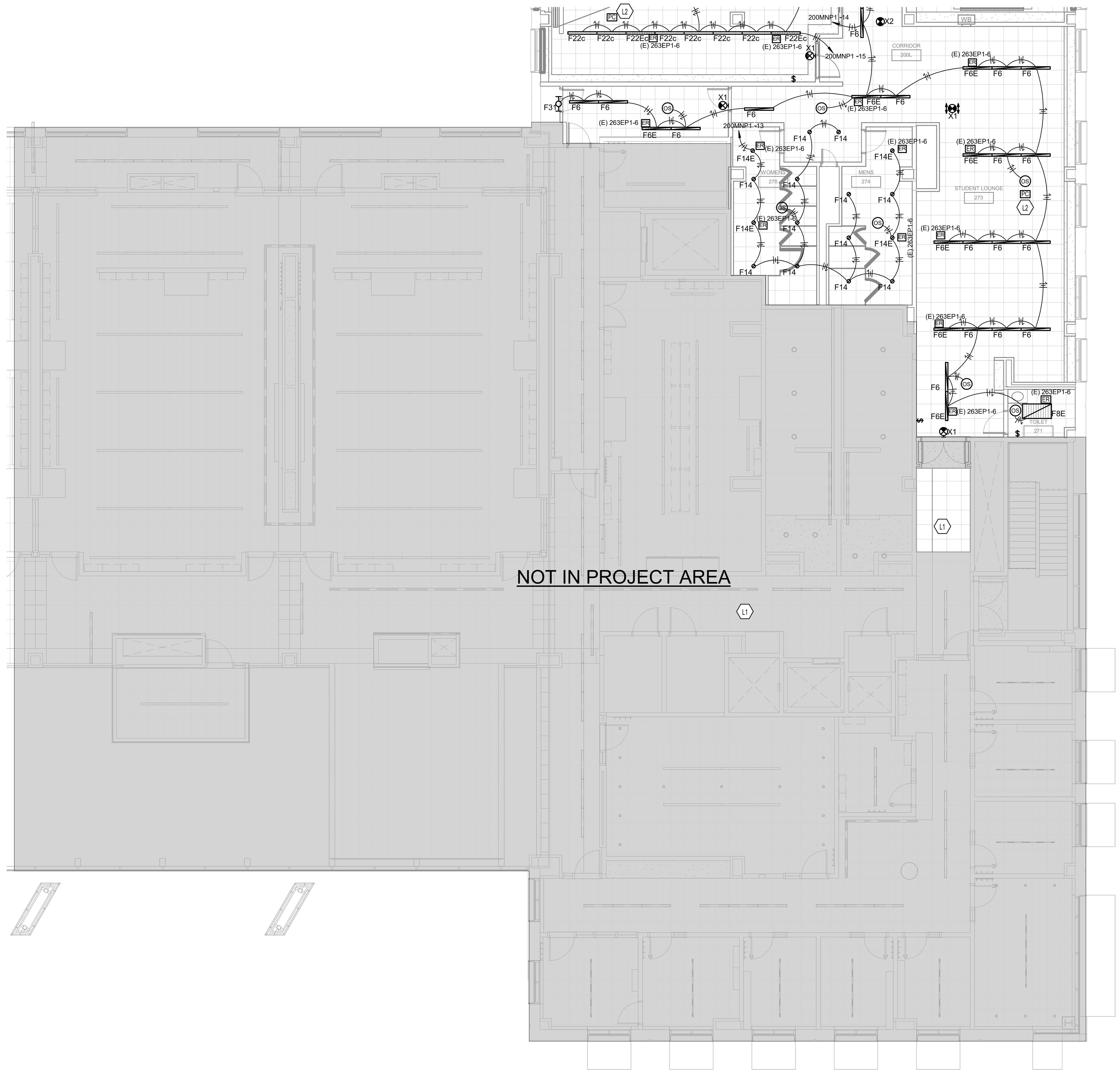
E-121D



A **LIGHTING - SECOND FLOOR AREA 'C'**
1/8" = 1'-0"

ELECTRICAL LIGHTING NOTES

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TAGGED NOTES

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Lexington, Kentucky 40509
859.252.6781

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

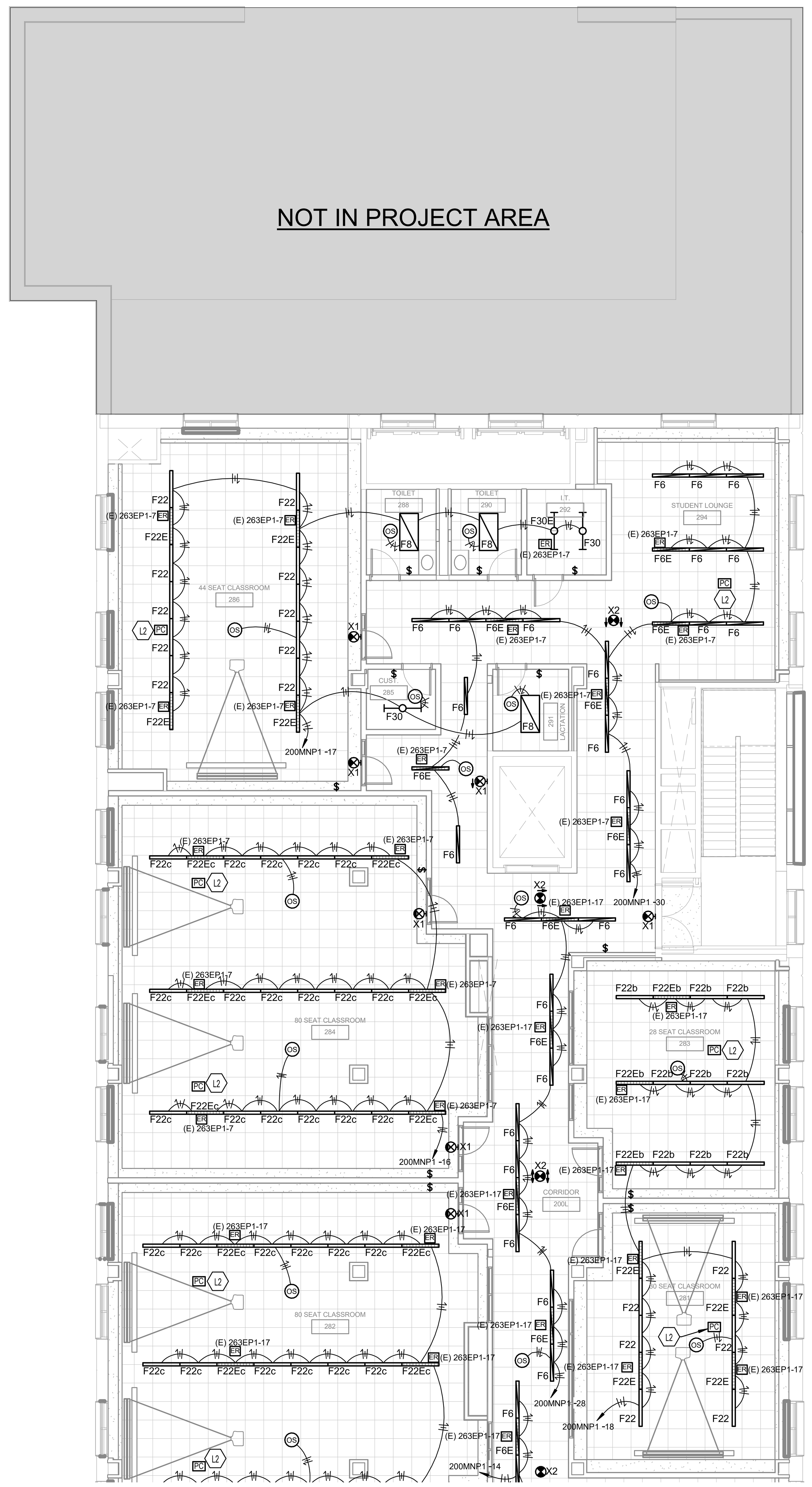
PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

LIGHTING SECOND FLOOR - NEW WORK PLAN - AREA 'C'

E-122C



A LIGHTING - SECOND FLOOR AREA 'D'
1/8" = 1'-0"

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TAGGED NOTES

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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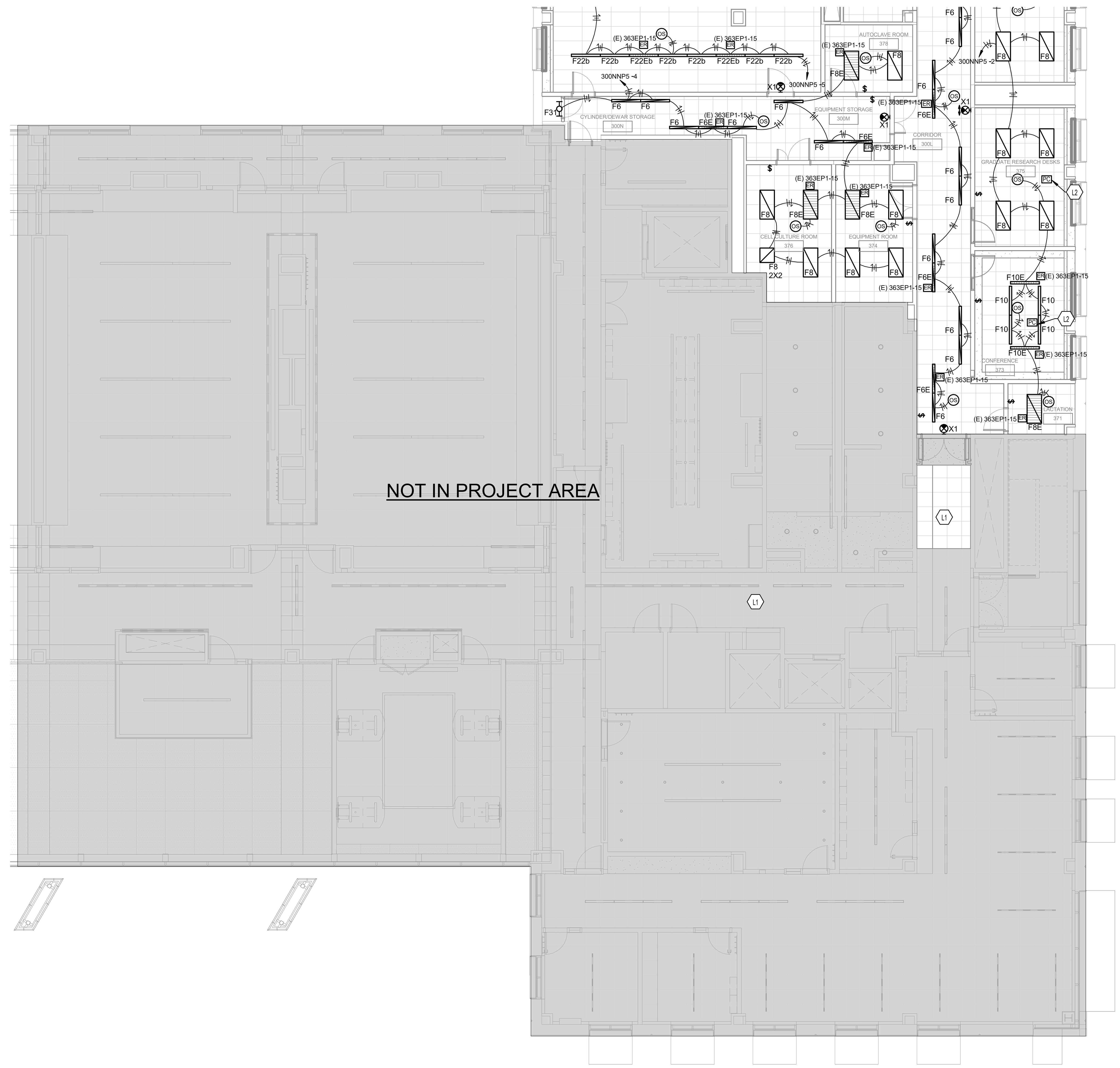
LIGHTING SECOND FLOOR - NEW WORK PLAN - AREA 'D'

E-122D



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A **LIGHTING - THIRD FLOOR AREA 'C'**
1/8" = 1'-0"

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ALAN R. KELLUM
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CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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LIGHTING THIRD FLOOR - NEW WORK PLAN - AREA 'C'

E-123C

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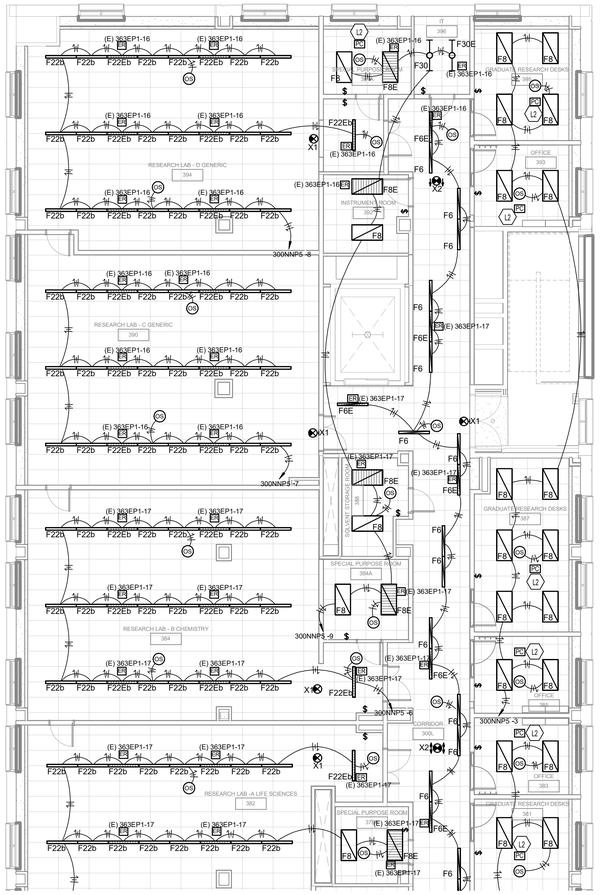

A **LIGHTING - THIRD FLOOR AREA 'D'**
1/8" = 1'-0"

JRA architects
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STATE OF KENTUCKY · ALAN R. KELLUM · 20166 · LICENSED PROFESSIONAL ENGINEER

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CMTA CONSULTING MECHANICAL TECHNICAL ARTS

CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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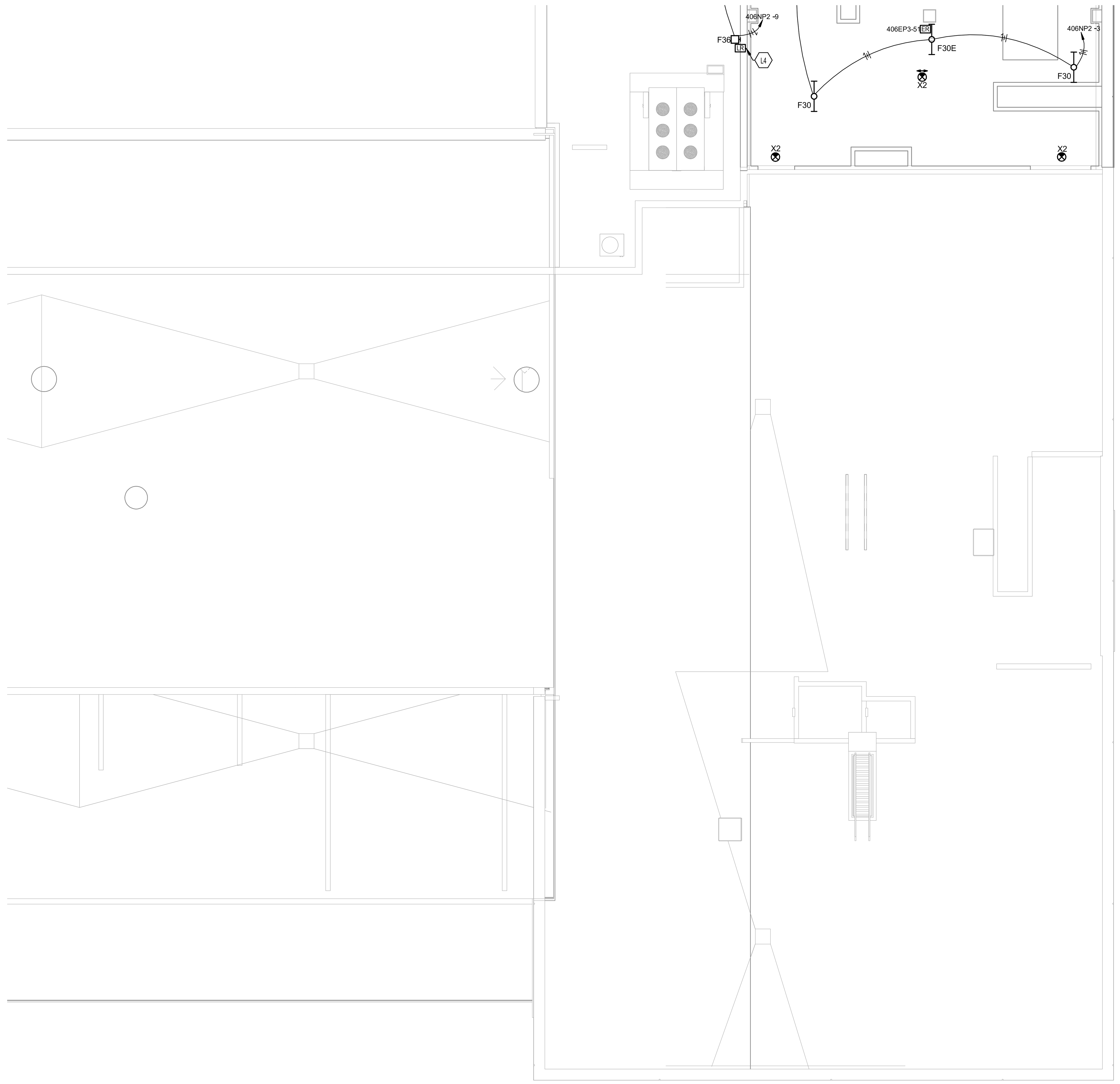
LIGHTING THIRD FLOOR - NEW WORK PLAN - AREA 'D'

E-123D



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TAGGED NOTES

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L4 PROVIDE CONTROL RELAY FOR EXTERIOR LIGHTING. PROGRAM TO FUNCTION WITH EXISTING EXTERIOR LIGHTING.

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
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LIGHTING FOURTH FLOOR - NEW WORK PLAN - AREA 'C'

E-124C

ELECTRICAL LIGHTING NOTES

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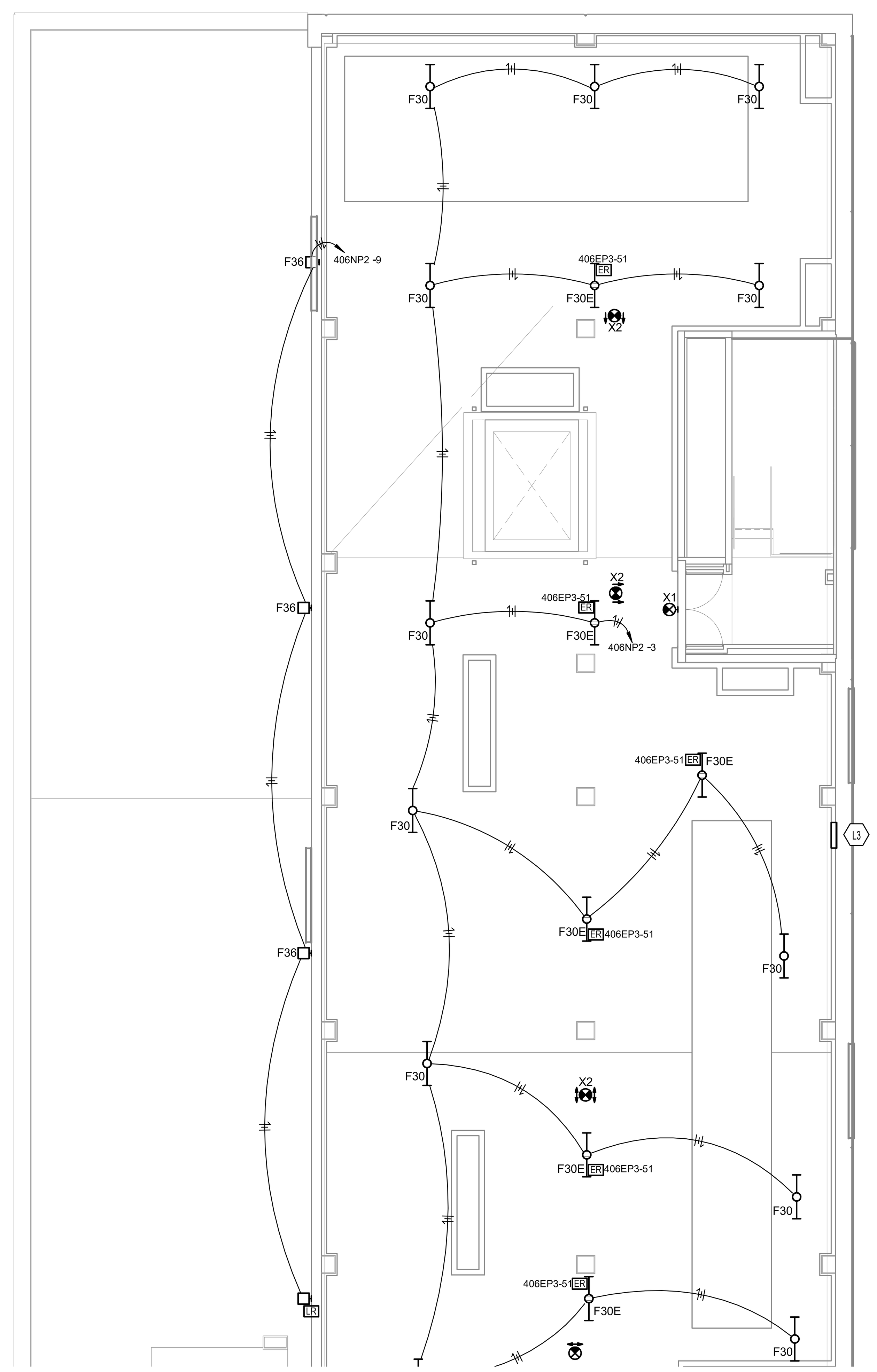

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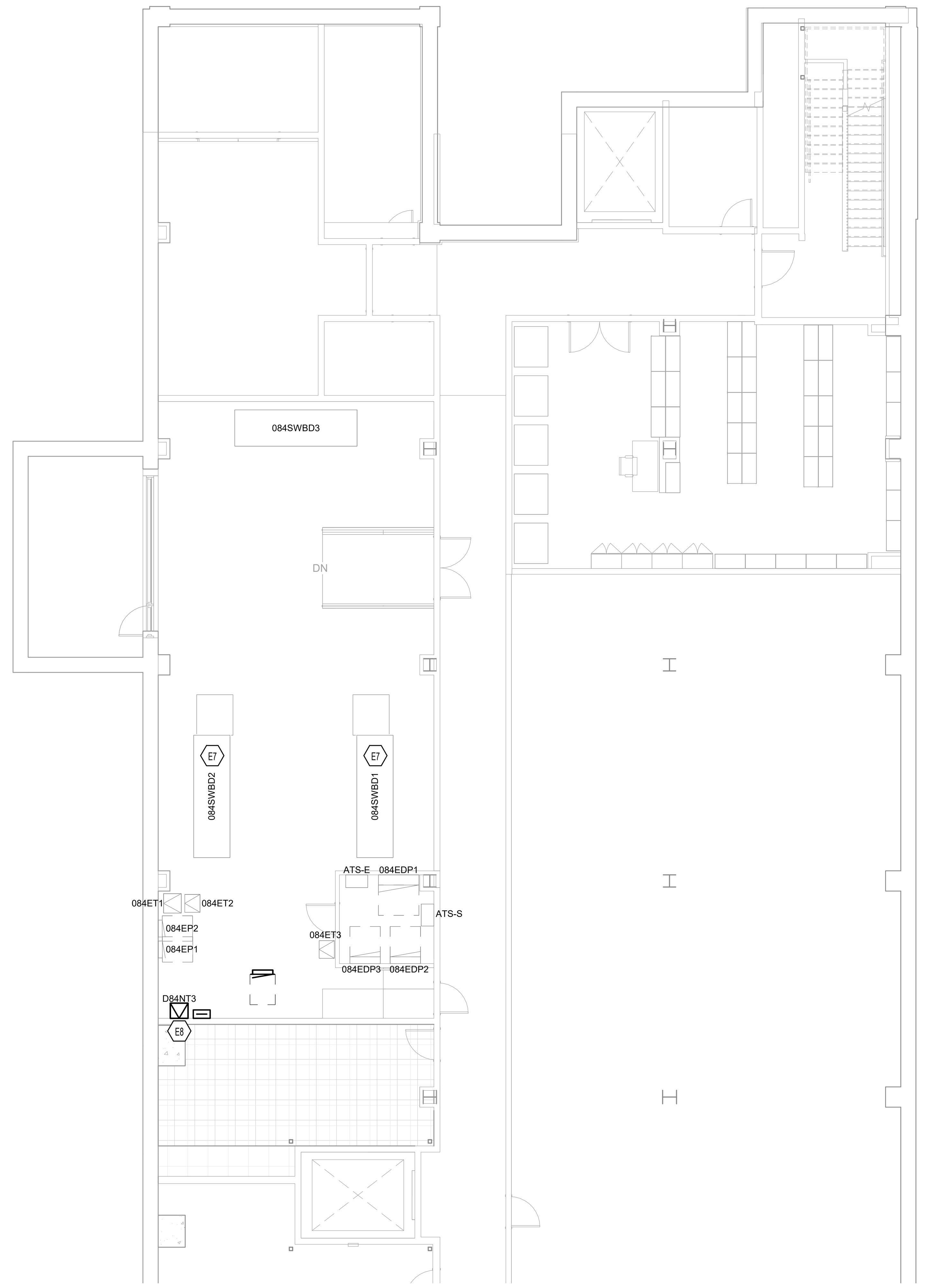
LIGHTING FOURTH FLOOR - NEW WORK PLAN - AREA 'D'

E-124D



A **POWER - BASEMENT AREA 'D'**
1/8" = 1'-0"

ELECTRICAL POWER NOTES

A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

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TAGGED NOTES

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E7 CONNECT NEW FEEDER(S) TO EXISTING SPARE BREAKER(S) IN SWITCHBOARD. ADJUST BREAKER SETTINGS AS NOTED ON ONE-LINE DIAGRAM AND AS REQUIRED BY COORDINATION STUDY. SEAL AND FIRE STOP ALL NEW FLOOR PENETRATIONS AND WALL PENETRATIONS INTO EXISTING ELECTRICAL ROOM.

E8 PROVIDE NEW TRANSFORMER, GROUNDING, FEEDERS AND SECONDARY PROTECTION. REFER TO ONE-LINE DIAGRAM. WALL MOUNT TRANSFORMER AS NECESSARY FOR ACCESS.

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CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
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LEXINGTON, KENTUCKY

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PROJECT	202277/XKJS22
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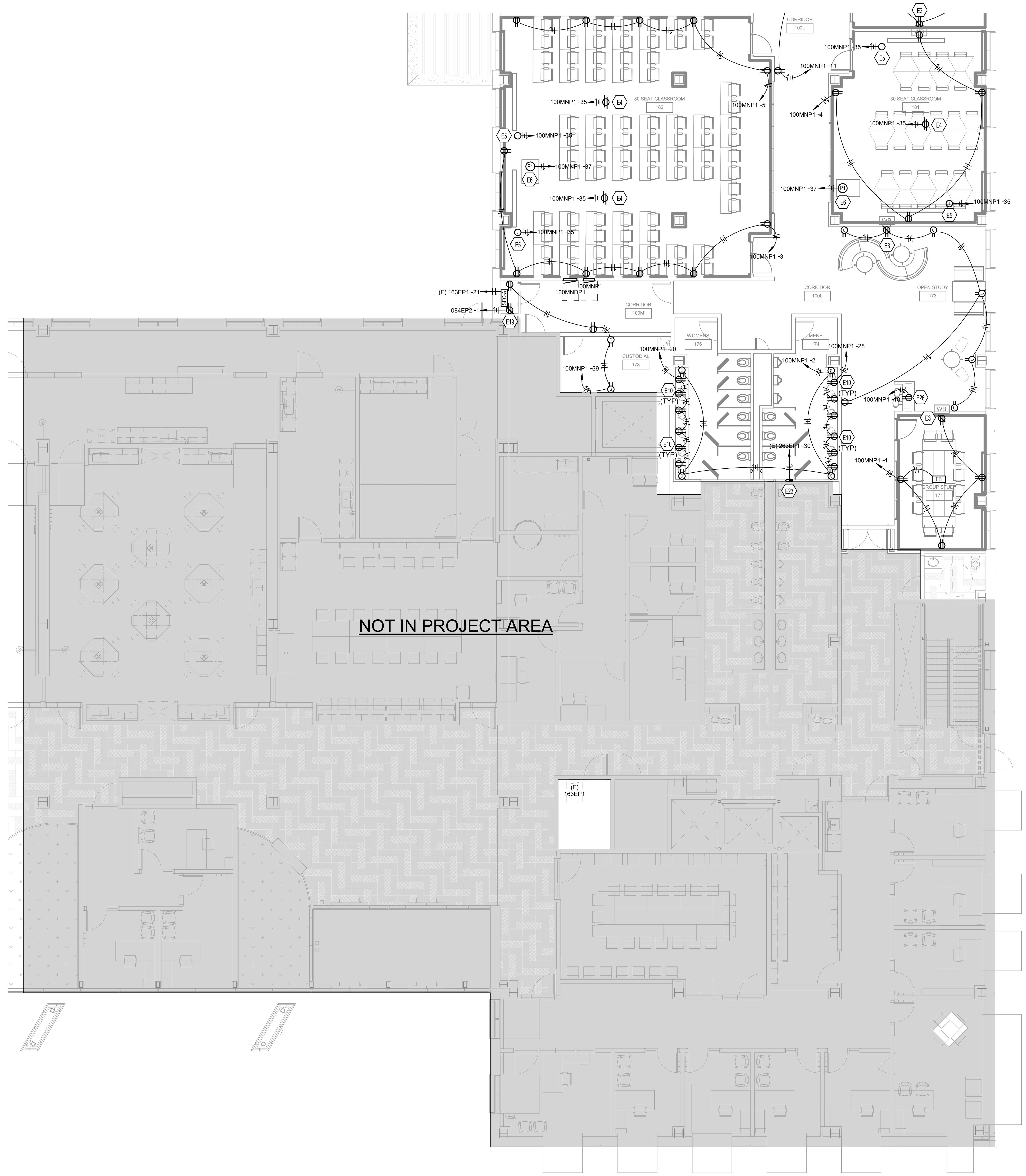
REVISIONS

No.	Description	Date

POWER BASEMENT - NEW WORK PLAN - AREA 'D'

E-130D



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1/8" = 1'-0"

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- E3 PROVIDE POWER FOR WALL BOX AT MONITOR AND RECEPTACLE AT 18".
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- E5 PROVIDE POWER FOR CEILING MOUNTED PROJECTOR SCREEN. PROVIDE CONNECTION FOR CONTROL SYSTEM PER TECHNOLOGY SHEETS.
- E6 PROVIDE POWER FOR LECTURN POKE-THRU FLOORBOX. REFER TO SHEET E-602 FOR POKE THRU SCHEDULE.
- E10 PROVIDE RECEPTACLE UNDER COUNTER FOR SINK POWER. PROVIDE GFI BREAKER IN PANEL.
- E19 PROVIDE ELECTRICAL CONNECTION TO DDC PANELS.
- E23 PROVIDE ELECTRICAL CONNECTION TO TRAP PRIMER.
- E26 PROVIDE GFCI BREAKER FOR WATER COOLER CONNECTION.

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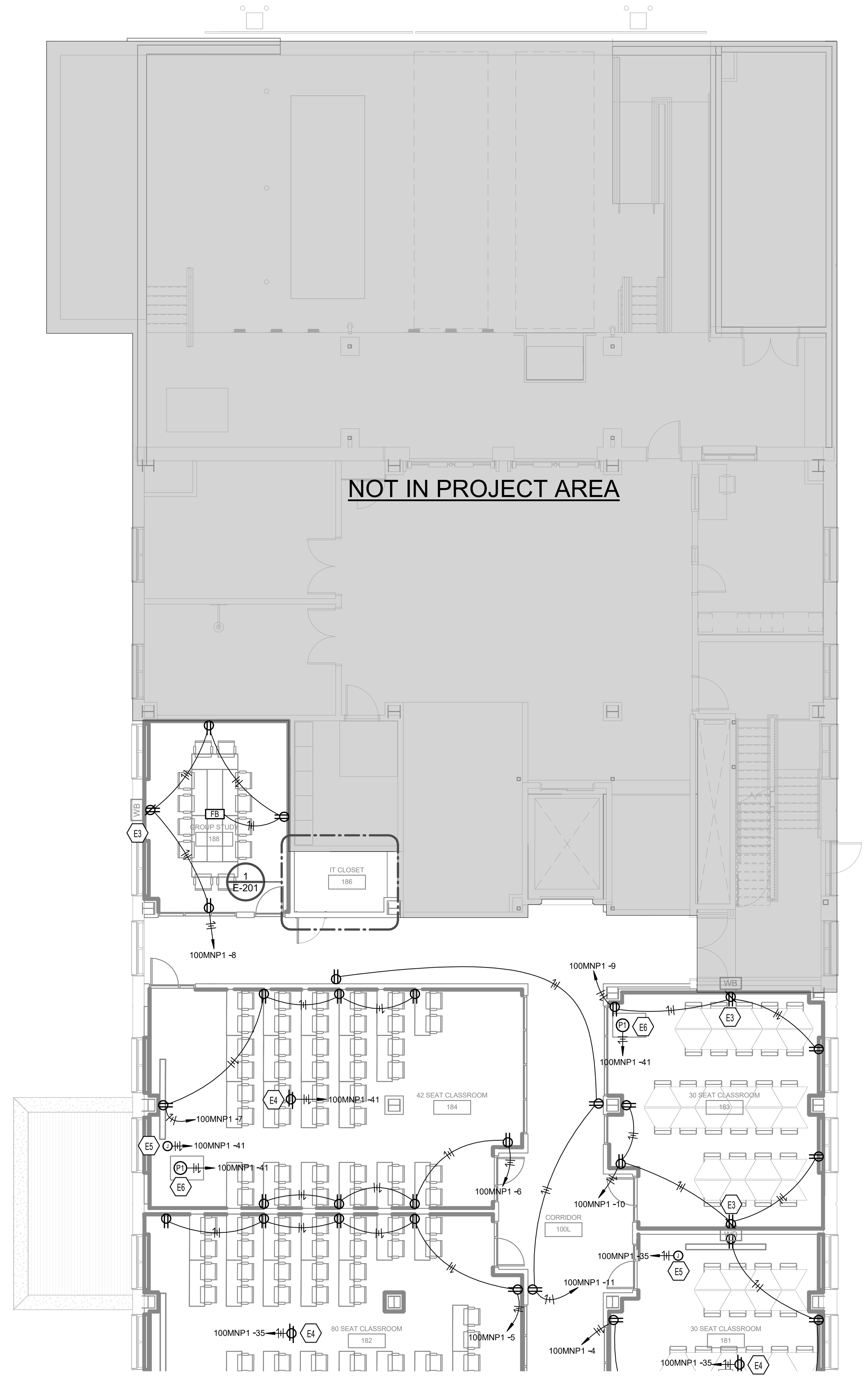
POWER FIRST FLOOR - NEW WORK PLAN - AREA 'C'

E-131C



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POWER FIRST FLOOR - NEW WORK PLAN - AREA 'D'

E-131D

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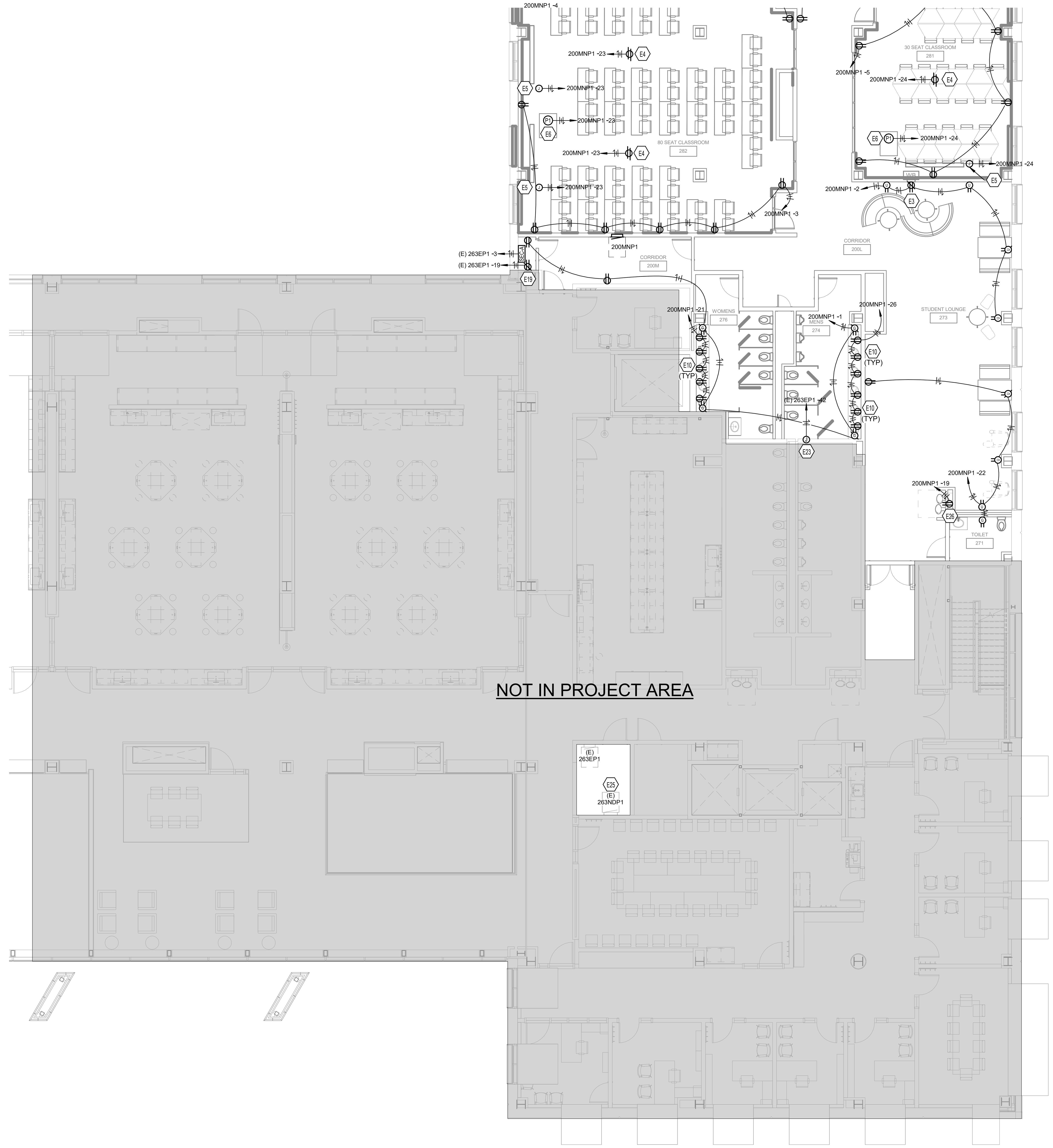
E25 CONNECT NEW PANELBOARD FEEDERS TO EXISTING SPARE BREAKERS IN DISTRIBUTION PANEL. UPDATE PANEL DIRECTORY. REFER TO ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.

E26 PROVIDE GFCI BREAKER FOR WATER COOLER CONNECTION.



(A) POWER - SECOND FLOOR AREA 'C'
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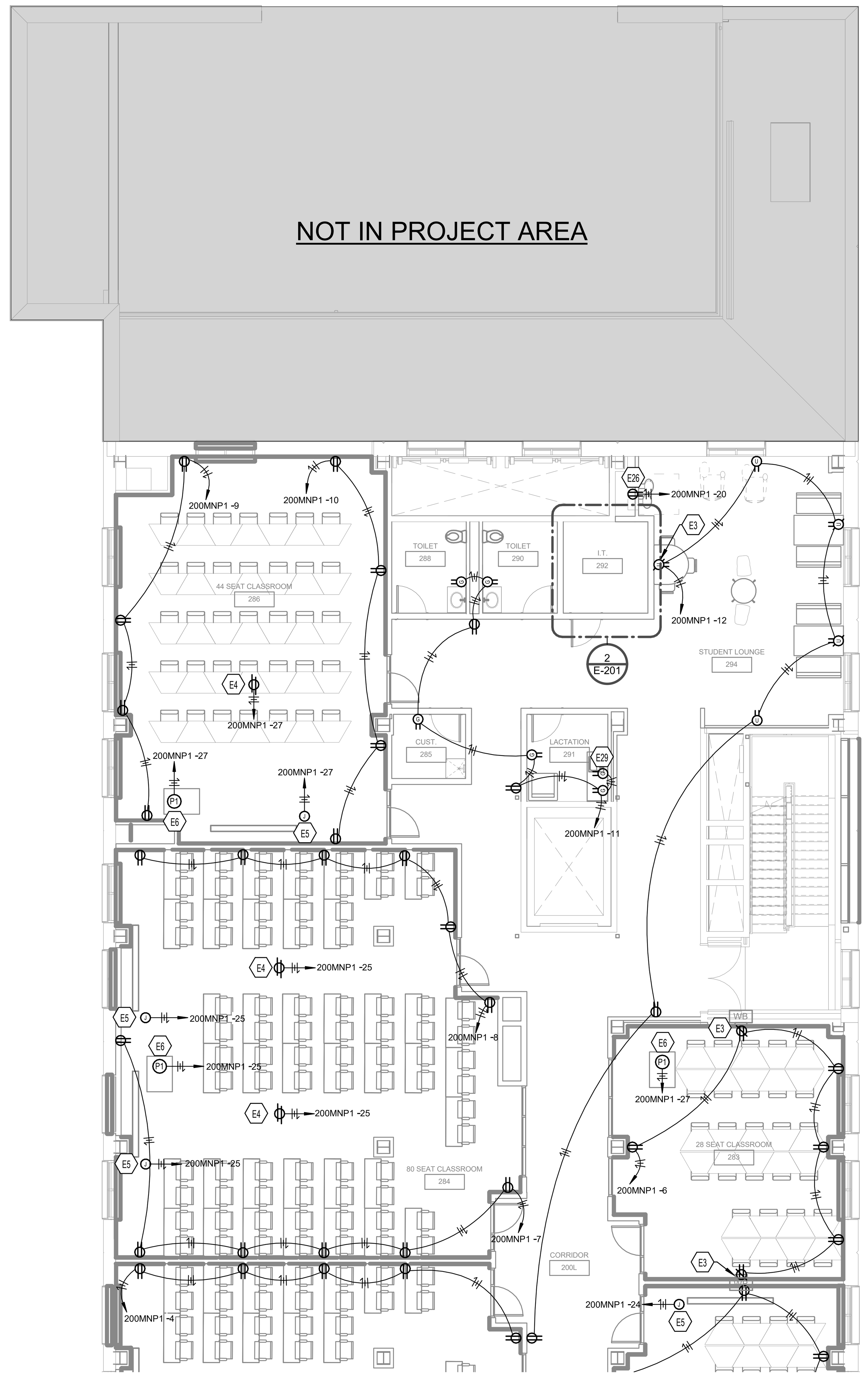

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POWER SECOND FLOOR - NEW WORK PLAN - AREA 'D'

E-132D

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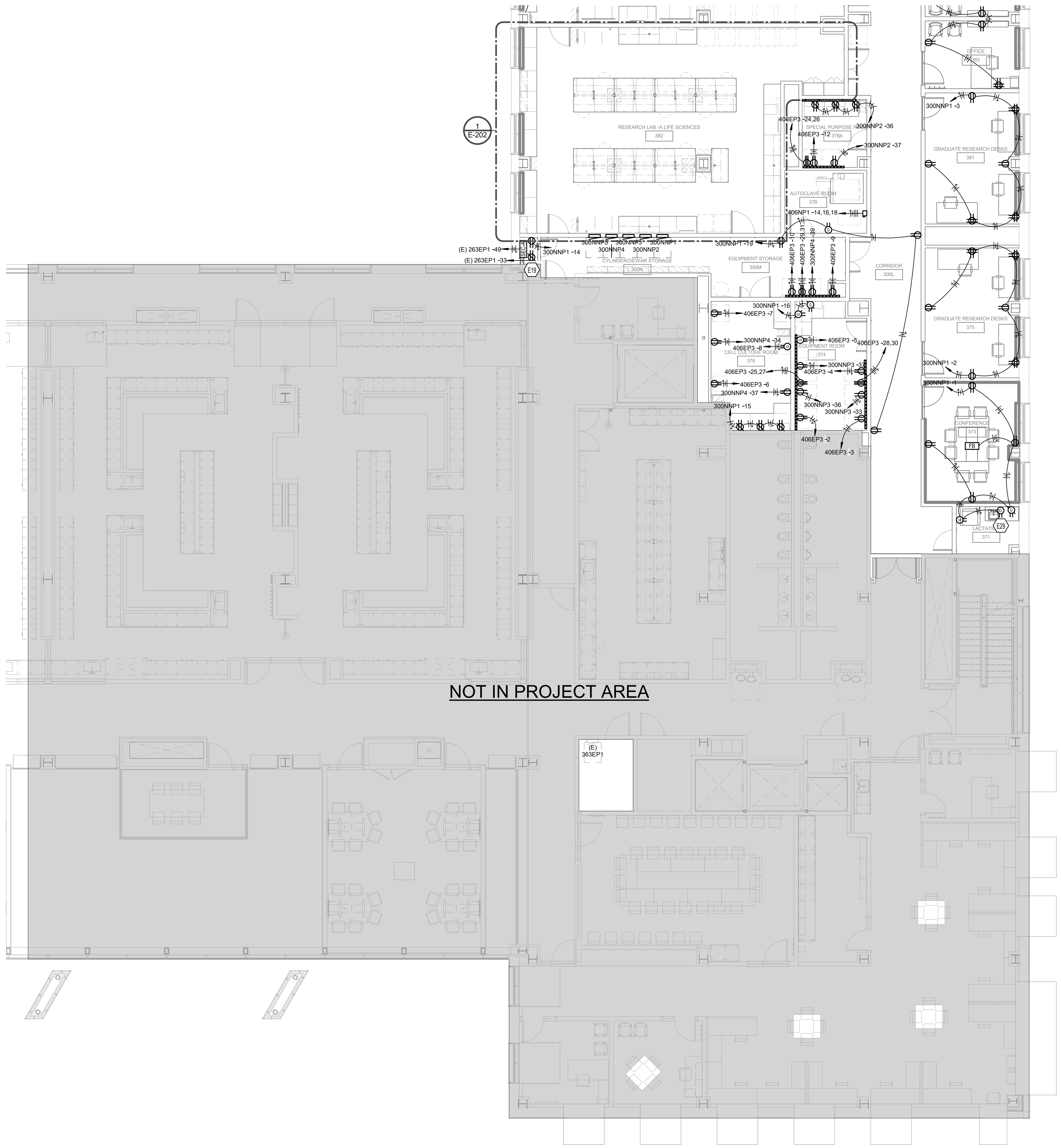

A RESEARCH LAB -A LIFE SCIENCES POWER
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POWER THIRD FLOOR - NEW WORK PLAN - AREA 'C'

E-133C

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ELECTRICAL POWER NOTES

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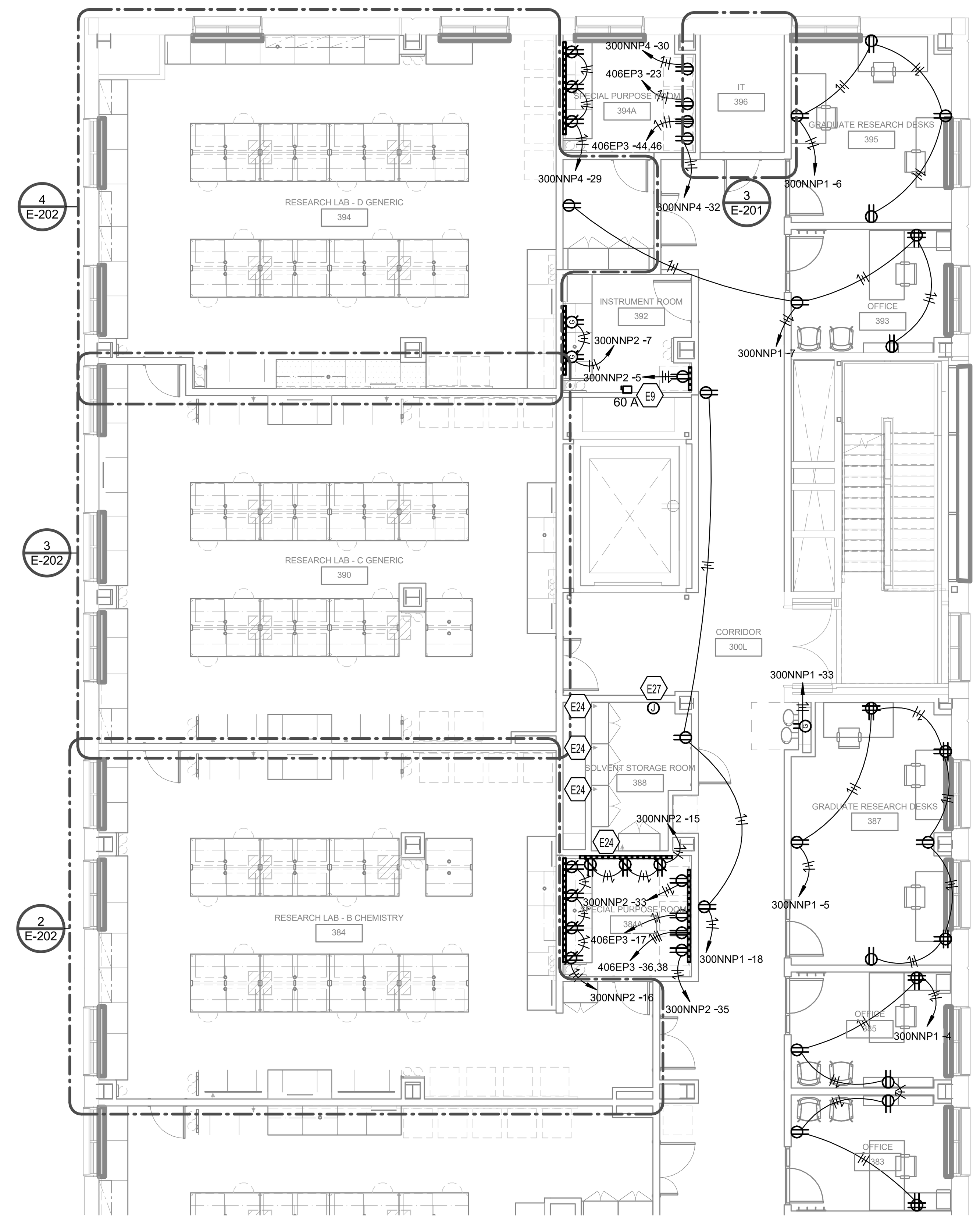
E9 PROVIDE FUSED 60A DISCONNECT FOR FUTURE EQUIPMENT CONNECTION.

E24 PROVIDE 1#6 GROUND FOR CONNECTION TO STORAGE CABINET. COORDINATE LOCATION PRIOR TO ROUGH-IN. EXTEND TO CLOSEST STEEL COLUMN AND BOND. MAKE CONNECTION ABOVE CEILING IN ACCESSIBLE AREA.

E27 PROVIDE POWER FOR EMERGENCY SHOWER/EYE WASH UNIT EMERGENCY ALARM AND LIGHT SYSTEM. CONNECT TO NEAREST CIRCUIT FOR EMERGENCY POWER OFF.



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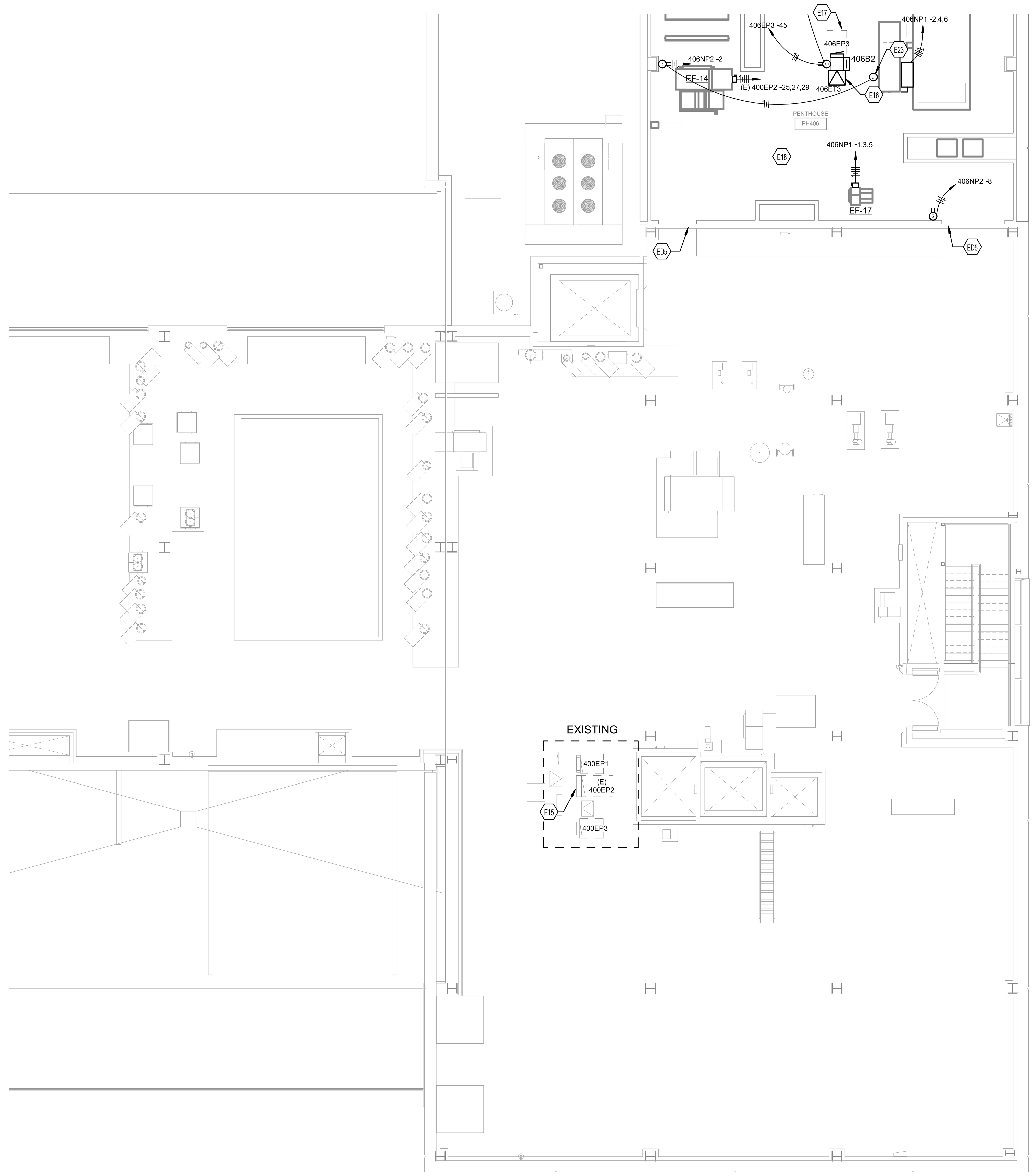

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B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).

E LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

TAGGED NOTES

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E15 PROVIDE NEW BREAKERS IN EXISTING PANEL FOR NEW LOADS. REFER TO SCHEDULE AND ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.

E16 PROVIDE STRUCTURAL SUPPORTS TO WALL MOUNT TRANSFORMER WITH BOTTOM AT 7' AFF.

E17 PROVIDE STRUCTURAL SUPPORTS AS REQUIRED TO MOUNT PANELBOARDS AND EQUIPMENT.

E18 ALL FLOOR PENETRATIONS WITHIN PENTHOUSE SHALL BE CURBED AND SEALED WATER-TIGHT.

E23 PROVIDE ELECTRICAL CONNECTION TO TRAP PRIMER.

ED5 RELOCATE MISCELLANEOUS CONDUITS AND OTHER ELECTRICAL DEVICES OR EQUIPMENT NECESSARY TO ALLOW REMOVAL OF WALL SECTIONS AND INSTALLATION OF NEW DUCTWORK.

MODIFY EXISTING UL MASTER LABEL LIGHTNING PROTECTION SYSTEM AS NECESSARY TO CONSTRUCT PENTHOUSE. EXTEND LIGHTNING PROTECTIN SYSTEM TO COVER NEW CONSTRUCTION AND ROOFTOP EQUIPMENT. PROVIDE NEW MASTER LABEL FOR SYSTEM.

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UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

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PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

POWER FOURTH FLOOR - NEW WORK PLAN - AREA 'C'

E-134C

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ELECTRICAL POWER NOTES

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C IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).

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TAGGED NOTES

##

E16 PROVIDE STRUCTURAL SUPPORTS TO WALL MOUNT TRANSFORMER WITH BOTTOM AT 7' AFF.

E17 PROVIDE STRUCTURAL SUPPORTS AS REQUIRED TO MOUNT PANELBOARDS AND EQUIPMENT.

E18 ALL FLOOR PENETRATIONS WITHIN PENTHOUSE SHALL BE CURBED AND SEALED WATER-TIGHT.

E19 PROVIDE ELECTRICAL CONNECTION TO DDC PANELS.

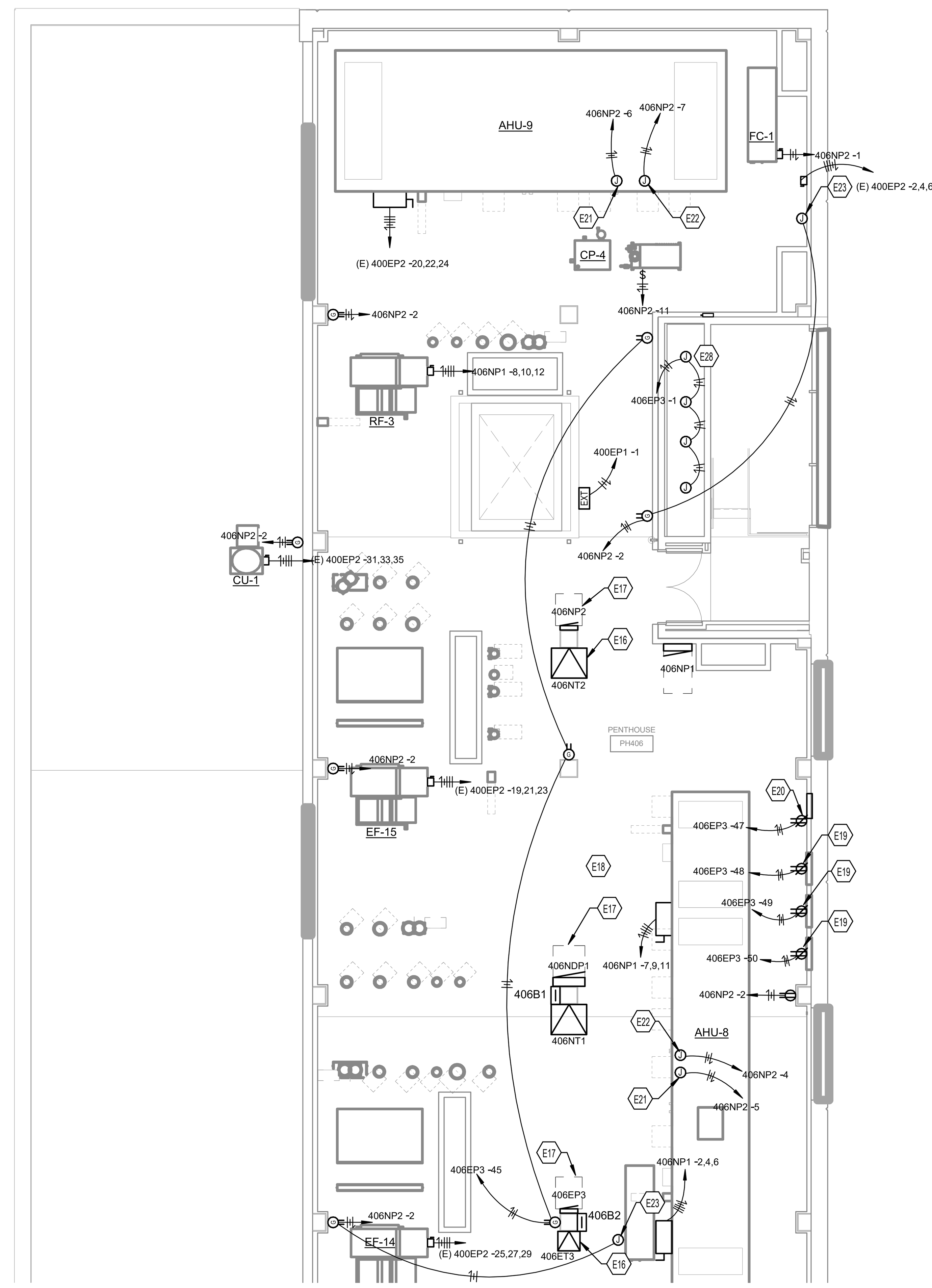
E20 PROVIDE ELECTRICAL CONNECTION TO LIGHTING CONTROL.

E21 PROVIDE ELECTRICAL CONNECTION TO AHU ENCLOSURE LIGHTING AND RECEPTACLES. INTERCONNECT SHIPPING SPLITS AS NECESSARY FOR FULL OPERATION.

E22 PROVIDE ELECTRICAL CONNECTION TO AHU UV LIGHTING.

E23 PROVIDE ELECTRICAL CONNECTION TO TRAP PRIMER.

E28 PROVIDE 120V CONNECTION FOR DUCT SMOKE DETECTOR AND DAMPER. A FIRE ALARM OUTPUT RELAY OR AN INTEGRAL RELAY BASE MAY BE USED TO CONTROL THE DAMPER.



A **POWER - FOURTH FLOOR AREA 'D'**
1/8" = 1'-0"

MODIFY EXISTING UL MASTER LABEL LIGHTNING PROTECTION SYSTEM AS NECESSARY TO CONSTRUCT PENTHOUSE. EXTEND LIGHTNING PROTECTIN SYSTEM TO COVER NEW CONSTRUCTION AND ROOFTOP EQUIPMENT. PROVIDE NEW MASTER LABEL FOR SYSTEM.

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POWER FOURTH FLOOR - NEW WORK PLAN - AREA 'D'

E-134D

TAGGED NOTES

S1 PROVIDE 1 DATA OUTLET ABOVE CEILING FOR CONNECTION TO PROJECTOR.

S3 FIELD COORDINATE EXACT LOCATION OF OUTLETS WITH MONITOR BRACKER.

S4 CONNECT NEW CABLE TRAY TO EXISTING TRAY SYSTEM. PROVIDE BONDING AS NECESSARY TO MAKE ALL TRAY ELECTRICALLY CONTINUOUS.

S21 CONTRACTOR SHALL TEMPORARALLY SUPPORT OR REMOVE/REINSTALL CEILING DEVICES AS NECESSARY TO ALLOW ABOVE-CEILING WORK OUTSIDE OF PROJECT BOUNDARY. WORK OUTSIDE OF THE PROJECT AREA MUST BE COORDINATED WITH BUILDING OPERATIONS AND MUST BE PERFORMED OUTSIDE OF NORMAL WORKING HOURS.

ELECTRICAL SYSTEMS NOTES

A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

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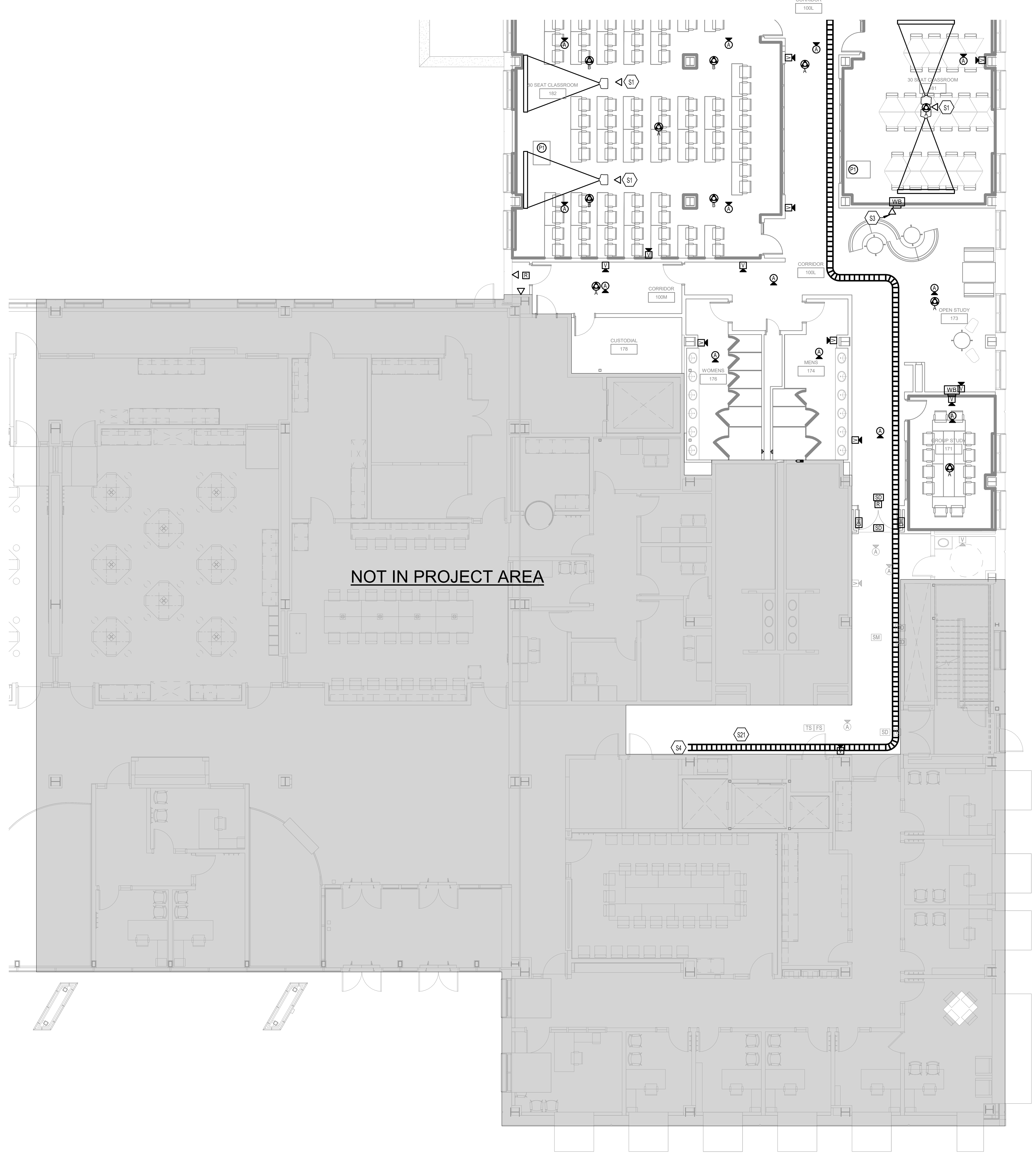
D REFER TO "SYSTEM INSTALLATION MATRIX" (ON SYSTEMS LEGEND SHEET) AND SPECIFICATIONS FOR CONTRACTOR REQUIREMENTS OF EACH SYSTEM.

E THE CONTRACTOR SHALL ROUTE ALL "SYSTEM CONDUIT STUB-UPS" TO THE NEAREST CORRIDOR CABLING PATH (SEE "STUB-UP" DETAILS). REFER TO CABLING PATH INSTALLATION DETAIL FOR ADDITIONAL REQUIREMENTS.

F CONTRACTOR SHALL PAINT ALL SYSTEMS CONDUIT STUB-UPS LIGHT BLUE FOR SYSTEMS CABLING INTO THE CORRIDOR CABLING PATH. PROVIDE PULL STRINGS IN ALL NEW CONDUIT RUNS FOR SYSTEM CABLING INSTALLATION.



A SYSTEMS - FIRST FLOOR AREA 'C'
1/8" = 1'-0"

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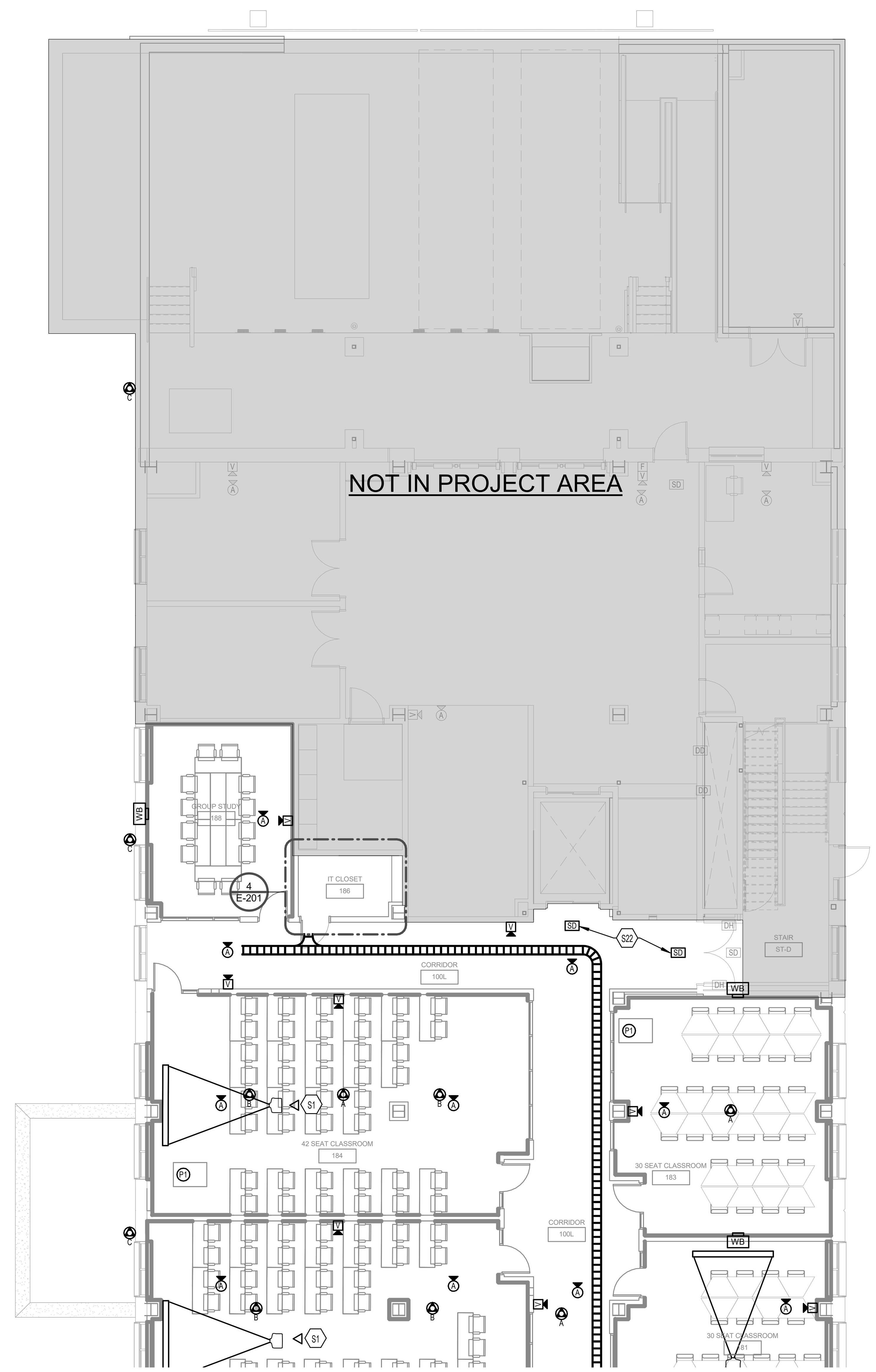
SYSTEMS FIRST FLOOR - NEW WORK PLAN - AREA 'C'

E-141C



A SYSTEMS - FIRST FLOOR AREA 'D'
1/8" = 1'-0"

TAGGED NOTES

- S1 PROVIDE 1 DATA OUTLET ABOVE CEILING FOR CONNECTION TO PROJECTOR.
- S22 INSTALL DEVICE IN NEW CEILING. EXTEND EXISTING CIRCUIT TO NEW LOCATION.

ELECTRICAL SYSTEMS NOTES

- A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.
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SYSTEMS FIRST FLOOR - NEW WORK PLAN - AREA 'D'

E-141D

TAGGED NOTES

S1 PROVIDE 1 DATA OUTLET ABOVE CEILING FOR CONNECTION TO PROJECTOR.

S2 PROVIDE 2 DATA DROP OUTLET ABOVE CEILING FOR CONNECTION TO PROJECTORS.

S4 CONNECT NEW CABLE TRAY TO EXISTING TRAY SYSTEM. PROVIDE BONDING AS NECESSARY TO MAKE ALL TRAY ELECTRICALLY CONTINUOUS.

ELECTRICAL SYSTEMS NOTES

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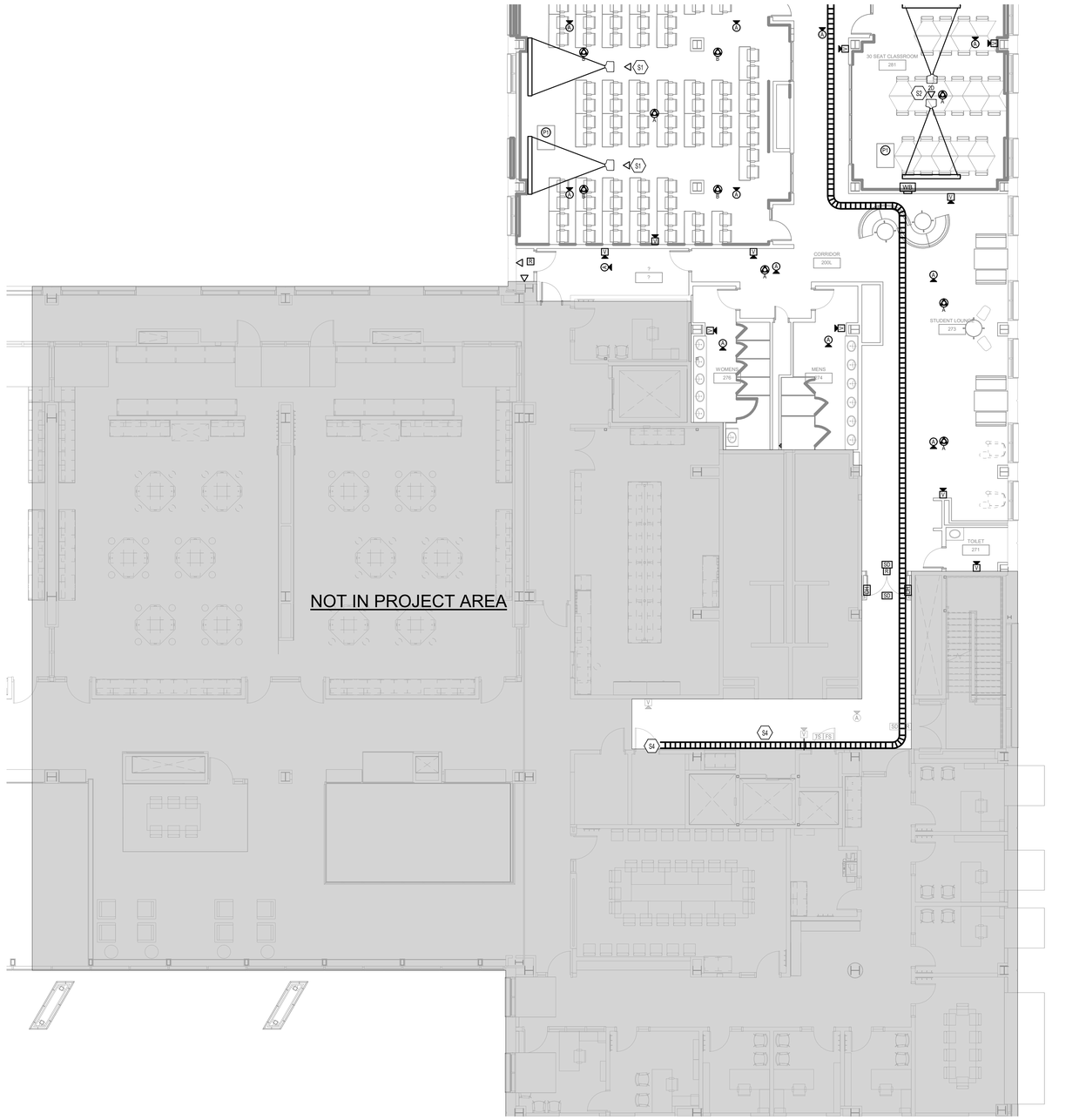

A SYSTEMS - SECOND FLOOR AREA 'C'
1/8" = 1'-0"

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No.	Description	Date

SYSTEMS SECOND FLOOR - NEW WORK PLAN - AREA 'C'

E-142C

TAGGED NOTES

S1 PROVIDE 1 DATA OUTLET ABOVE CEILING FOR CONNECTION TO PROJECTOR.

S2 PROVIDE 2 DATA DROP OUTLET ABOVE CEILING FOR CONNECTION TO PROJECTORS.

ELECTRICAL SYSTEMS NOTES

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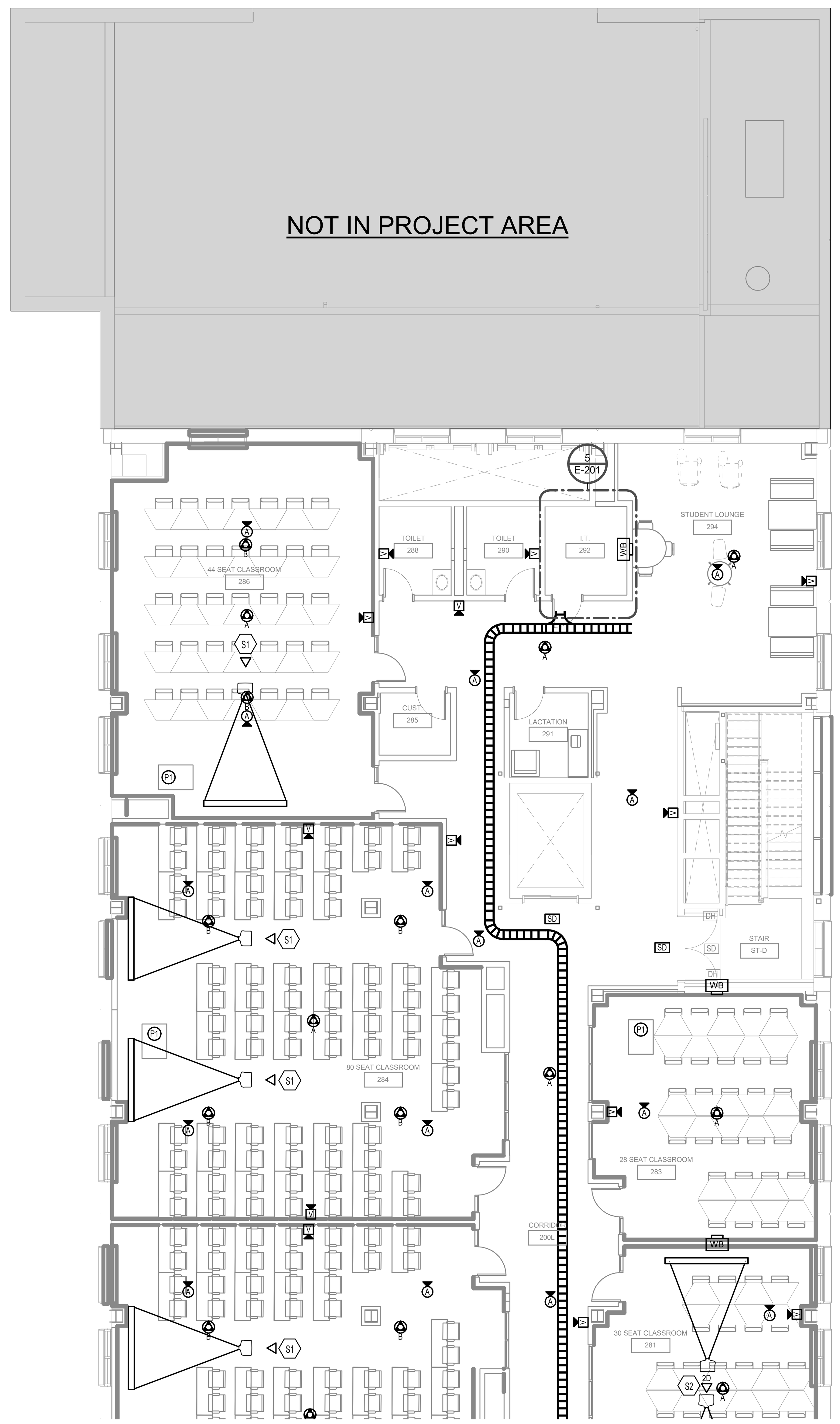

A SYSTEMS - SECOND FLOOR AREA 'D'
1/8" = 1'-0"

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SYSTEMS SECOND FLOOR - NEW WORK PLAN - AREA 'D'

E-142D

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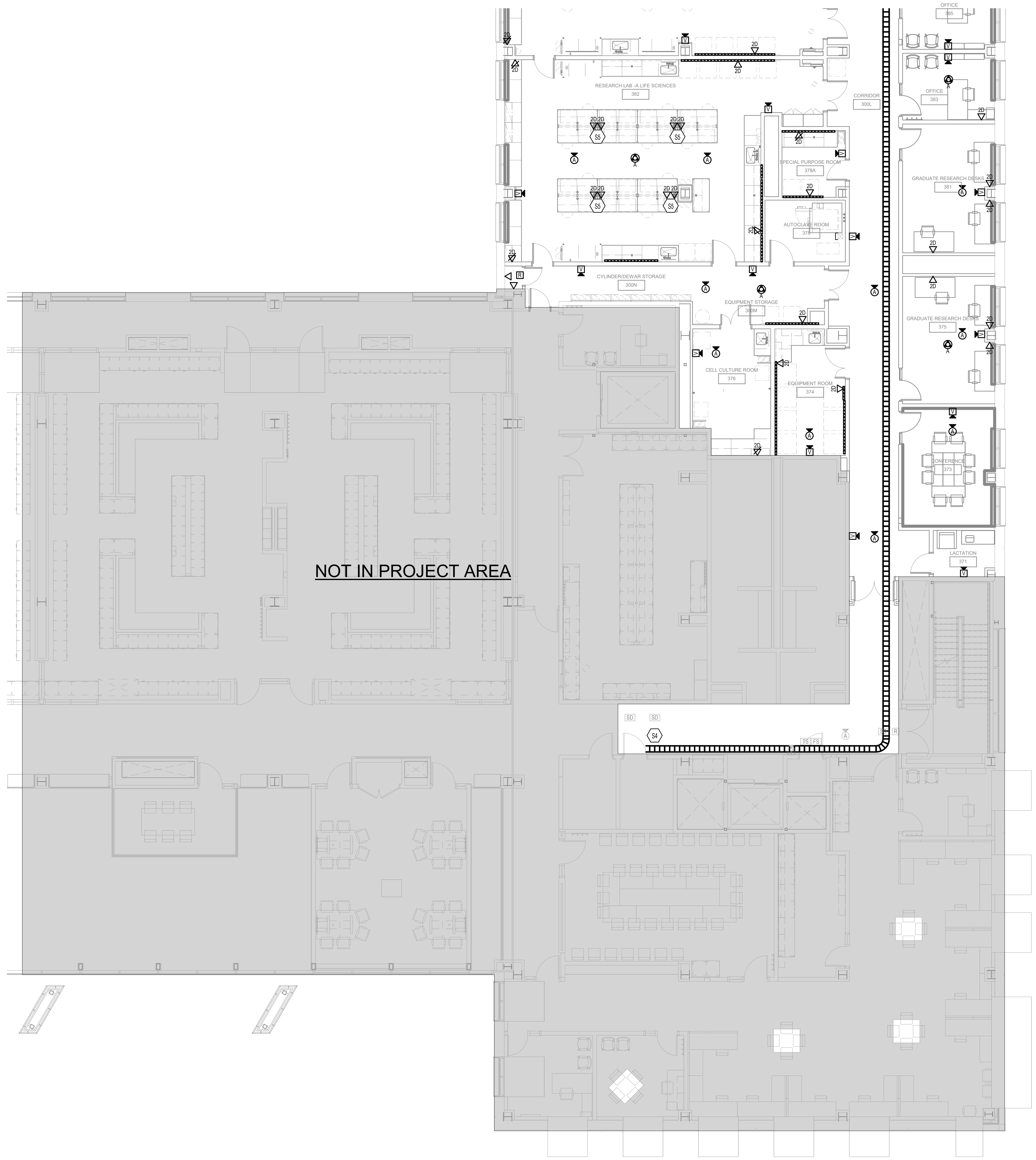

A SYSTEMS - THIRD FLOOR AREA 'C'
1/8" = 1'-0"

TAGGED NOTES

##

- S4 CONNECT NEW CABLE TRAY TO EXISTING TRAY SYSTEM. PROVIDE BONDING AS NECESSARY TO MAKE ALL TRAY ELECTRICALLY CONTINUOUS.
- S5 PROVIDE DATA AT CEILING PANEL FOR LAB CASEWORK. REFER TO LAB CONSULTANT DRAWINGS FOR INSTALLATION DETAIL.

ELECTRICAL SYSTEMS NOTES

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SYSTEMS THIRD FLOOR - NEW WORK PLAN - AREA 'C'

E-143C

TAGGED NOTES

S5 PROVIDE DATA AT CEILING PANEL FOR LAB CASEWORK. REFER TO LAB CONSULTANT DRAWINGS FOR INSTALLATION DETAIL.

ELECTRICAL SYSTEMS NOTES

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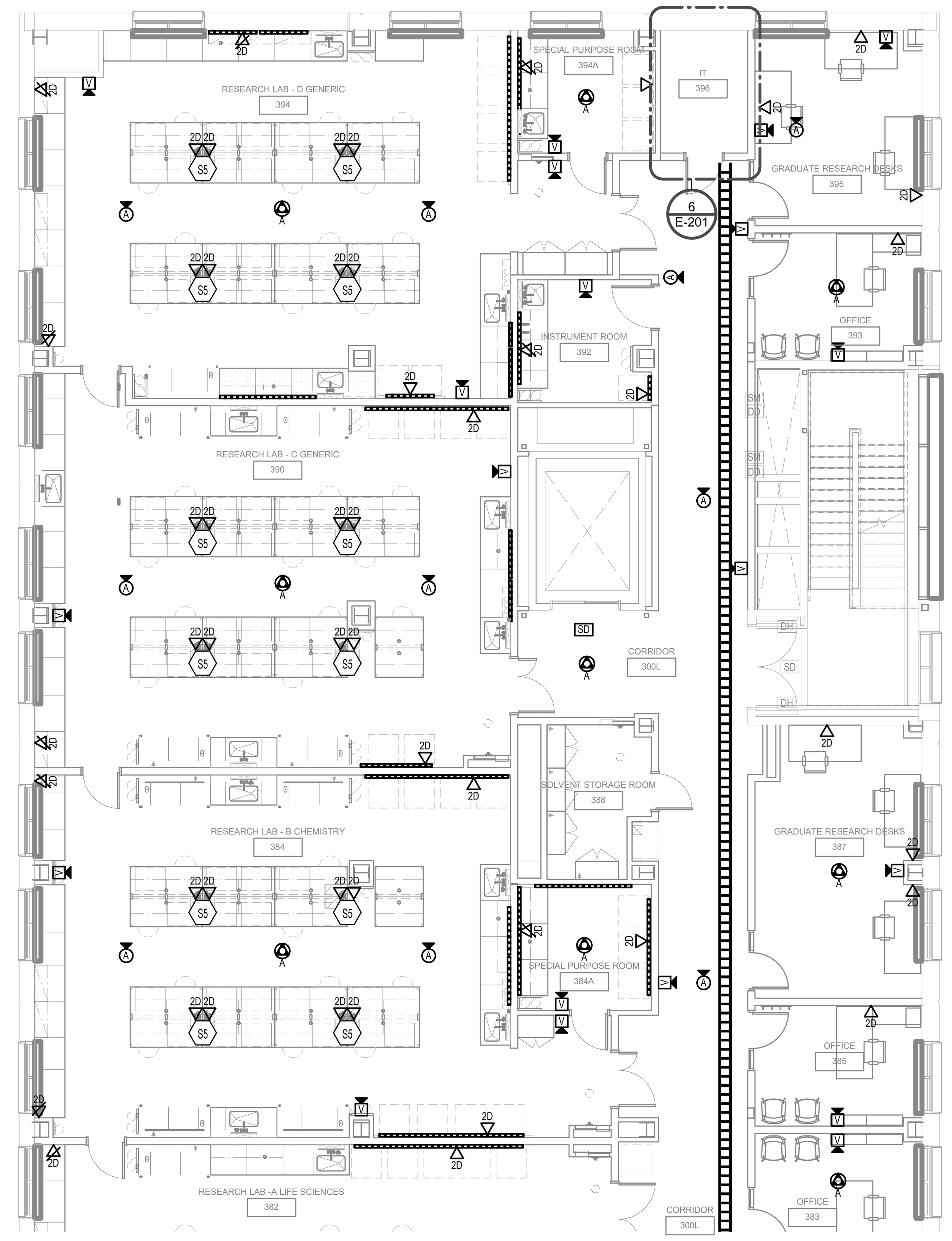

A SYSTEMS - THIRD FLOOR AREA 'D'
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LEXINGTON, KENTUCKY

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DATE	3.14.23

REVISIONS

No.	Description	Date

SYSTEMS THIRD FLOOR - NEW WORK PLAN - AREA 'D'

E-143D

Autodesk Docs://202277 - UK JSB Improvements/2022.XKJS22 MEP.rvt

TAGGED NOTES

##

ELECTRICAL SYSTEMS NOTES

A. REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

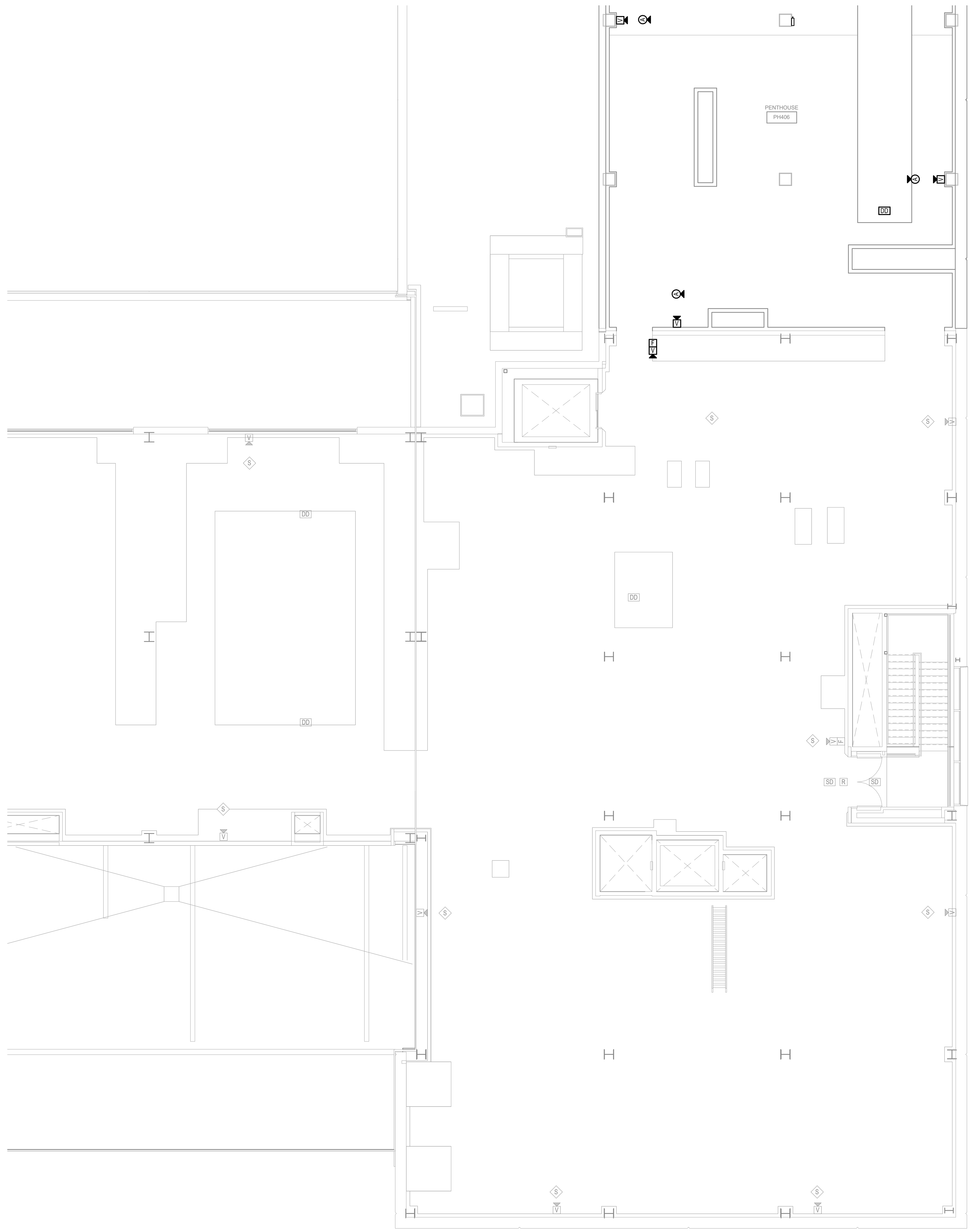
B. CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

C. IDENTIFY THE PANEL AND CIRCUIT NUMBER FOR ALL RECEPTACLES, SWITCHES, ETC. IN AREA OF CONSTRUCTION. PROVIDE CLEAR ADHESIVE LABELS WITH BLACK LETTERING. IN HEALTHCARE FACILITIES, ENGRAVE EMERGENCY DEVICE COVERPLATES IN PATIENT CARE AREAS. MARK INSIDES OF ALL DEVICE BOXES WITH PANEL AND CIRCUIT NUMBER.

D. REFER TO "SYSTEM INSTALLATION MATRIX" (ON SYSTEMS LEGEND SHEET) AND SPECIFICATIONS FOR CONTRACTOR REQUIREMENTS OF EACH SYSTEM.

E. THE CONTRACTOR SHALL ROUTE ALL "SYSTEM CONDUIT STUB-UPS" TO THE NEAREST CORRIDOR CABLING PATH (SEE "STUB-UP" DETAILS). REFER TO CABLING PATH INSTALLATION DETAIL FOR ADDITIONAL REQUIREMENTS.

F. CONTRACTOR SHALL PAINT ALL SYSTEMS CONDUIT STUB-UPS LIGHT BLUE FOR SYSTEMS CABLING INTO THE CORRIDOR CABLING PATH. PROVIDE PULL STRINGS IN ALL NEW CONDUIT RUNS FOR SYSTEM CABLING INSTALLATION.



1 SYSTEMS - FOURTH FLOOR AREA 'C'
1/8" = 1'-0"

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CONTRACT DOCUMENTS
IMPROVE FACILITIES - JACOBS SCIENCE BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
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REVISIONS

No.	Description	Date

SYSTEMS FOURTH FLOOR - NEW WORK PLAN - AREA 'C'

E-144C

3/13/2023 7:28:51 PM

TAGGED NOTES

S20 PROVIDE DUCT DETECTOR AT MOTORIZED DAMPERS.

ELECTRICAL SYSTEMS NOTES

A REFER TO THE ARCHITECT'S REFLECTED CEILING PLANS, ELEVATIONS, AND CASEWORK DETAILS FOR EXACT LOCATIONS OF ALL WALL AND CEILING MOUNTED ELECTRICAL DEVICES.

B CONTRACTOR SHALL FOLLOW BRANCH CIRCUITING LAY-OUT, AS INDICATED ON THE FLOOR PLANS, WITH A MAXIMUM OF THREE (3) BRANCH CIRCUITS PER HOMERUN. EACH BRANCH CIRCUIT SHALL BE PROVIDED WITH A DEDICATED NEUTRAL CONDUCTOR. DEDICATED NEUTRAL CONDUCTORS SHALL BE CONSIDERED CURRENT CARRYING. IF ADDITIONAL CONDUCTORS ARE RAN IN THE SAME CONDUIT WITH THOSE INDICATED, CONTRACTOR SHALL DERATE ALL CURRENT CARRYING CONDUCTORS PER NEC 310.15(B)(3), AND UPSIZE CONDUIT AS REQUIRED PER NEC 300.17 AND ANNEX C. MULTIWIRE BRANCH CIRCUITS AS DEFINED IN NEC 100 / 210.4 (CIRCUITS SHARING A COMMON NEUTRAL CONDUCTOR) SHALL NOT BE PERMITTED.

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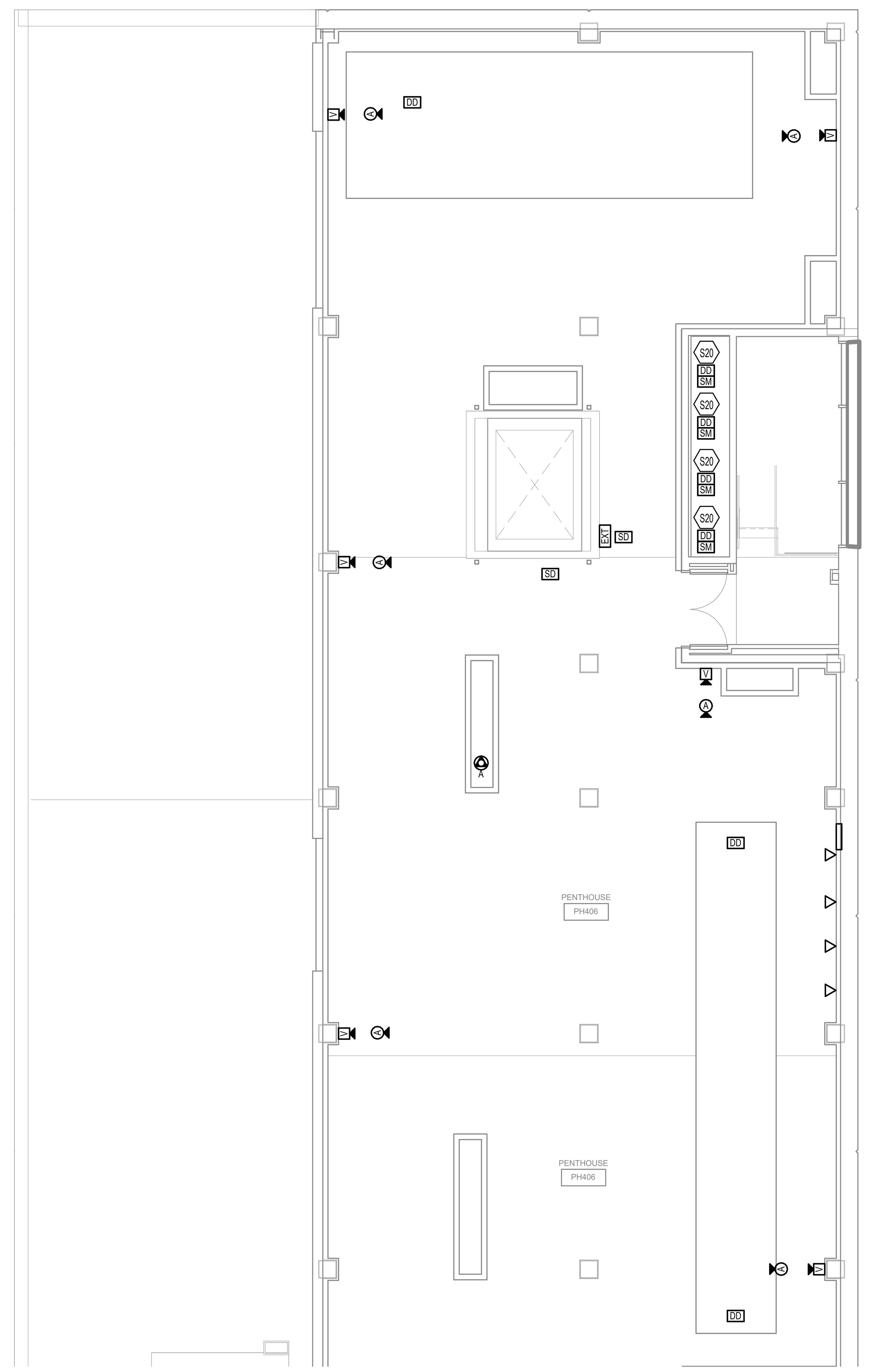

A SYSTEMS - FOURTH FLOOR AREA 'D'
1/8" = 1'-0"

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SYSTEMS
FOURTH FLOOR
- NEW WORK
PLAN - AREA 'D'

E-144D

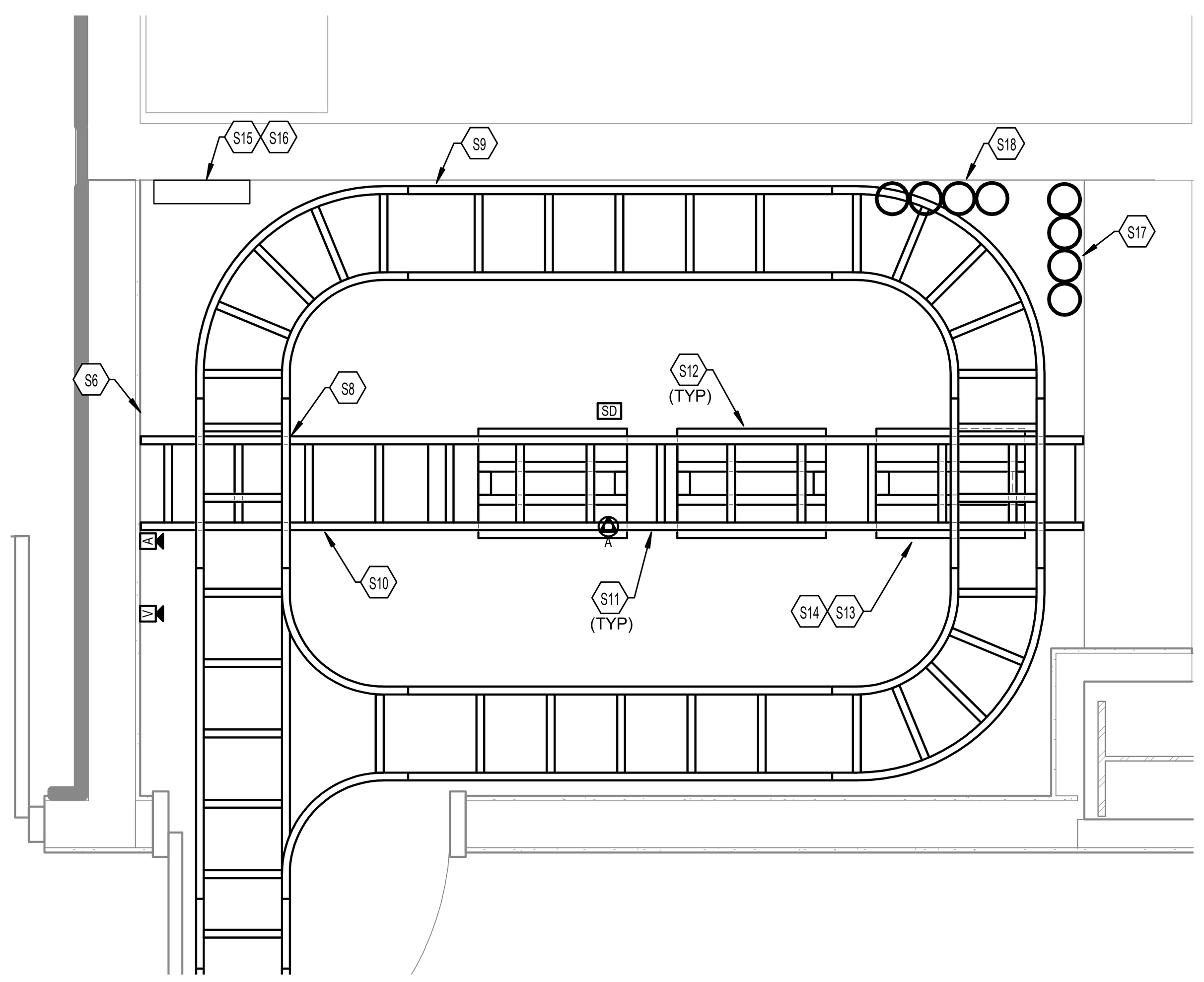
ELECTRICAL ENLARGED NOTES

A ALL ROOM LAYOUTS ARE TYPICAL AND MAY VARY OR MIRROR OTHER ASSOCIATED ROOMS. CONTRACTOR SHALL REFER TO ARCHITECTURAL ELEVATIONS AND COORDINATE EACH ROOM PRIOR TO ROUGH-IN.

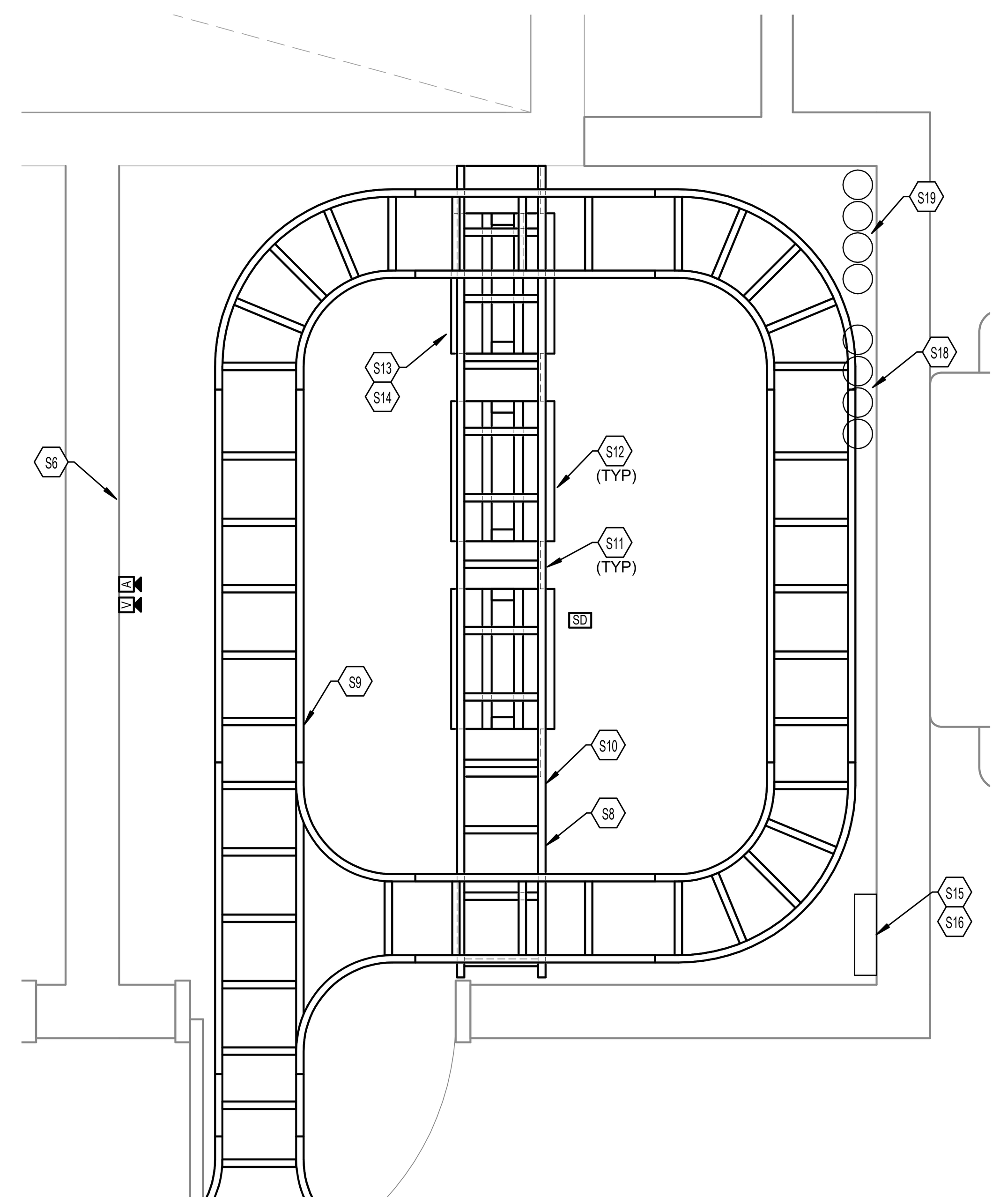
TAGGED NOTES

##

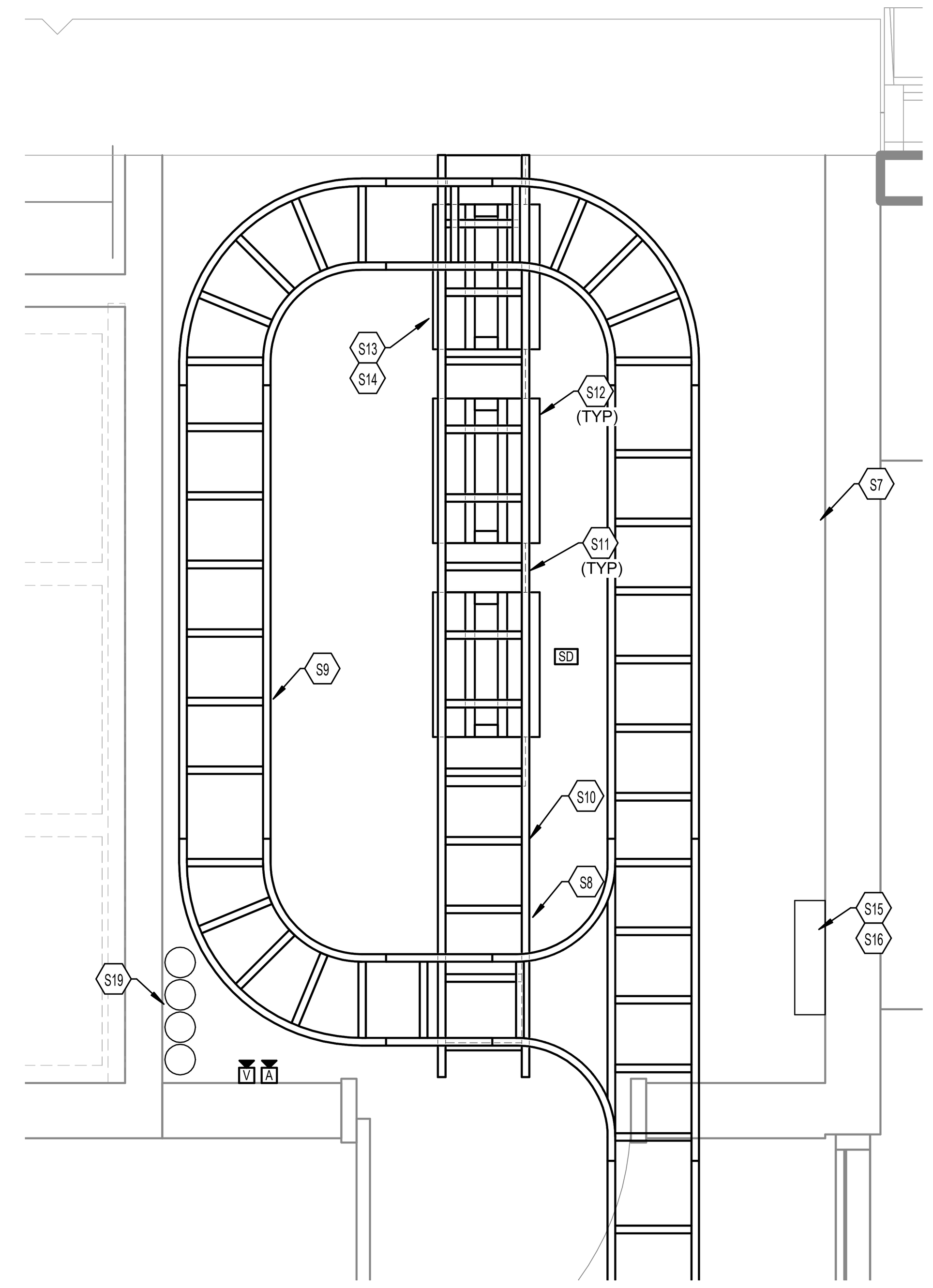
- E11 PROVIDE TWO L6-30R RECEPTACLES BEHIND EACH DATA RACK LOCATED IN NEW IT ROOM FOR CONNECTION TO RACK MOUNT EQUIPMENT. COORDINATE WITH UKIT STAFF PRIOR TO INSTALLATION.
- S6 PROVIDE 3/4" PLYWOOD BACKBOARD PAINTED WITH 2 COATS OF FIRE RETARDANT WHITE PAINT ON ALL WALLS OF COMMUNICATION ROOM, LEAVING SELECTED PLYWOOD STAMPS VISIBLE FOR INSPECTION. EXTEND FROM 4" AFF TO 8'-6" AFF. (TYPICAL)
- S7 PROVIDE COPPER COMMUNICATIONS GROUND BAR (TGB) MOUNTED AT 6'-0" AFF. BOND ALL RACKS, TRAY, LADDER, SHIELDS, SLEEVES, EQUIPMENT, ETC. IN THIS ROOM TO TGB WITH #6 COPPER. PROVIDE 500KCMIL BONDING CONDUCTOR BACK TO BUILDING TMGB IN MDF. REFER TO GROUNDING ONE-LINE.
- S8 PROVIDE FACTORY FABRICATED RADIUS DROP-OUT FOR ALL CABLE TRANSITIONING FROM LADDER TO CABLE RUNWAY.
- S9 PROVIDE 12"X4" LADDER-STYLE CABLE TRAY AT 8' AFF AROUND PERIMETER OF NEW IT ROOM.
- S10 PROVIDE 12"X4" CABLE RUNWAY MOUNTED TO TOP OF NEW DATA RACK AND BOLTED TO WALL ON EITHER SIDE.
- S11 PROVIDE VERTICAL WIRE MANAGEMENT ON ALL SIDES OF RACK. (TYPICAL)
- S12 PROVIDE NEW DATA RACK AND WIRE MANAGEMENT.
- S13 PROVIDE NEW FIBER BACKBONE CABLING TO DATA RACK . REFER TO COMMUNICATIONS ONE-LINE DIAGRAM. ALL TERMINATIONS TO BE ON CORNING 24 STRAND LC PIGTAIL SPLICE CASSETTES (CCH-CS24-A9-P00RE).
- S14 PROVIDE NEW COPPER TRUNK CABLING TO DATA RACK . REFER TO COMMUNICATIONS ONE-LINE DIAGRAM. ALL TERMINATIONS TO BE ON RACK-MOUNTED 110 BLOCKS
- S15 PROVIDE NEW HARDLINE COAX FROM BUILDING MDF TO EACH NEW IDF. REFER TO ONE-LINE DIAGRAM. HARDLINE TERMINATION AND DISTRIBUTION DEVICES WILL BE PROVIDED BY SPECTRUM.
- S16 PROVIDE WALL-MOUNT PATCH PANEL WITH BULKHEAD F CONNECTORS. TERMINATE ALL CATV STATION CABLING AT THIS LOCATION.
- S17 PROVIDE FOUR 4" CONDUITS FROM BUILDING MDF TO 1ST FLOOR IDF. PROVIDE GROUNDING BUSHINGS AND BOND TO TGB.
- S18 PROVIDE FOUR 4" CONDUITS FROM 1ST FLOOR IDF TO 2ND FLOOR IDF. PROVIDE GROUNDING BUSHINGS AND BOND TO TGB.
- S19 PROVIDE FOUR 4" CONDUITS FROM 2ND FLOOR IDF TO 3RD FLOOR IDF. PROVIDE GROUNDING BUSHINGS AND BOND TO TGB.



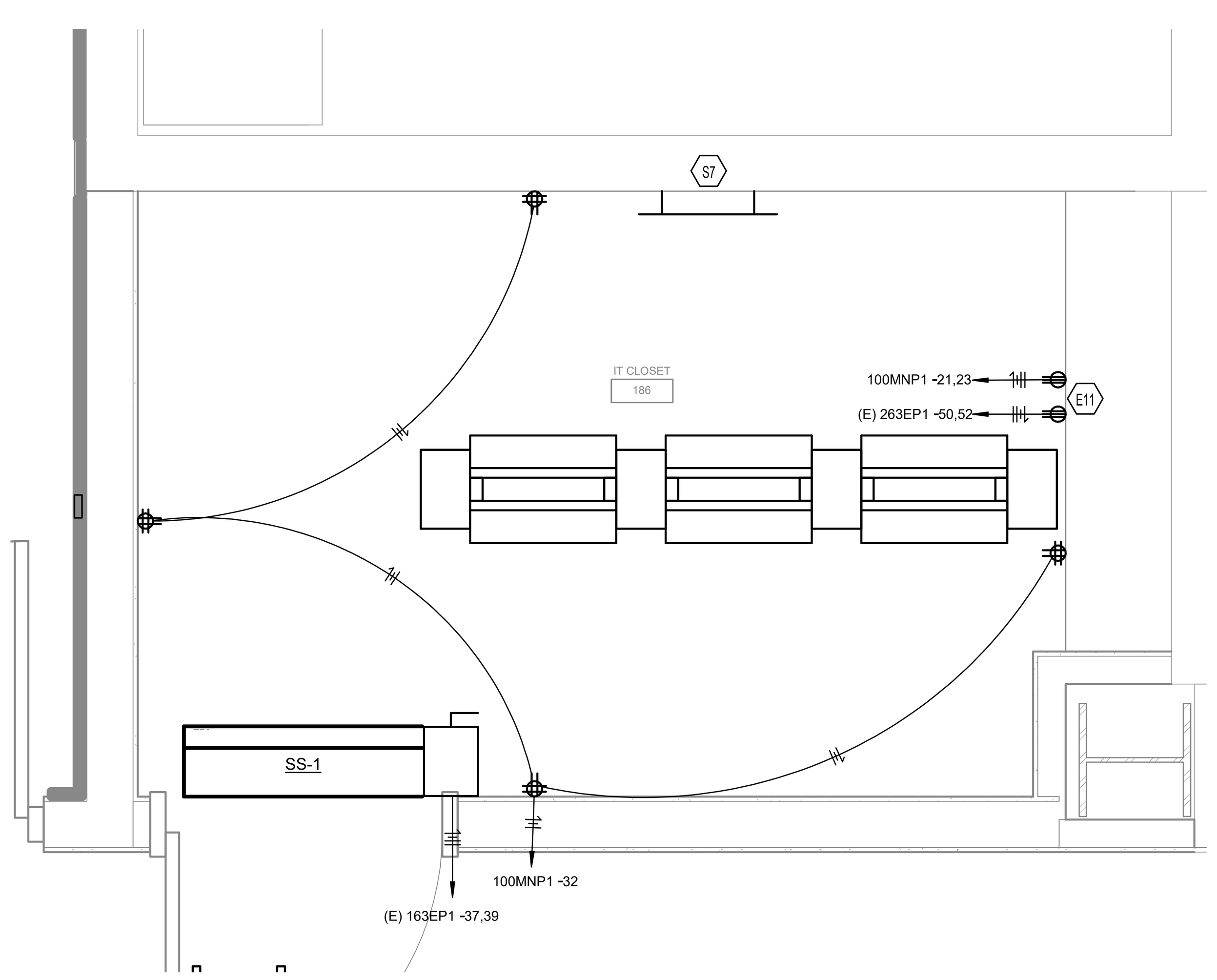
1 **FIRST FLOOR IT CLOSET - SYSTEMS**
3/4" = 1'-0"



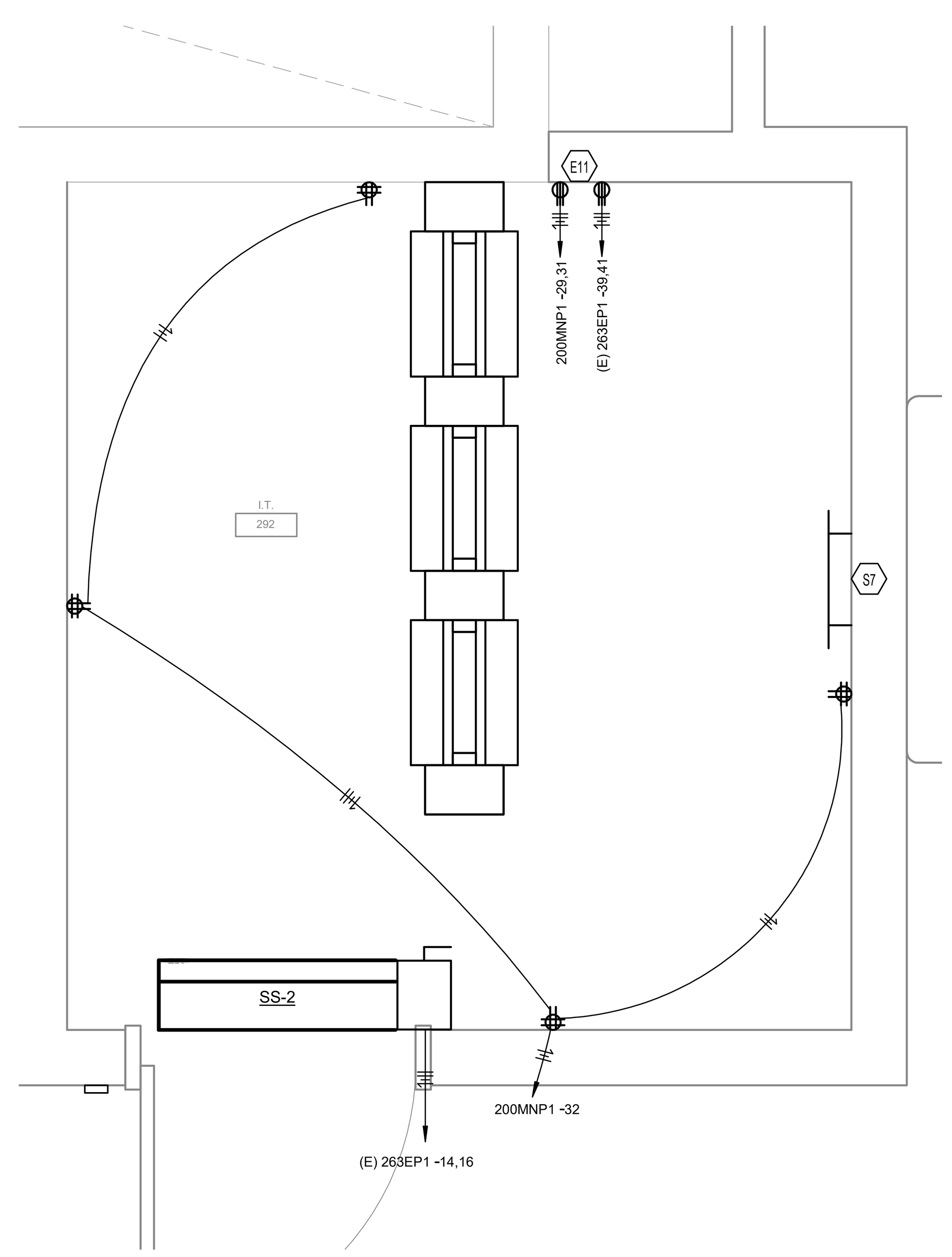
2 **SECOND FLOOR IT CLOSET - SYSTEMS**
3/4" = 1'-0"



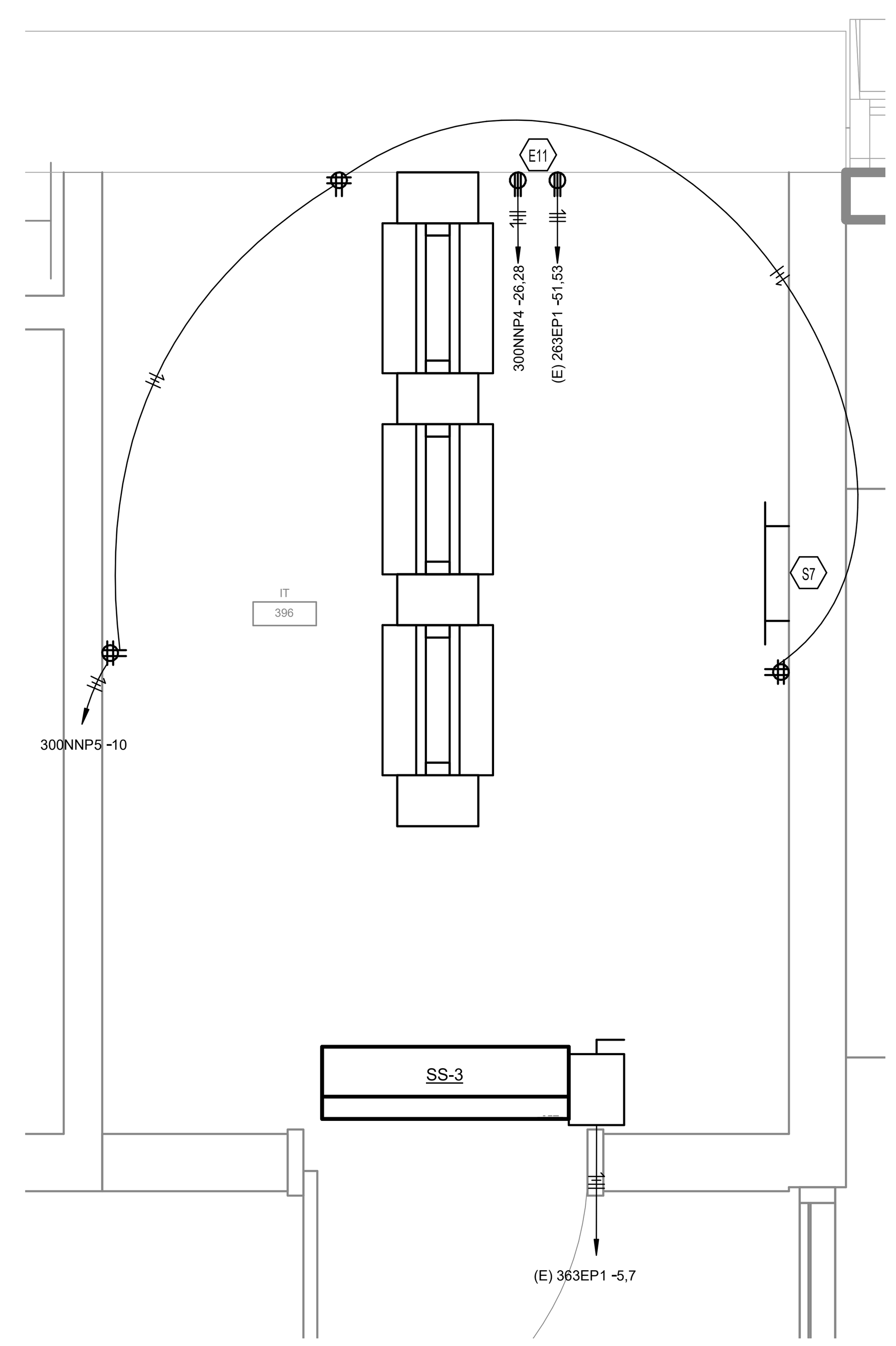
3 **THIRD FLOOR IT CLOSET - SYSTEMS**
3/4" = 1'-0"



4 **FIRST FLOOR IT CLOSET - POWER**
3/4" = 1'-0"



5 **SECOND FLOOR IT CLOSET - POWER**
3/4" = 1'-0"



6 **THIRD FLOOR IT CLOSET - POWER**
3/4" = 1'-0"

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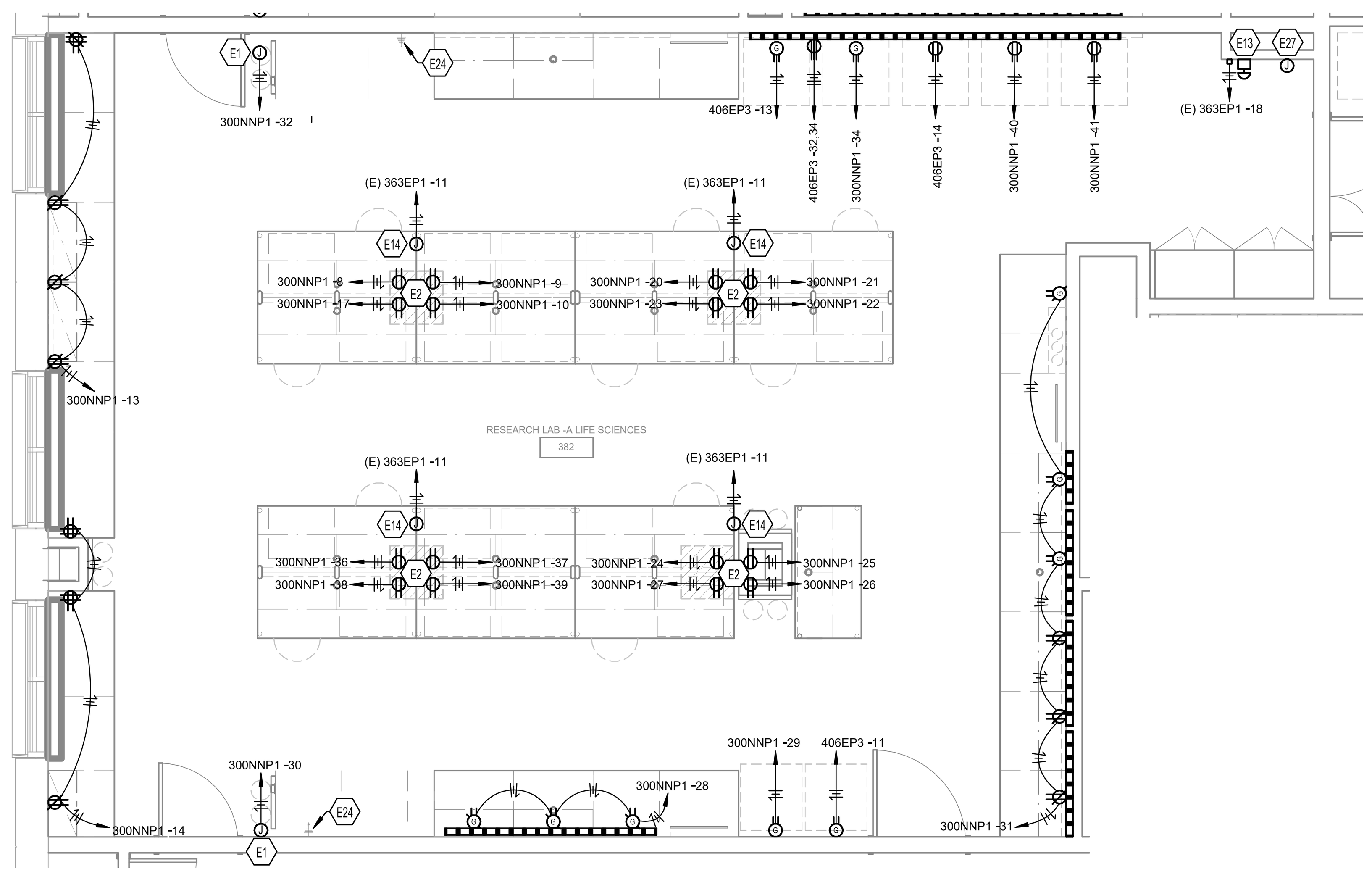
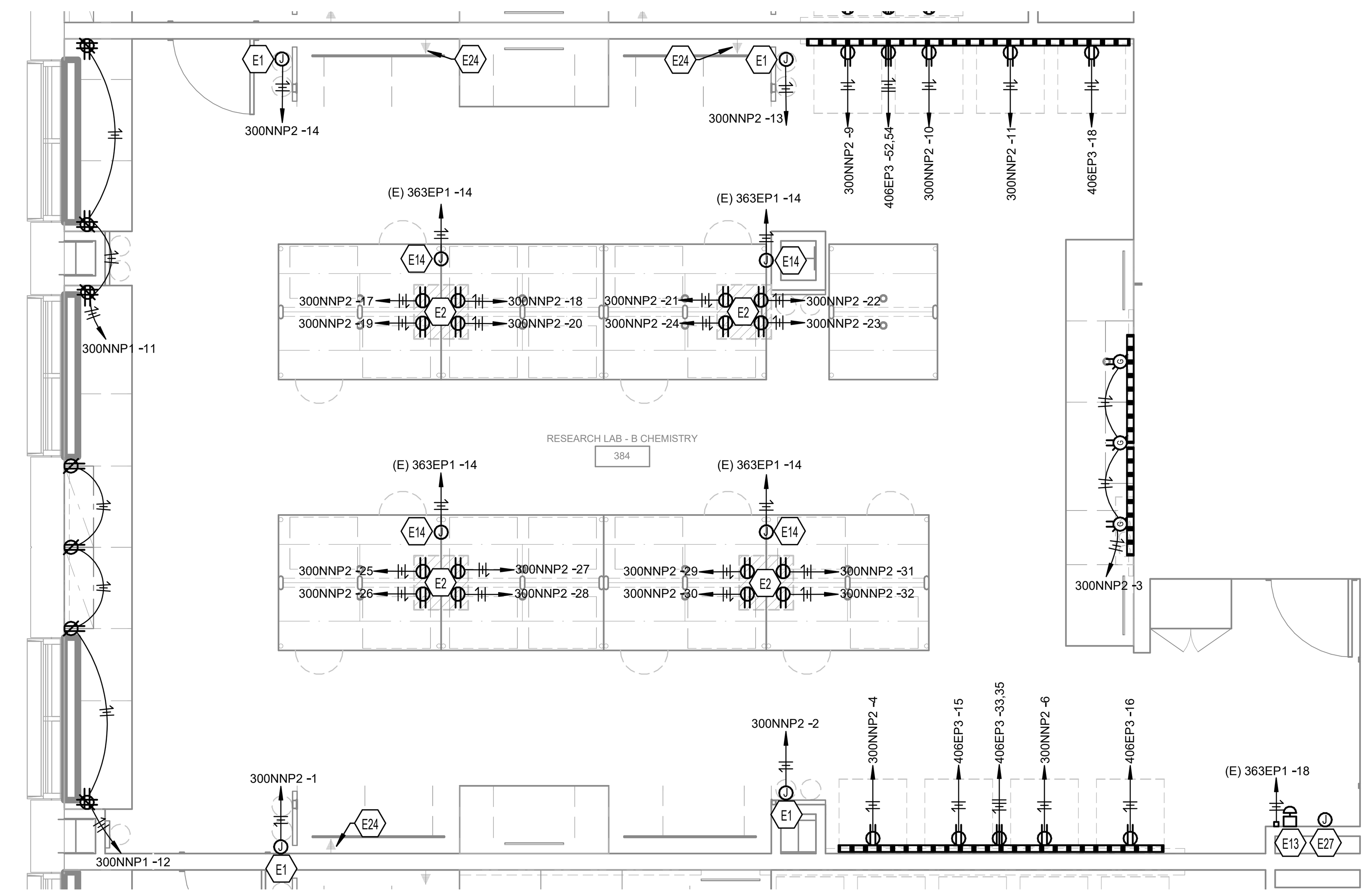
ELECTRICAL ENLARGED VIEWS

E-201



1 POWER - RESEARCH LAB - A LIFE SCIENCES
1/4" = 1'-0"



2 POWER - RESEARCH LAB - B CHEMISTRY
1/4" = 1'-0"

ELECTRICAL POWER NOTES

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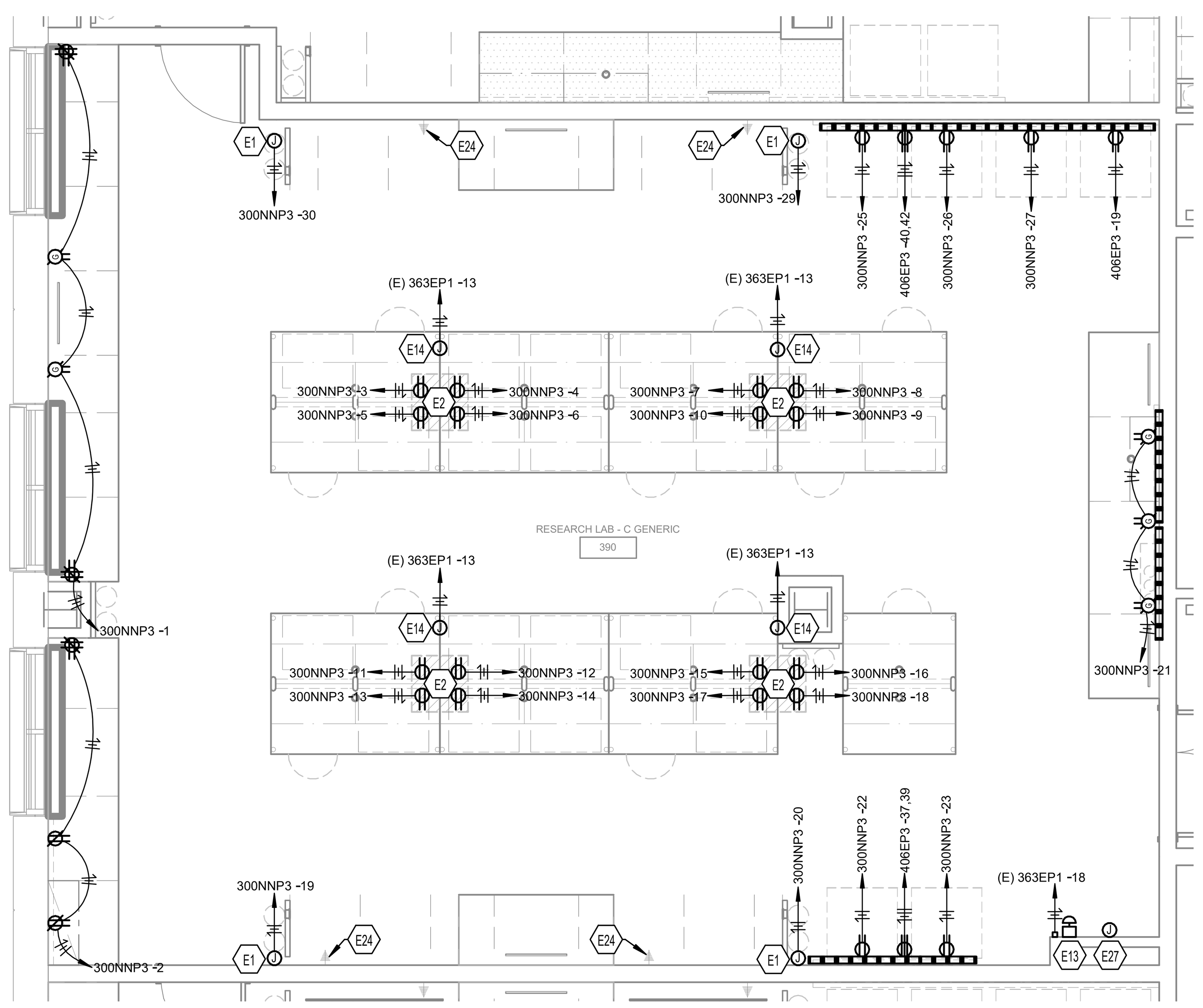
- D RECEPTACLES THAT ARE CONTROLLED BY AN AUTOMATIC MEANS SUCH AS OCCUPANCY SENSOR OR ENERGY MANAGEMENT SYSTEM SHALL BE MARKED IN ACCORDANCE WITH NEC 406.3(E).
- E LOCATIONS OF ELECTRICAL CONNECTIONS AND LOCAL DISCONNECTS SHALL BE COORDINATED WITH MECHANICAL AND PLUMBING CONTRACTORS TO ENSURE ACCESS AND WORKING CLEARANCE IS MAINTAINED PER NEC. NOTIFY OTHER TRADES OF REQUIRED CLEARANCE AREAS TO AVOID ROUTING OF OTHER SYSTEMS IN THESE AREAS. DO NOT INSTALL ELECTRICAL EQUIPMENT OVER EQUIPMENT NAMEPLATES OR ACCESS PANELS OR THROUGH ACCESS/MAINTENANCE CLEARANCES OF EQUIPMENT BY OTHER TRADES.

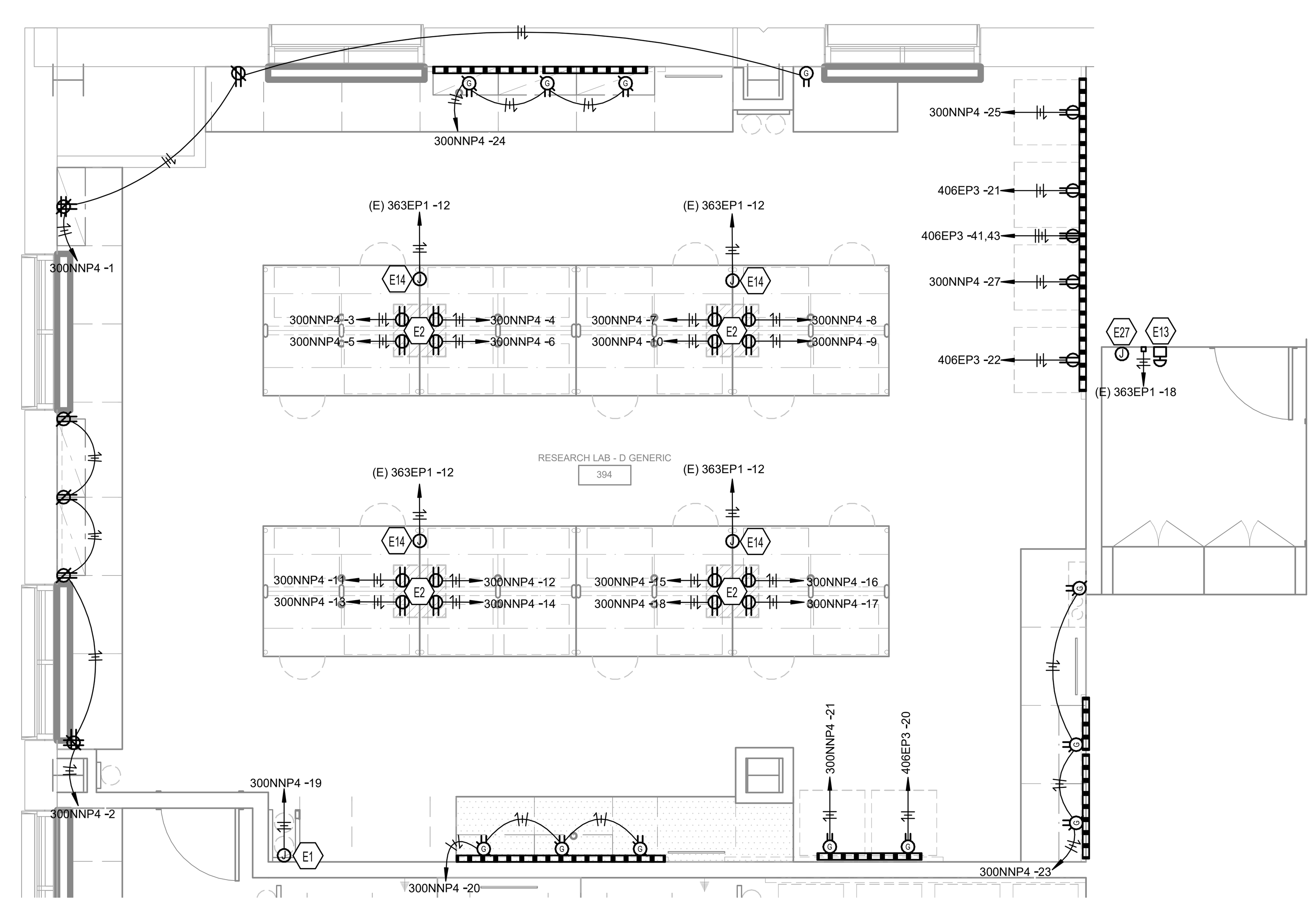
TAGGED NOTES

##

- E1 PROVIDE POWER CONNECTION FOR FUME HOOD RECEPTACLES.
- E2 PROVIDE CEILING PANEL WITH NEMA L5-20R TWIST LOCK CONNECTIONS FOR LAB CASEWORK POWER. REFER TO LAB CONSULTANT DRAWINGS FOR INSTALLATION DETAIL.
- E13 CONNECT EMERGENCY POWER OFF AND CONTACTOR TO SOLENOID VALVE IN LAB ROOM.
- E14 PROVIDE POWER AT EXHAUST MANIFOLD CONNECTION.
- E24 PROVIDE 1#6 GROUND FOR CONNECTION TO STORAGE CABINET. COORDINATE LOCATION PRIOR TO ROUGH-IN. EXTEND TO CLOSEST STEEL COLUMN AND BOND. MAKE CONNECTION ABOVE CEILING IN ACCESSIBLE AREA.
- E27 PROVIDE POWER FOR EMERGENCY SHOWER/EYE WASH UNIT EMERGENCY ALARM AND LIGHT SYSTEM. CONNECT TO NEAREST CIRCUIT FOR EMERGENCY POWER OFF.



3 POWER - RESEARCH LAB C - GENERIC
1/4" = 1'-0"



4 POWER - RESEARCH LAB D - GENERIC
1/4" = 1'-0"

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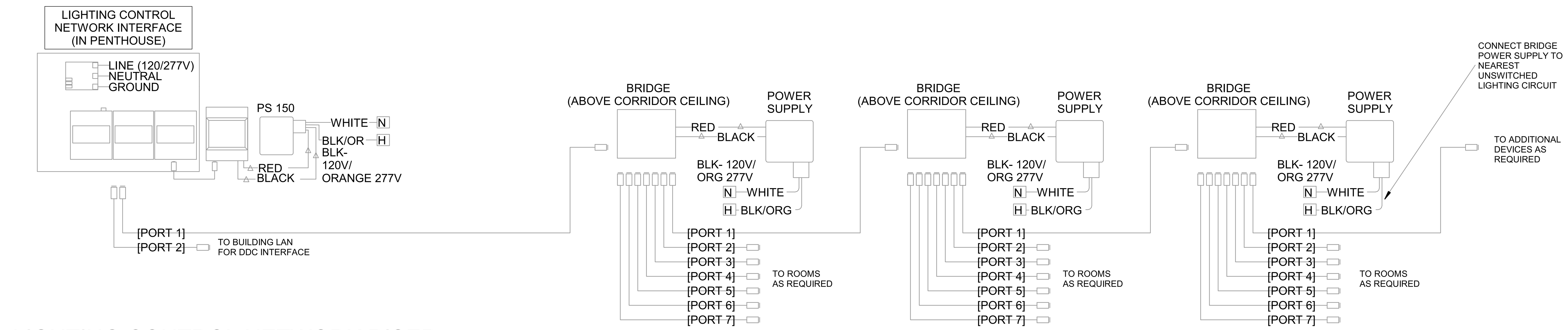
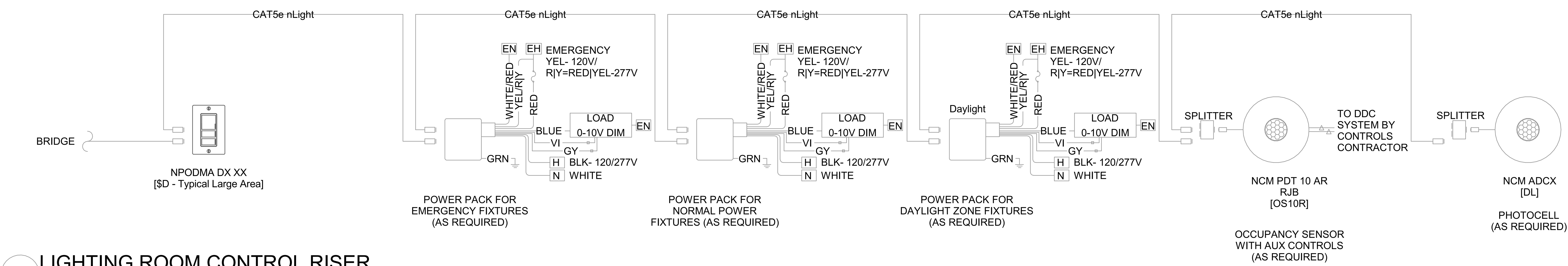
ELECTRICAL ENLARGED VIEWS

E-202



1 LIGHTING CONTROL NETWORK RISER
Design 1



2 LIGHTING ROOM CONTROL RISER
Design 1

SOO		OCCUPANCY SENSOR				TIME CLOCK			WALL SWITCH					DAYLIGHT SENSOR			OTHER			NOTES
		VACANCY MODE (MANUAL ON)	OCCUPANCY MODE (AUTO ON)	SENSOR TIME OUT PERIOD (MINUTES)	DUAL TECHNOLOGY	SCHEDULE ON TIME	SCHEDULE OFF TIME	SCHEDULE OVERRIDE SWITCH	MANUAL (ON/OFF)	MANUAL DIMMING	KEY SWITCH	SCENE CONTROL	GRAPHIC TOUCHSCREEN	SWITCHING (ON/OFF)	DIMMING	TARGET LIGHTING LEVELS (FC)	EXTERIOR LOCATION	PLUG LOAD CONTROL	NETWORKED	
A	CONFERENCE	X		10	X			X		X					X				X	
B	CORRIDOR/COMMONS		X	10		TBD	TBD		X						X				X	
C	LAB	X		10	X			X		X									X	
D	OFFICE	X		10	X			X		X					X				X	
E	RESTROOM		X	10	X			X		X									X	

SEQUENCE OF OPERATIONS

A. CONFERENCE ROOMS

When occupant enters space, lights shall remain off until manually turned ON via wall switch. Occupancy sensor shall maintain lights ON while space is occupied, and automatically turn them OFF after 10 minutes of all occupants vacating space. Lights to be manually controlled by dimming wall switch controls. Lights within daylighting zones shall automatically dim in response to available daylight. The space shall also require that lighting system can interface with BAS and output contacts for the lighting system.

B. CORRIDOR/COMMONS

When occupant enters space, occupancy sensor shall automatically turn ON lights. Occupancy sensor shall maintain lights ON while space is occupied, and automatically turn them OFF after 10 minutes of all occupants vacating space. Lights to be manually controlled by on/off wall switch controls. Astronomical time clock shall turn lights on at a predetermined time and turn them off at a predetermined time. During schedule off hours, occupancy sensor or override switch shall turn lights on for a maximum of 2 hours and provide a blink warning 5 minutes prior to automatic shutoff. Lights within daylighting zones shall automatically dim in response to available daylight.

C. LABS

When occupant enters space, lights shall remain off until manually turned ON via wall switch. Occupancy sensor shall maintain lights ON while space is occupied, and automatically turn them OFF after 10 minutes of all occupants vacating space. Lights to be manually controlled by dimming wall switch controls. The space shall also require that lighting system can interface with BAS and output contacts for the lighting system.

D. OFFICES

When occupant enters space, lights shall remain off until manually turned ON via wall switch. Occupancy sensor shall maintain lights ON while space is occupied, and automatically turn them OFF after 10 minutes of all occupants vacating space. Lights to be manually controlled by dimming wall switch controls. Lights within daylighting zones shall automatically dim in response to available daylight. The space shall also require that lighting system can interface with BAS and output contacts for the lighting system.

E. RESTROOMS

When occupant enters space, occupancy sensor shall automatically turn lights on. Occupancy sensor shall maintain lights ON while space is occupied, and automatically turn them OFF after 10 minutes of all occupants vacating space. The space shall also require that lighting system can interface with BAS and output contacts for the lighting system.

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LIGHTING CONTROL RISER DIAGRAM

E-301

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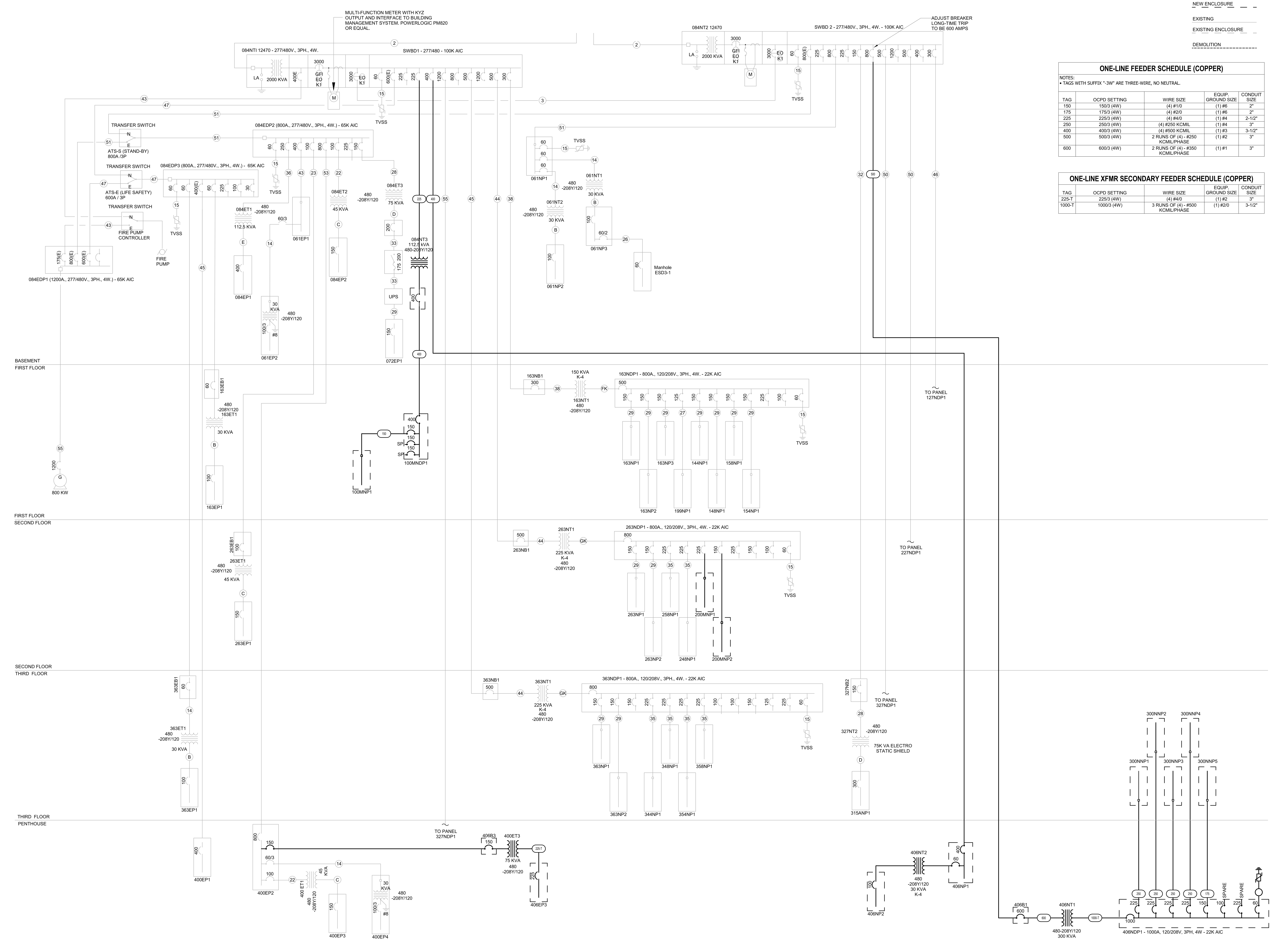
ONE-LINE NEW WORK TAGGED NOTES

ONE-LINE DIAGRAM LINETYPE LEGEND

- NEW
- NEW ENCLOSURE
- EXISTING
- EXISTING ENCLOSURE
- DEMOLITION



ONE-LINE FEEDER SCHEDULE (COPPER)				
NOTES: • TAGS WITH SUFFIX "-3W" ARE THREE-WIRE, NO NEUTRAL.				
TAG	OCPD SETTING	WIRE SIZE	EQUIP. GROUND SIZE	CONDUIT SIZE
150	150/3 (4W)	(4) #1/0	(1) #6	2"
175	175/3 (4W)	(4) #2/0	(1) #6	2"
225	225/3 (4W)	(4) #4/0	(1) #4	2-1/2"
250	250/3 (4W)	(4) #250 KCMIL	(1) #4	3"
400	400/3 (4W)	(4) #500 KCMIL	(1) #3	3-1/2"
500	500/3 (4W)	2 RUNS OF (4) - #250 KCMIL/PHASE	(1) #2	3"
600	600/3 (4W)	2 RUNS OF (4) - #350 KCMIL/PHASE	(1) #1	3"

ONE-LINE XFMR SECONDARY FEEDER SCHEDULE (COPPER)				
TAG	OCPD SETTING	WIRE SIZE	EQUIP. GROUND SIZE	CONDUIT SIZE
225-T	225/3 (4W)	(4) #4/0	(1) #2	3"
1000-T	1000/3 (4W)	3 RUNS OF (4) - #500 KCMIL/PHASE	(1) #2/0	3-1/2"

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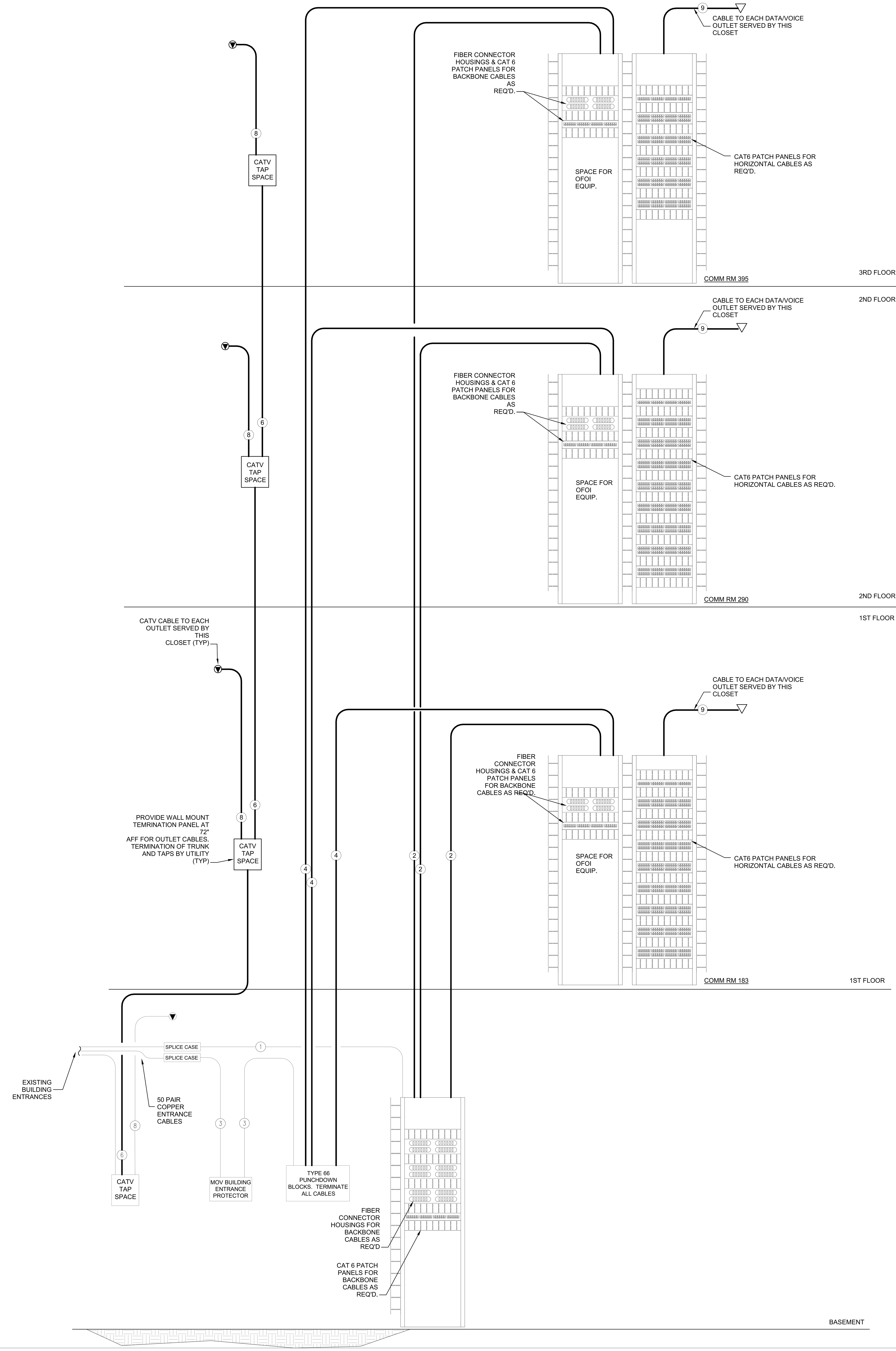
ELECTRICAL ONE-LINE DIAGRAM

E-302



GENERAL NOTES:

A. ALL PENETRATIONS THROUGH FLOORS OR WALLS SHALL BE FIRE STOPPED BY APPROVED METHOD. INSTALL FIRE STOP IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.

B. ALL EMPTY CONDUITS SHALL BE PROVIDED WITH PULL WIRE.

C. TOTAL DISTANCE FROM HORIZONTAL PATCH PANEL OR CROSS CONNECT TO WORKSTATION OUTLET SHALL NOT EXCEED 275'.

D. PROVIDE #6 GROUND TO ALL RACKS AND WALL MOUNTED EQUIPMENT. REFER TO GROUNDING DIAGRAM AND PLANS FOR GROUND BUS REQUIREMENTS.

E. CONTRACTOR SHALL PROVIDE DATA PATCH PANELS, 1 PORT PER EACH JACK WITH 25% SPARE CAPACITY. ALL CABLING SHALL TERMINATE ON RACK-MOUNT PATCH PANELS. ALL HORIZONTAL CABLING SHALL BE FULLY TERMINATED.

F. COPPER TRUNK CABLING IN IDF SHALL TERMINATE IN 110 STYLE PATCH PANELS. TERMINATE ALL PAIRS. VERIFY WITH OWNER PRIOR TO TERMINATION.

G. ALL DATA/VOICE AND CATV CABLING SHALL BE ROUTED IN CONDUIT FROM DEVICE BOX TO CABLE TRAY. CONDUIT SHALL BE CLAMPED AND BONDED TO CABLE TRAY.

H. ALL INSIDE-PLANT FIBER OPTIC CABLING SHALL BE INSTALLED IN 1" ORANGE INNERDUCT.

I. PROVIDE VERTICAL CABLE MANAGEMENT BETWEEN EACH EQUIPMENT RACK AND AT END OF EACH EQUIPMENT RACK. PROVIDE DOUBLE-SIDED HORIZONTAL CABLE MANAGEMENT BETWEEN EACH FLAT PATCH PANEL.

J. ROOM, RACK, AND EQUIPMENT LAYOUTS ARE GENERIC IN NATURE AND ONLY INTENDED TO SHOW THE GENERAL ARRANGEMENT OF COMPONENTS. ACTUAL CONFIGURATIONS SHALL BE SUBMITTED TO UK CNS FOR APPROVAL PRIOR TO INSTALLATION. REFER TO SPECIFICATIONS. PROVIDE ALL MISCELLANEOUS MATERIALS AND EQUIPMENT NECESSARY FOR A COMPLETE INSTALLATION.

CABLE LEGEND:

1. 24 STRAND SM AND 24 STRAND MM FIBERS.
2. 12 STRAND SM AND 12 STRAND MM FIBERS.
3. 50 PAIR CAT3 COPPER.
4. 25 PAIR COPPER.
5. 6 STRAND 62.5um MM FIBER.
6. .540 HARDLINE COAX.
7. 24ea. 4 PAIR CAT6 COPPER.
8. RG-6/U QUAD COAX.
9. 4 PAIR CAT6 COPPER.
10. 6 STRAND 50 UM MM FIBER

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STATE OF KENTUCKY ALAN R. KELLUM 20166 LICENSED PROFESSIONAL ENGINEER

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CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

COMMUNICATION RISER DIAGRAM

E-303

Autodesk Docs://202277 - UK JSB Improvements/2022.XKJS22 MEP.rvt
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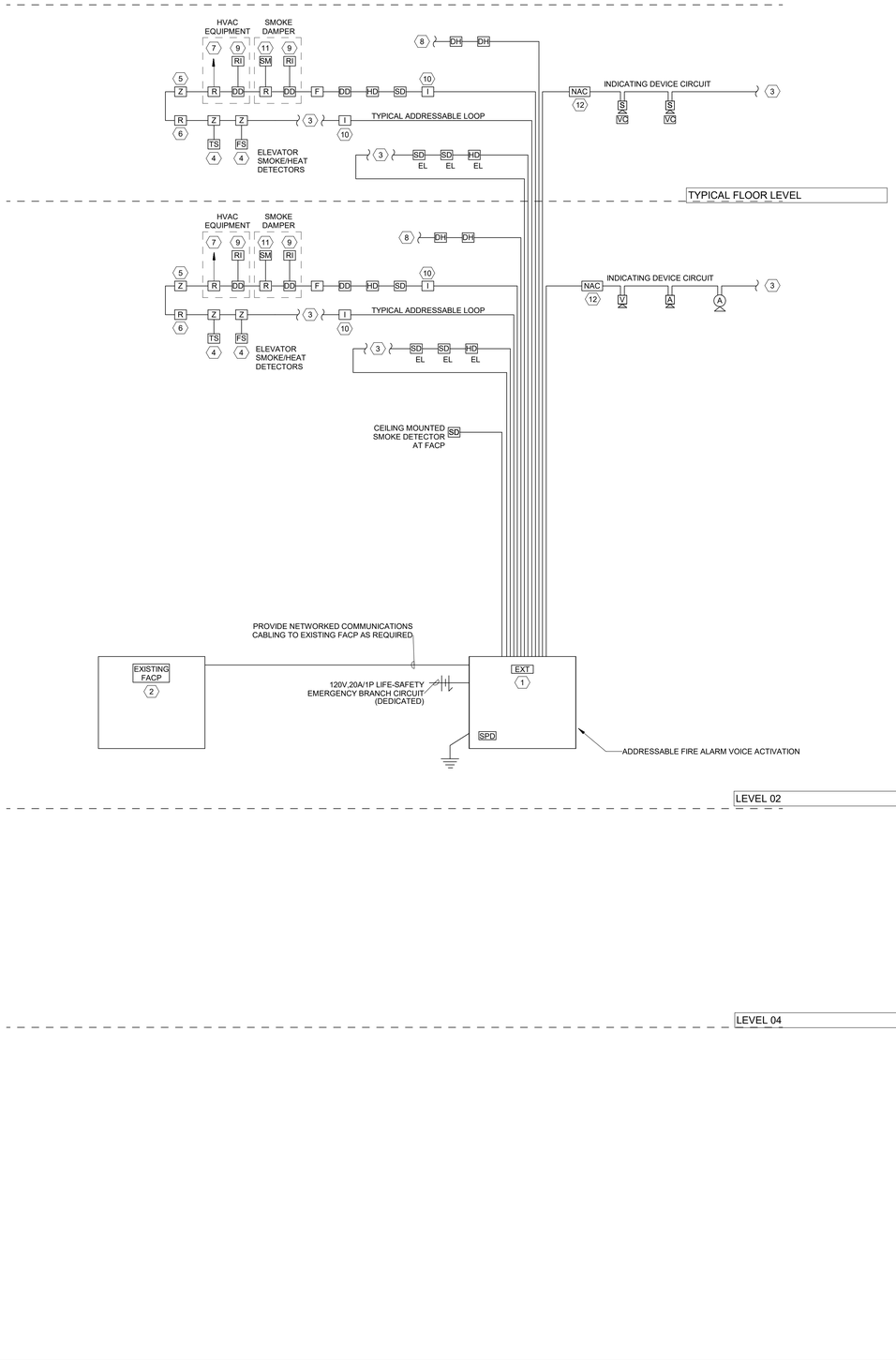
TAGGED NOTES:

1. PROVIDE NEW MICROPROCESSOR BASED, FIRE ALARM TRANSPONDER PANEL / EXTENDER AS REQUIRED, PANEL SHALL BE CAPABLE OF MONITORING ALL INDIVIDUALLY ADDRESSABLE ALARM INDICATING DEVICES OR POINTS AS INDICATED AND WITH A MINIMUM OF 20% SPARE CAPACITY FOR FUTRE EXPANISON. ALL SYSTEM EQUIPMENT SHALL BE HOUSED IN A SINGLE CABINET. REFER TO SPECIFICATIONS FOR FURTHER REQUIREMENTS.
2. PROVIDE ALL HARDWARE AND PROGRAMMING NECESSARY TO INTEGRATE NEW DEVICES INTO THE EXISTING FIRE ALARM SYSTEM.
3. TO ALL OTHER DEVICES ON LOOP/CIRCUIT AS REQUIRED. REFER TO FLOOR PLAN FOR PROPOSED DEVICE LOCATIONS.
4. COORDINATE WITH DRAWINGS FOR ACTUAL NUMBER OF TAMPER, FLOW AND PRESSURE SWITCHES REQUIRED TO BE MONITORED ON THE FIRE SUPPRESSION RISER AND THE SUPPRESSION ZONES ON EACH FLOOR.
5. PROVIDE ZONE ADDRESSABLE MODULE FOR SUPERVISION OF ANCILLARY FIRE PROTECTION/MONITORING SYSTEMS. DEVICE SHALL BE SURFACE MOUNTED IN NEMA-1 ENCLOSURE, ABOVE SUSPENDED CEILING. PROVIDE QUANTITY AND TYPE AS REQUIRED FOR: FIRE PROTECTION TAMPER, FLOW AND PRESSURE SWITCHES, FIRE PROTECTION POST-INDICATOR VALVE, DRY/CHEMICAL FIRE SUPPRESSION SYSTEMS, AND KITCHEN HOOD FIRE SUPPRESSION SYSTEM.
6. PROVIDE ADDRESSABLE FIRE ALARM RELAY FOR SIGNAL OUTPUT TO ANCILLARY BUILDING SYSTEMS. DEVICE SHALL BE SURFACE MOUNTED IN NEMA-1 ENCLOSURE, ABOVE SUSPENDED CEILING. PROVIDE QUANTITY AND TYPE AS REQUIRED. OPERABLE FIRE SHUTTERS TO CLOSE ON FIRE ALARM. ACCESS CONTROL DOORS TO UNLOCK AND POSITIVELY LATCH ON FIRE ALARM. ELEVATOR FOR ALL SPECIFIED AND REQUIRED FUNCTIONS.
7. ROUTE CONTROL WIRING (IN CONDUIT) BACK TO NEW HVAC EQUIPMENT CONTROLS FOR AUTOMATIC SHUTDOWN.
8. TO ALL OTHER DOOR HOLDERS ON INDICATED FLOOR. DOOR HOLDERS SHALL BE POWERED FROM THE FIRE ALARM SYSTEM CABINETS AND SHALL RELEASE ON FIRE ALARM AS REQUIRED. REFER TO ARCHITECTURAL DOOR HARDWARE SCHEDULES AND DIVISION 8 AND 28 SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
9. PROVIDE NEW FLUSH-MOUNTED REMOTE ALARM/POWER INDICATING KEY RESET/TEST STATION ON CORRIDOR WALL (WHENEVER POSSIBLE) AT 7'- 6" AFF BELOW SMOKE DAMPER/DUCT SMOKE DETECTOR LOCATION AS REQUIRED.
10. PROVIDE AN "ISOLATOR MODULE" AT ALL BRANCH RUNS IF REQUIRED. MOUNT IN A SURFACE NEMA-1 ENCLOSURE ABOVE THE SUSPENDED CEILING. PROVIDE AS REQUIRED BY SYSTEM MANUFACTURER TO ISOLATE LOOPS ON EACH FLOOR AND WITHIN EACH SMOKE COMPARTMENT.
11. ROUTE 120V POWER WIRING THROUGH ADDRESSABLE RELAY MODULE FOR CONTROL OF DAMPER VIA ASSOCIATED DUCT/AREA SMOKE DETECTOR.
12. PROVIDE NUMBER OF NOTIFICATION APPLIANCE POWER SUPPLIES AS REQUIRED. LOCATE IN ELECTRICAL ROOMS. SUBMIT PROPOSED LOCATIONS IN SHOP DRAWINGS FOR REVIEW.

FIRE ALARM SYSTEM RISER LEGEND:

V	DUAL ALERT STROBE (VISUAL OUTPUT @ 110 CANDELAS MINIMUM)
A	WALL MOUNTED AUDIO-ONLY NOTIFICATION APPLIANCE
A	CEILING MOUNTED AUDIO-ONLY NOTIFICATION APPLIANCE
A	MASS NOTIFICATION CEILING SPEAKER
F	FIRE ALARM DOUBLE ACTION MANUAL PULL STATION
DD	FIRE ALARM DUCT MOUNTED SMOKE DETECTOR
RI	FLUSH MOUNTED REMOTE ALARM/POWER INDICATING KEY RESET/TEST STATION.
HD	CEILING MOUNTED FIRE ALARM HEAT DETECTOR
HD 200°	CEILING MOUNTED FIRE ALARM HEAT DETECTOR - 200° FIXED TEMPERATURE
SD	CEILING MOUNTED FIRE ALARM SMOKE DETECTOR
TS	FIRE ALARM TAMPER SWITCH
FS	FIRE ALARM FLOW SWITCH
PS	FIRE ALARM PRESSURE SWITCH
PIV	FIRE ALARM POST INDICATING VALVE
FACP	FIRE ALARM CONTROL PANEL
FAA	FIRE ALARM REMOTE ANNUNCIATOR
DH	MAGNETIC DOOR HOLDER - RELEASES UPON FIRE ALARM ACTIVATION COORDINATE ROUGH-IN LOCATION WITH ARCHITECT
SP	SMOKE DAMPER POWER CONNECTION
FO	FIRE ALARM ADDRESSABLE OUTPUT RELAY
R	ADDRESSABLE FIRE ALARM RELAY
SPD	SURGE PROTECTION DEVICE
I	ISOLATOR MODULE
Z	ZONE ADDRESSABLE MODULE
NAC	NOTIFICATION APPLIANCE POWER SUPPLY
EXT	FIRE ALARM EXTENDER PANEL



FIRE ALARM SYSTEM GENERAL NOTES:

A. EXTEND THE EXISTING INTELLIGENT ADDRESSABLE FIRE ALARM SYSTEM TO PROVIDE COVERAGE FOR THE FIT-UP SPACE. THIS FIRE ALARM SYSTEM SHALL BE CAPABLE OF MONITORING THE INCOMING FIRE SUPPRESSION RISER, MANUAL PULL-STATIONS, ALL CEILING MOUNTED AUTOMATIC SMOKE AND HEAT DETECTORS AND ALL DUCT-MOUNTED AUTOMATIC SMOKE DETECTORS.
B. THIS RISER IS PARTIAL. ALL THE DEVICES CONNECTED TO THE FIRE ALARM CONTROL PANEL (FACP) UNITS ARE NOT SHOWN. THE CONTRACTOR SHALL REFER TO THE ELECTRICAL FLOOR PLANS FOR ADDITIONAL REQUIREMENTS.
C. ANNUNCIATE ALL INDIVIDUAL FIRE ALARM DEVICES AS WELL AS AUXILIARY FUNCTIONS AT EACH ANNUNCIATOR. REFER TO SPECIFICATIONS, AS WELL AS GENERAL NOTES AND SCHEDULES THIS SHEET.
D. FIELD VERIFY THE EXACT NUMBERS AND LOCATIONS OF ALL MECHANICAL RELATED ITEMS (EX. SPRINKLER CONNECTIONS, EXSTINGUISHING SYSTEMS, SMOKE DAMPERS, ETC.) AND MAKE CONNECTIONS AS REQUIRED/INDICATED.
E. PROVIDE A DUCT-MOUNTED SMOKE DETECTOR IN THE DUCTWORK SERVING EACH AUTOMATIC FIRE/SMOKE DAMPER. THESE DETECTORS ARE TO MONITOR THE DUCT OPENING IN A SMOKE OR FIRE RATED PARTITION. THESE DETECTORS ARE TO BE PROVIDED WITH AN AUXILIARY, 24V, NORMALLY-CLOSED, RELAY WHICH HOLDS THE DAMPER OPEN. THIS RELAY IS TO KEEP THE DAMPER OPEN UNDER NORMAL CONDITIONS, THIS RELAY IS TO BE WIRED SO THAT IT OPENS, THUS ALLOWING THE DAMPER TO CLOSE, IN THE EVENT OF AN ALARM OR LOSS OF POWER CONDITION. THESE DETECTORS ARE TO BE SUPPLIED AND CONNECTED TO THE FIRE ALARM SYSTEM BY THE ELECTRICAL CONTRACTOR AND SHALL BE INSTALLED IN THE DUCTWORK BY THE MECHANICAL CONTRACTOR.
F. PROVIDE ADDRESSABLE NOTIFICATION APPLIANCES WITH THIS SYSTEM. THESE APPLIANCES ARE TO BE WHITE WITH RED LETTERING. AUDIBLE NOTIFICATION APPLIANCES ARE TO UTILIZE AN AUDIBLE HORN SETTING AT A MIMIMUM OF 87dB. VISUAL NOTIFICATION APPLIANCES SHALL BE CAPABLE OF MULTIPLE CANDELA SETTINGS UP TO 110 CANDELAS. ALL CONDUIT IN THE FIRE ALARM SYSTEM SHALL BE 3/4" SIZE EXCEPT AS OTHERWISE NOTED. PROVIDE LARGER CONDUIT IF REQUIRED TO MAINAIN CONDUCTORS AT 40% MAXIMUM FILL.
G. FIRE ALARM MANUAL STATIONS SHALL BE DOUBLE-ACTION TYPE, POSITIVE VISUAL INDICATION OF OPERATION, KEY RESET, AND ALL SHOULD BE KEYED ALIKE.
H. AVOID PLACEMENT OF HEAT DETECTORS CLOSE TO HEAT-PRODUCING EQUIPMENT WHERE RATE-OF-RISE WILL DEGRADE DETECTOR PERFORMANCE OR PRODUCE NUISANCE ALARMS. USE DEVICES CAPABLE FIXED TEMPERATURE (165 F TO 200 F) DETECTION IN SUCH AREAS.
I. THE ENTIRE FIRE ALARM SYSTEM INSTALLATION SHALL BE IN FULL ACCORDANCE WITH THE CURRENT EDITION OF NFPA, KBC, AMERICANS WITH DISABILITIES ACT AND ALL OTHER APPLICABLE CODES.
J. COORDINATE WITH THE DOOR HARDWARE SET SPECIFICATIONS AND THE OWNER'S SECURITY REPRESENTATIVE TO VERIFY THE DOORS THAT WILL REQUIRE CONNECTION TO THE FIRE ALARM SYSTEM.
K. ALL TAMPER, FLOW AND PRESSURE SWITHCES THAT ARE PROVIDED IN THE CONTRACT SHALL BE CONNECTED TO THE FIRE ALARM SYSTEM BY FIRE ALARM CONTRACTOR. WHERE IN UNDERGROUND VAULTS, USE SEALED WATERPROOF CONNECTORS AND SWITCHES. REFER TO FIRE SUPPRESSION SYSTEM SHOP DRAWING FOR EACH TYPE OF DEVICE AND LOCATIONS.
L. ALL FIRE ALARM STROBE LIGHTS SHALL BE SYCRONIZED TO ACCOMIDATE BUILDING STANDARDS.
M. ALL FIRE ALARM SYSTEM CABLING SHALL BE ROUTED IN CONDUIT. CONDUIT SHALL BE 3/4" MINIMUM OR AS REQUIRED TO SUIT CONDUCTORS. CONDUIT SHALL BE MANUFACTURED RED IN COLOR - FIELD PAINTED RED CONDUIT SHALL NOT BE ACCEPTED.
N. PROVIDE DUCT MOUNTED SMOKE DETECTORS FOR AIR HANDLING UNITS THAT ARE 2000 CFM OR GREATER.
O. THE SENSITIVITY OF SMOKE DETECTORS SHALL BE ADJUSTED FOR THE SERVICE DUTY IN THE AREA INDICATED, TO SUIT BUILDING OPERATIONAL CONDITIONS.
P. WIRE SIZE SELECTIONS FOR AUDIO/VISUAL UNITS SHALL BE CALCULATED AND SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
Q. RISER DIAGRAM FOR FIRE ALARM SYSTEM IS FOR BID PURPOSES ONLY. SYSTEM SHALL BE INSTALLED AND CONNECTED IN ACCORDANCE WITH WIRING DIAGRAMS OBTAINED FROM MANUFACTURER AND THAT HAVE BEEN APPROVED BY THE STATE FIRE MARSHALL'S OFFICE OR THE LOCAL AUTHORITY HAVING JURISDICTION, AS APPLICABLE. IT IS THE RESPONIBILITY OF THE CONTRACTOR TO CONFIRM ALL QUANITIES AND LOCATION OF FIRE ALARM DEVICES PRIOR TO SYSTEM ACTIVATION.
R. AUTOMATIC FIRE ALARM DETECTORS SHALL BE LOCATED SO AS TO PREVENT SHIELDING BY DUCTWORK, EQUIPMENT AND PIPING ON CEILING. SPACING BETWEEN DETECTORS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS IN ANY CASE. ADDITIONAL DETECTORS SHALL BE PROVIDED IF NEEDED TO INSURE COMPLETE COVERAGE OF THE INDICATED SPACE.
S. FIRE ALARM SIGNALING DEVICES SHALL BE SEMI-FLUSH TYPE AUDIBLES AND DUAL LENS FLASHING LAMP PER UK STANDARD. SURFACE-MOUNTED UNITS MAY BE USED IN UNFINISHED AREAS.
T. NO SMOKE DETECTORS SHALL BE LOCATED CLOSER THAN 36" TO SUPPLY, RETURN OR EXHAUST AIR OPENINGS NOR CLOSER THAN 12" TO WALL/CEILING INTERSECTIONS.
U. SMOKE EVACUATION FAN CONTACTORS (STARTERS) SHALL BE PROVIDED BY FIRE ALARM CONTRACTOR.
V. VERIFY THE FINAL ROOM NAME AND NUMBERING SCHEME USED FOR ANNUNCIATOR LEGENDS IS IN ACCORD WITH THE ACTUAL ROOM NAMES AND NUMBERS FINALLY CHOSEN BY THE OWNER.
W. ALL ANNUNCIATOR LEGEND NUMBERING AND/OR ALPHANUMERIC DISPLAY LEGENDS SHALL BE APPROVED BY THE ARCHITECT, OWNER, AND LOCAL FIRE DEPARTMENT AUTHORITY, AS APPLICABLE. SUBMIT THIS INFORMATION WITH SHOP DRAWINGS.
X. A TECHNICAL REPRESENTATIVE OF FIRE ALARM MANUFACTURER SHALL BE PRESENT AT ALL TIMES DURING FIRE ALARM CERTIFICATION.
Y. WRITTEN CERTIFICATION OF ENTIRE FIRE ALARM SYSTEM SHALL BE SUBMITTED TO OWNER AND CMTA AT CLOSE OF PROJECT.
Z. FIRE ALARM EXTENDER PANELS SHALL NOT BE LOCATED IN MDF OR IDF ROOMS. ONLY FIRE ALARM DEVICES SERVING MDF OR IDF ROOMS SHALL BE ALLOWED IN MDF OR IDF ROOMS.

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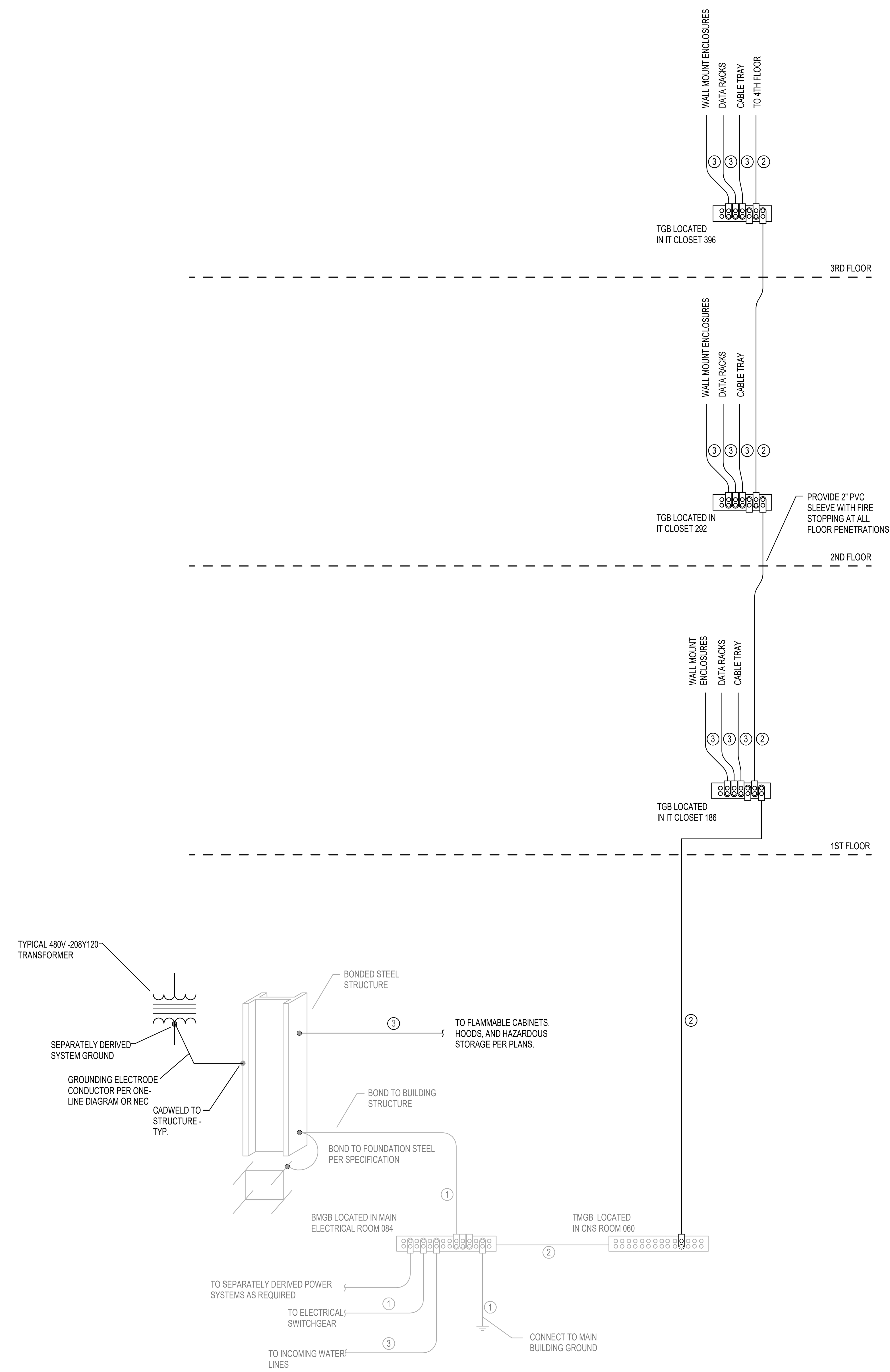
FIRE ALARM RISER DIAGRAM

E-304



GROUNDING CONDUCTOR SCHEDULE

1. #4/0 INSULATED COPPER CONDUCTOR WITH GREEN IDENTIFICATION MARKING AND CONNECTION INFORMATION LABEL ON EACH END.
2. 500 KCMIL INSULATED COPPER CONDUCTOR WITH GREEN INDENTIFICATION MARKING AND CONNECTION INFORMATION LABEL ON EACH END.
3. #2 INSULATED COPPER CONDUCTOR WITH GREEN INDENTIFICATION MARKING AND CONNECTION INFORMATION LABEL ON EACH END.

GROUNDING GENERAL NOTES:

A. BONDS TO EQUIPMENT AND ENCLOSURES NOTED IN THIS DIAGRAM ARE REPRESENTATIVE ONLY. COORDINATE ALL CONNECTIONS TO GROUNDING SYSTEM WITH PLANS AND CODE REQUIREMENTS.

B. BOND ALL SEPARATELY DERIVED POWER SYSTEMS TOBUILDING STEEL PER NEC. CONFIRM THAT ALL EMERGENCY BRANCH AND NORMAL POWER GROUNDS ARE INTERCONNECTED PER NFPA 99 AND NEC 517.14.

C. REFER TO ELECTRICAL DETAILS SHEET E6.01 FOR GROUND BAR MOUNTING AND CONNECTION REQUIREMENTS.

LEGEND:

BMGB - BUILDING MAIN GROUND BUSBAR
TMGB - TELECOMMUNICATIONS MAIN GROUND BUSBAR
TGB - TELECOMMUNICATIONS GROUND BUSBAR
GB - GROUND BUSBAR

1 ELECTRICAL GROUND SYSTEM DIAGRAM

SCALE: NONE

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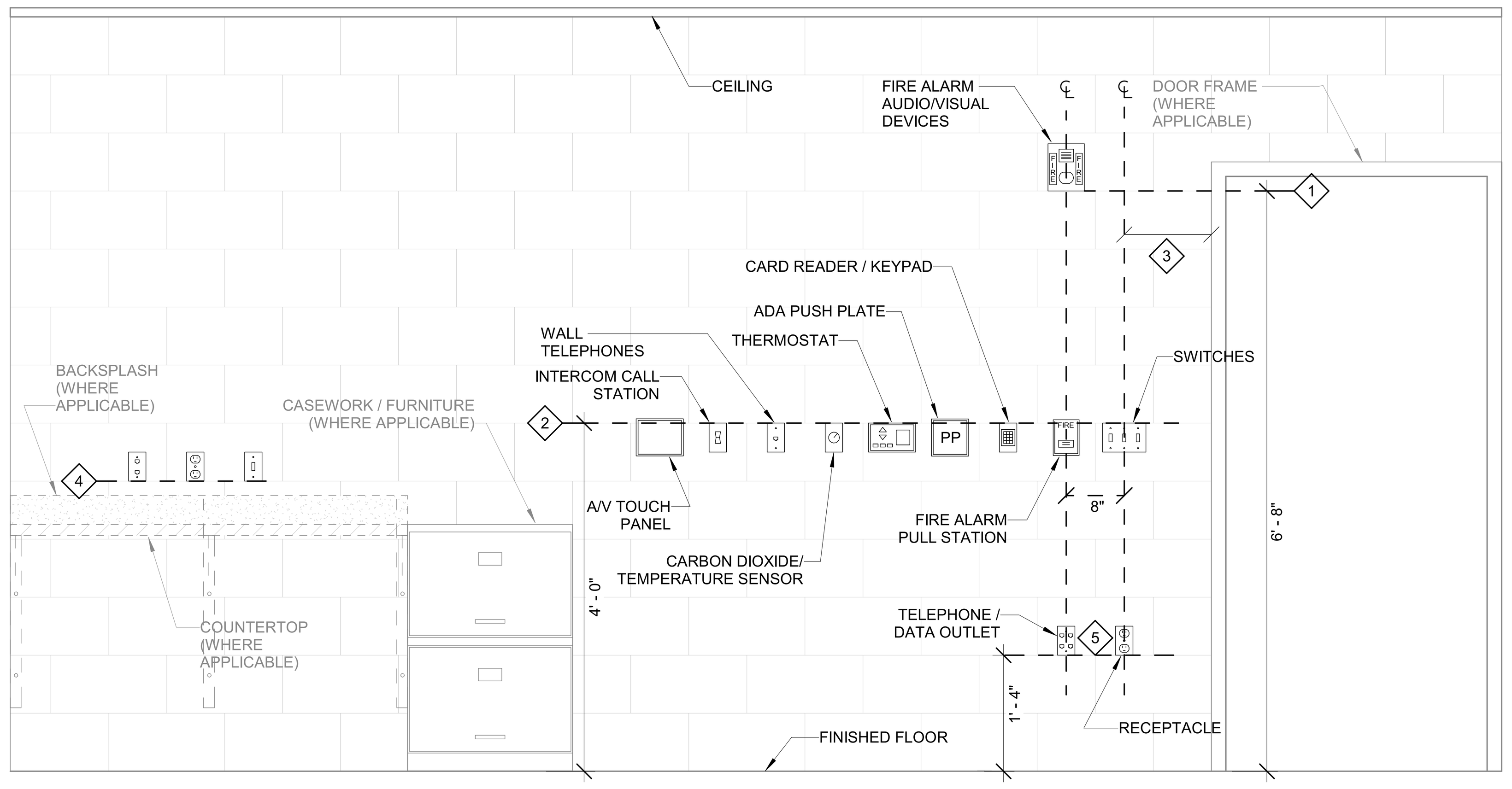
ELECTRICAL GROUND SYSTEM DIAGRAM

E-305



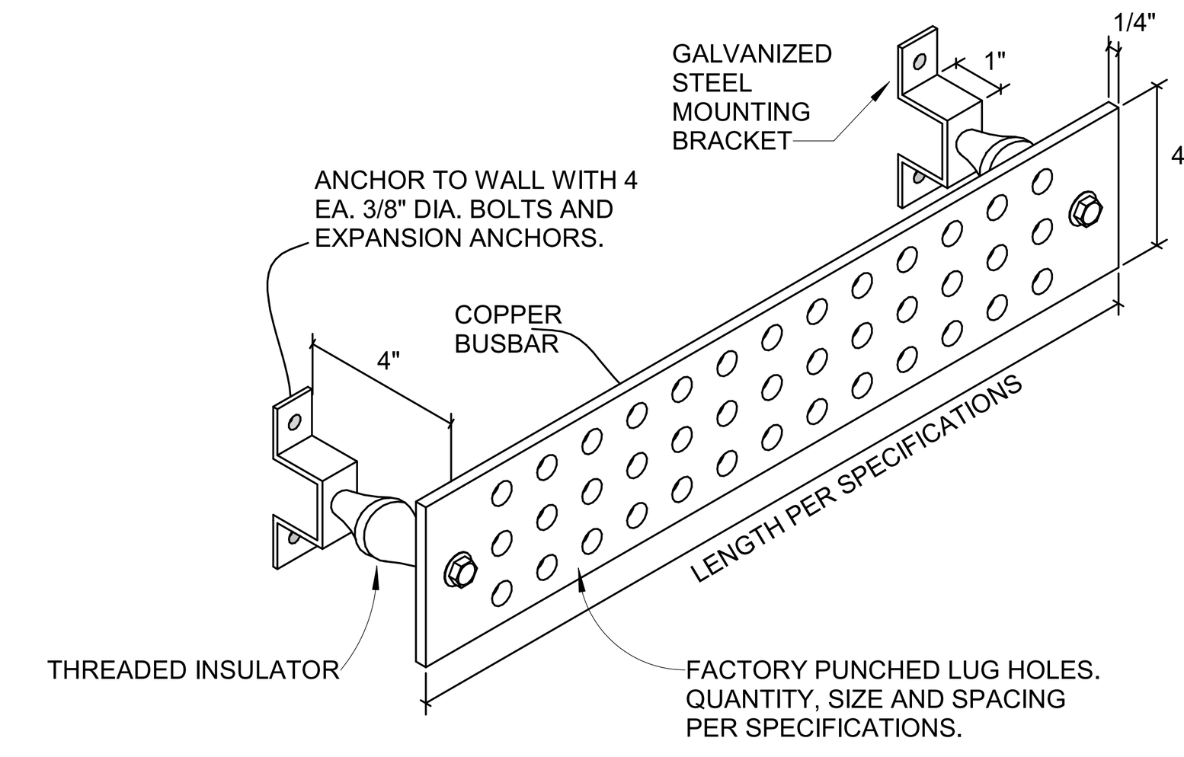
DEVICE MOUNTING DETAIL - GENERAL NOTES:

A. THIS DETAIL IS INTENDED AS A GENERAL GUIDELINE. SPECIFIC ELEVATIONS SHOWN ON ARCHITECTURAL ELEVATIONS TAKE PRECEDENCE.
B. WHERE DEVICES OF ANY DISCIPLINE ARE LOCATED IN THE SAME GENERAL AREA ON THE PLANS AND ARE SHOWN TO BE MOUNTED AT A SIMILAR HEIGHT, ALIGN HORIZONTALLY ALONG TOP OF DEVICE BACKBOX (AS SHOWN IN DETAIL AND DESCRIBED IN KEY NOTE #2).
C. WHERE DEVICES OF ANY DISCIPLINE ARE LOCATED IN THE SAME GENERAL AREA ON THE PLANS AND ARE SHOWN MOUNTED AT DIFFERENT HEIGHTS, ALIGN VERTICALLY ALONG THE CENTERLINE OF THE DEVICE BACKBOX (AS SHOWN IN DETAIL).
D. FOR ANY WALL OTHER THAN PAINTED GYPSUM BOARD OR CMU, DEVICE LOCATIONS MUST BE FIELD APPROVED BY ENGINEER OR ARCHITECT PRIOR TO INSTALLATION OF FINISHES.

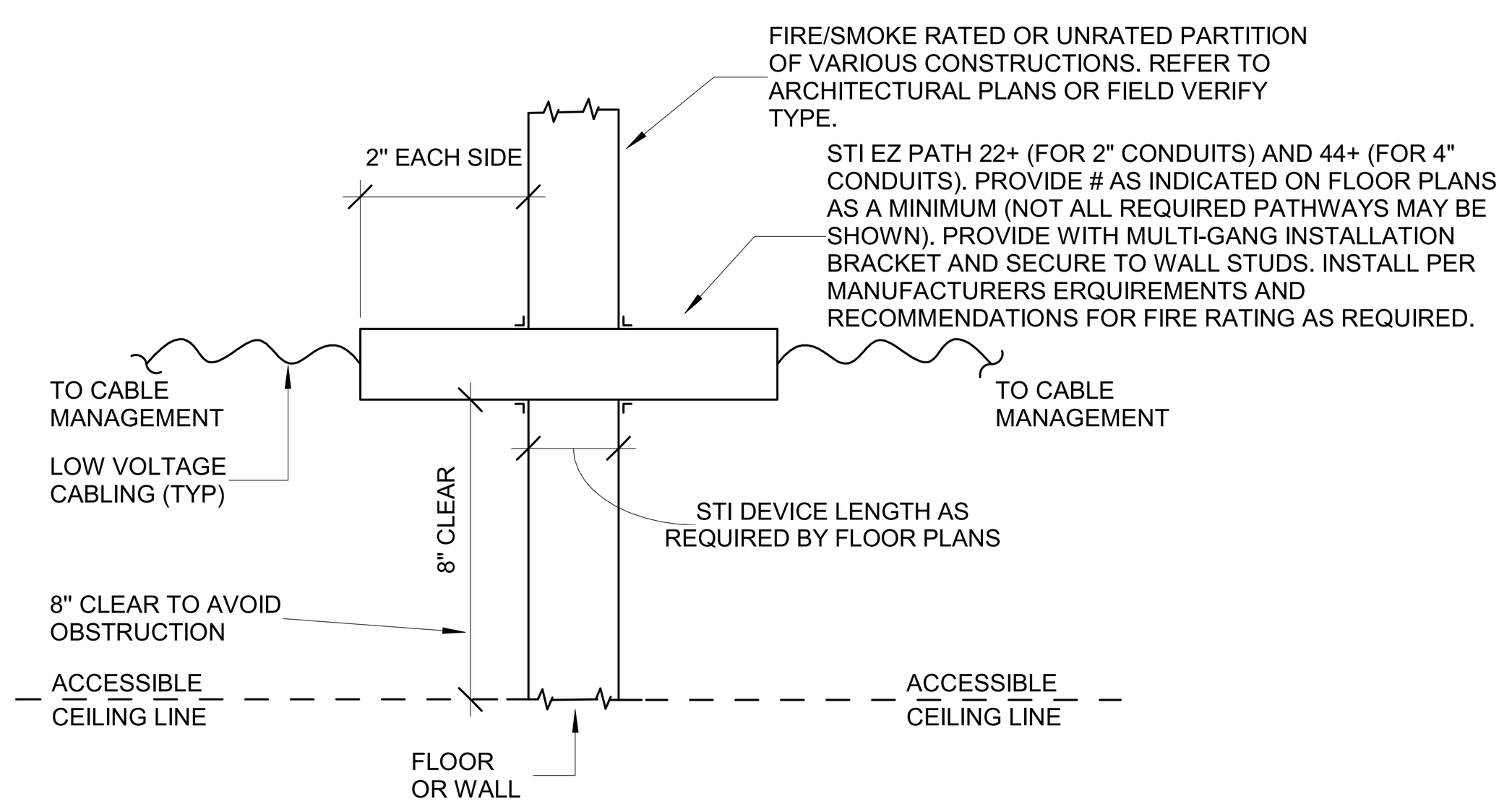
DEVICE MOUNTING DETAIL - KEY NOTES: (X)

1. MOUNT VISUAL NOTIFICATION APPLIANCES SO THAT ENTIRE LENS IS BETWEEN 80" AND 96" AFF. IF CEILING IS TOO LOW FOR DEVICE TO BE MOUNTED ABOVE 80", MOUNT SO THAT THE LENS IS WITHIN 6" OF FINISHED CEILING.
2. ALIGN BACKBOXES OF DEVICES AT THE MOUNTING HEIGHT INDICATED. MEASURE TO THE TOP OF THE BACKBOX FOR STANDARD OUTLET BOXES. NON-STANDARD BACKBOXES ARE TO BE INSTALLED SUCH THAT THE FINISHED DEVICES ARE ALIGNED ALONG THEIR RESPECTIVE CENTERLINES.
3. MOUNTING HEIGHTS SHOWN ILLUSTRATE DESIGN INTENT AND ARE TO BE FOLLOWED UNLESS CONTRADICTED BY APPLICABLE CODE. WHERE DEVICES ARE SHOWN ADJACENT TO DOOR FRAMES ON PLANS INSTALL 12" FROM FRAME TO AVOID SLUSHED SECTIONS OR BRACING. SPECIFIC DEVICES ARE SHOWN IN RELATIVE ORDER FROM DOOR FRAME; WHERE INDICATED DEVICES ARE NOT PRESENT AT A PARTICULAR LOCATION, ADJUST LOCATIONS OF INSTALLED DEVICES CLOSER TO DOOR.
4. THE CONTRACTOR IS TO COORDINATE ALL ROUGH-INS WITH ANY COUNTERTOPS/BACKSPLASHES TO AVOID CONFLICT. ALIGN DEVICE BACKBOXES IN THE NEXT FULL BLOCK ABOVE THE BACKSPLASH AS SHOWN. FOR NON-BLOCK WALLS ALIGN BOTTOM OF DEVICE BACKBOXES 4" ABOVE BACKSPLASH. COORDINATE WORK WITH CASEWORK AND KITCHEN SHOP DRAWINGS. MAXIMUM ELEVATION IS TO BE 44" AFF PER ADAAG REQUIREMENTS. IF CONFLICT STILL ARISES CONTACT THE ENGINEER FOR DIRECTION ON HOW TO PROCEED.
5. MAXIMUM SEPARATION FOR POWER AND DATA OUTLETS SERVING THE SAME WORKPLACE TO BE 16".

1 TYPICAL WALL DEVICE MOUNTING DETAIL
SCALE: NONE

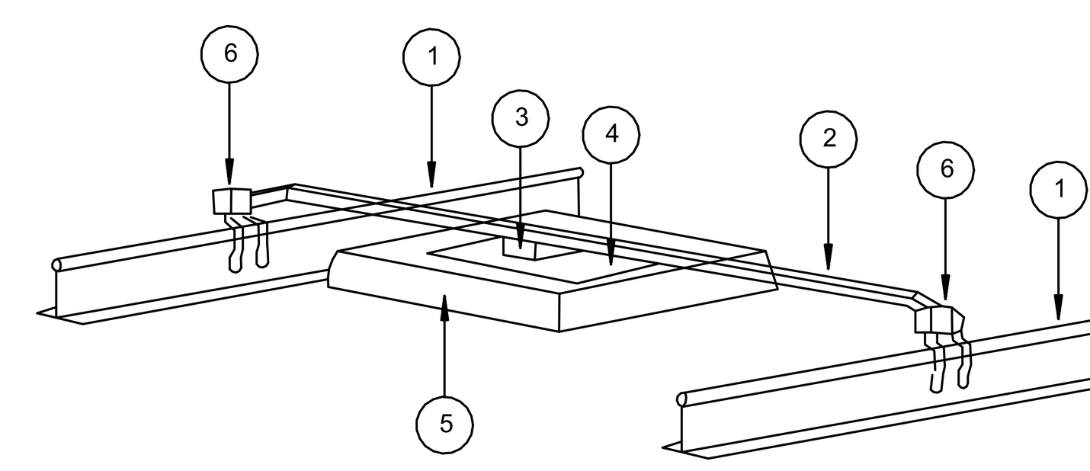


2 GROUND BUS BAR MOUNTING
SCALE: NONE



NOTE:
PATHWAYS SHALL BE PROVIDED WHERE PENETRATING CEILINGS (RATED OR NOT) FOR EXPOSED CABLE ROUTING TO LADDER TRAY IN MDF/IDF ROOMS. PROVIDE GRID SYSTEMS MOUNT AS REQUIRED.

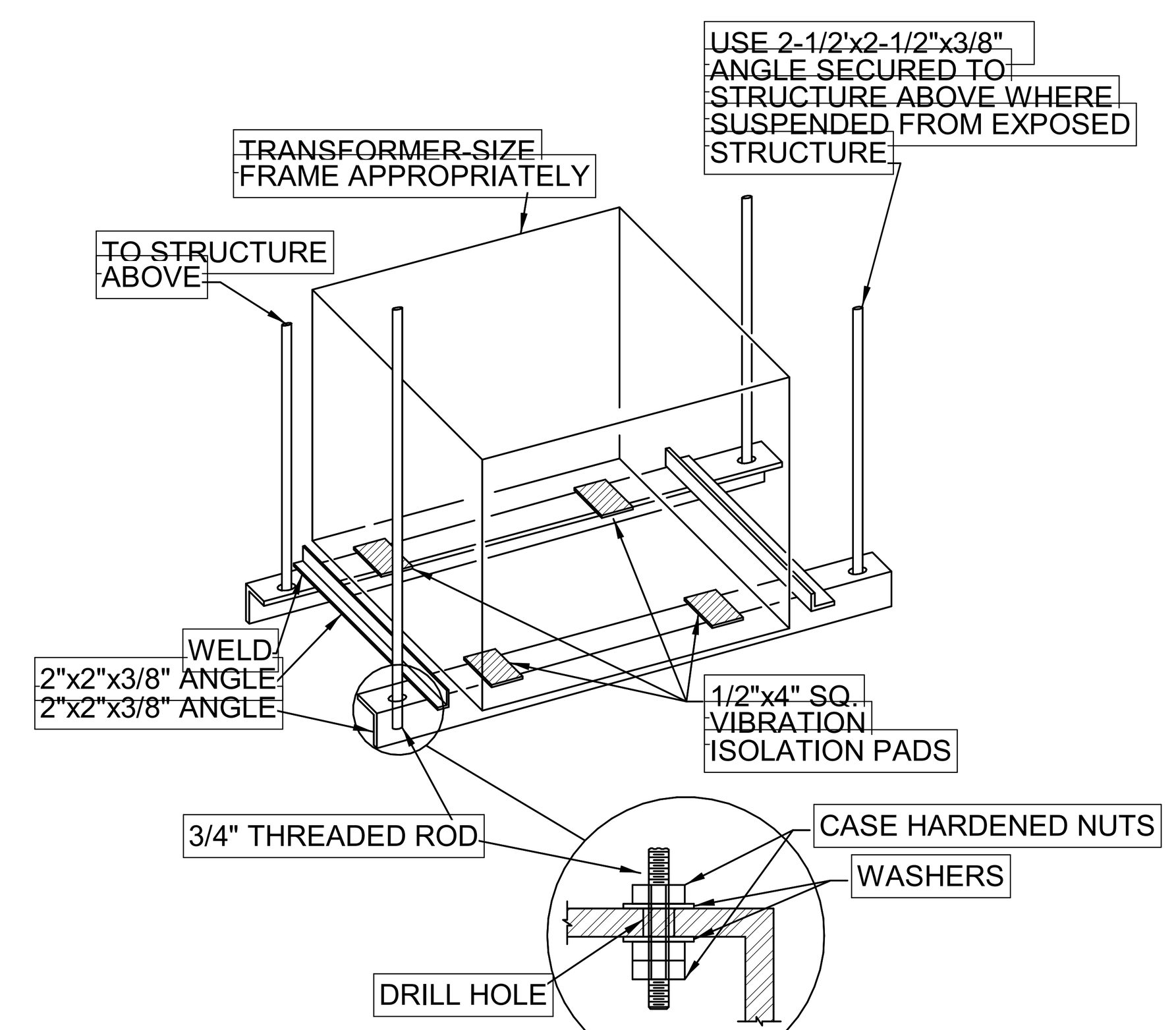
3 SYSTEMS CABLING SLEEVE INSTALLATION DETAIL
SCALE: NONE



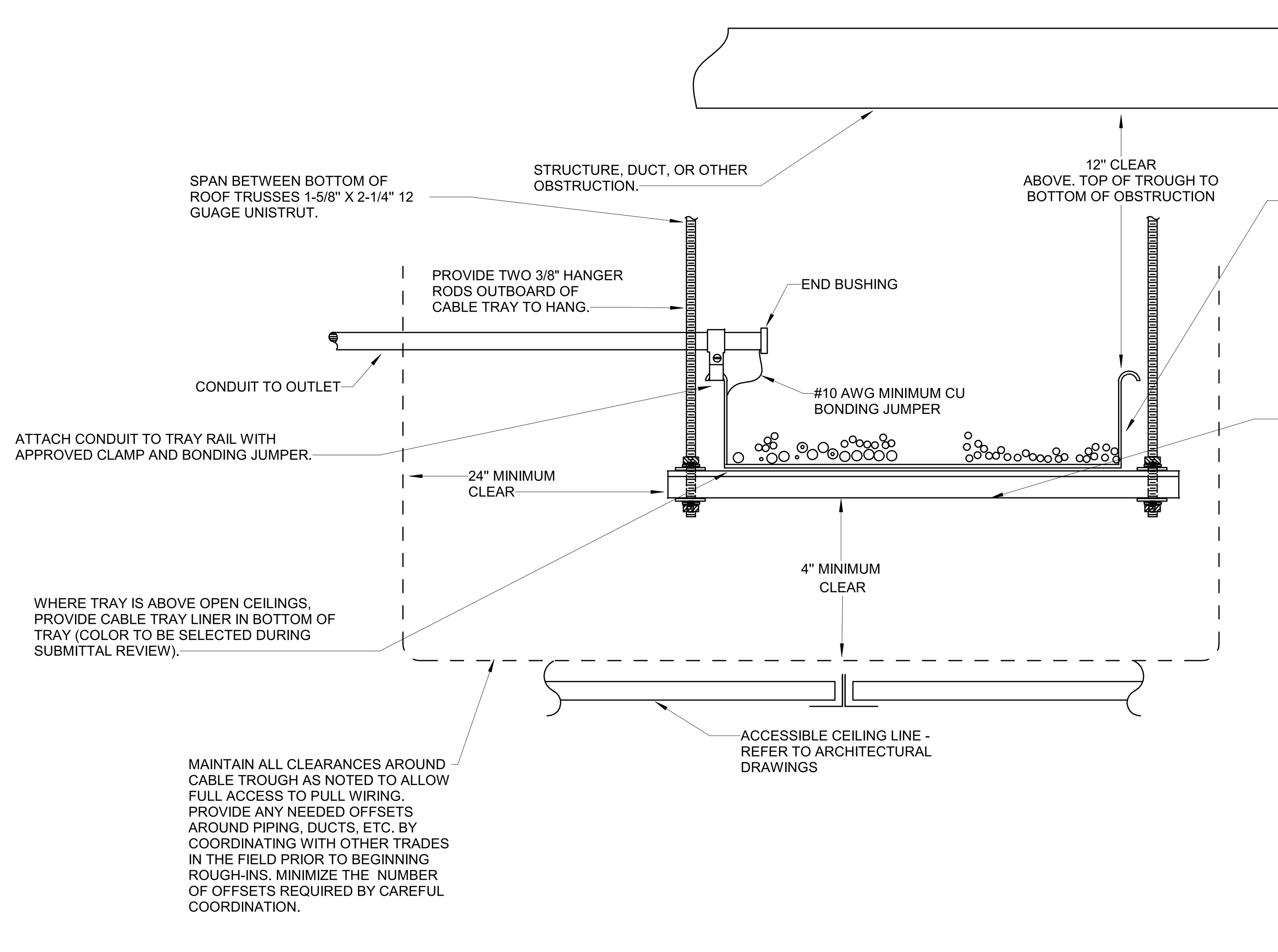
1	SUSPENDED CEILING T-RAIL	4	CISCO UNIVERSAL BRACKET, O.F.C.I.
2	T-BAR BOX HANGER, O.F.C.I.	5	CISCO ACCESS POINT, O.F.C.I.
3	BRACKET MOUNTING CLIP, O.F.C.I.	6	T-RAIL CLIP, O.F.C.I.

SYMBOL ON DRAWING: WAP

5 TYPICAL RECESSED WIRELESS ACCESS POINT DETAIL
SCALE: NONE



6 TRANSFORMER SUSPENDED FROM STRUCTURE
SCALE: NONE



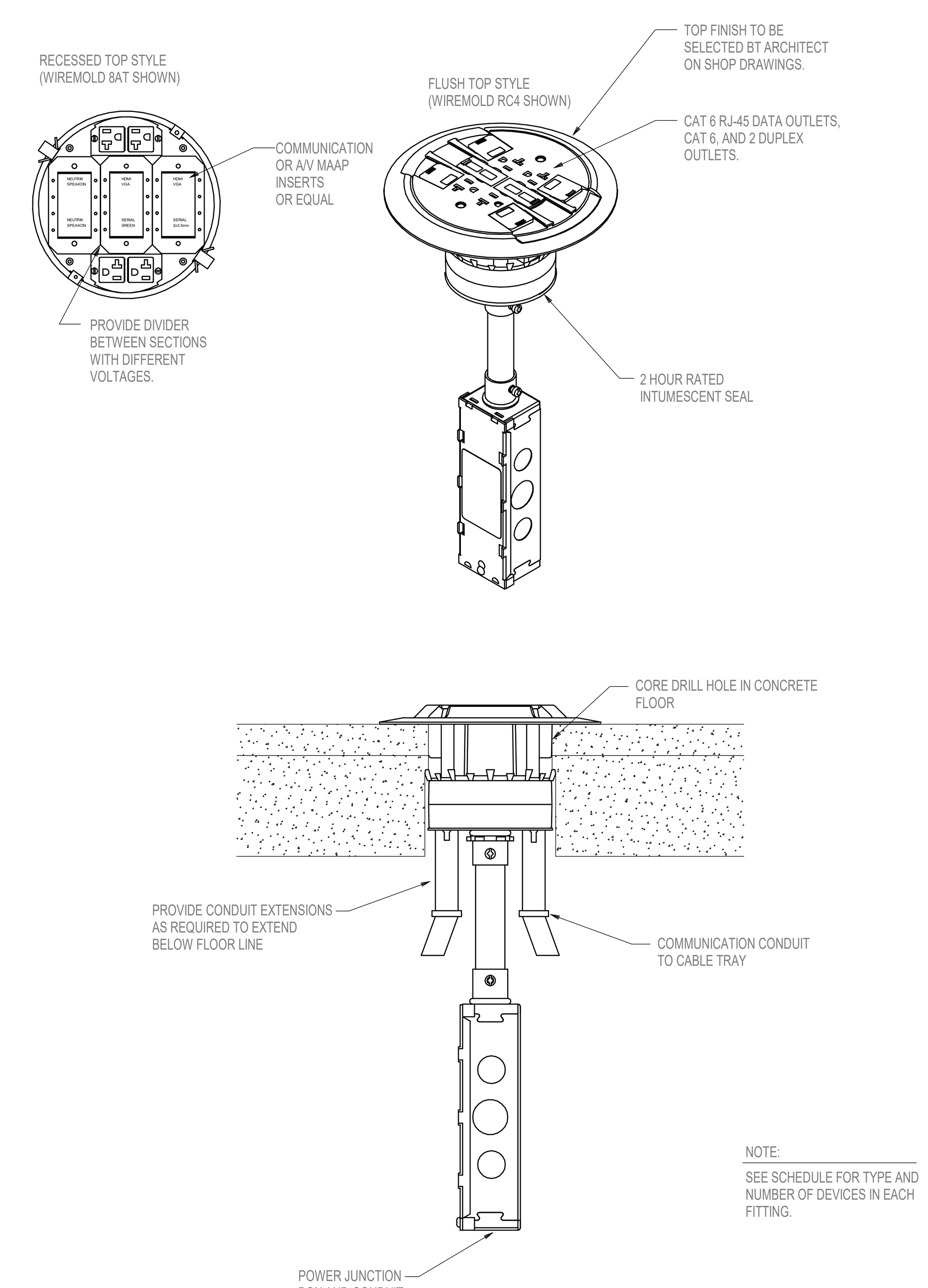
LOADING DEPTH OF CABLE TRAY SHALL BE 4" CLEAR MIN INSIDE.

1 5/8" X 1 5/8" 14 GA STEEL STRUT CHANNEL WITH CONTINUOUS PERFORATIONS ALONG BOTTOM FOR CABLE TRAY SUPPORT MEMBER - TRAY SUPPORTS SHALL BE ON (5) FIVE MINIMUM FOOT CENTERS AND WITHIN (3) THREE FEET OF TURNS, TRANSITIONS AND TERMINATIONS FASTEN THROUGH TO UNISTRUT WITH TWO 1/4"-20 BOLTS PER HANGER.

GENERAL NOTES:

- WIDTH OF TRAY TO BE AS SPECIFIED OR AS IDENTIFIED ON FLOOR PLAN NOTATIONS.
- ALL CABLE TRAY SHALL BE ACCESSIBLE. WHERE CABLE TRAY IS ROUTED ABOVE INACCESSIBLE CEILINGS, CONTRACTOR SHALL PROVIDE 4" EMT CONDUIT WITH EQUIVALENT CABLE FILL AREA. EACH CONDUIT SHALL BE CONTINUOUSLY BONDED AT EACH END AND TO CABLE TRAY. PROVIDE PULL BOXES PER BICSI STANDARDS, PULL BOXES SHALL BE ACCESSIBLE.
- CABLE TRAY OR SUPPORTS SHALL NOT BE USED FOR SUPPORT OF ANY SYSTEMS WITHOUT PRIOR APPROVAL FROM ENGINEER.
- NO OPEN SPLICES PERMITTED IN CABLE TRAY. CABLE BUNDLING SHALL NOT NEGITIVLY IMPACT PERFORMANCE OR HEAT BUILD-UP IN TRAY/TROUGH.
- CONTRACTOR TO VERIFY THE AMOUNT OF CROSS-SECTIONAL AREA NEEDED IN THE TROUGH PRIOR TO INSTALLING AND INCREASE THE WIDTH OF TROUGH IF TOTAL FILL OF EACH SECTION WILL BE GREATER THAN 60%.

4 C-CABLE TRAY INSTALLATION
SCALE: NONE



NOTE:
SEE SCHEDULE FOR TYPE AND NUMBER OF DEVICES IN EACH FITTING.

7 POKE-THRU DETAIL
SCALE: NONE

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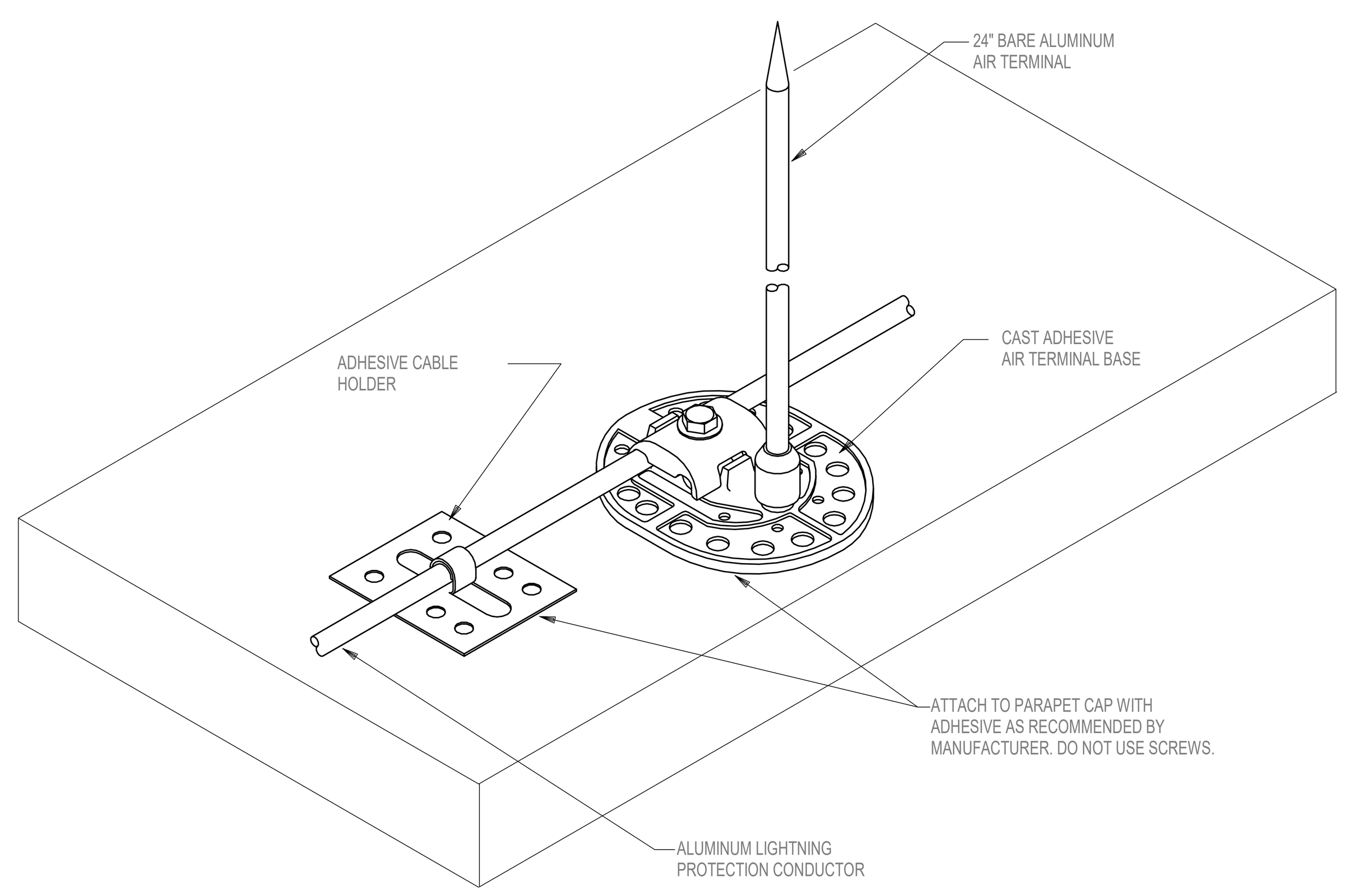
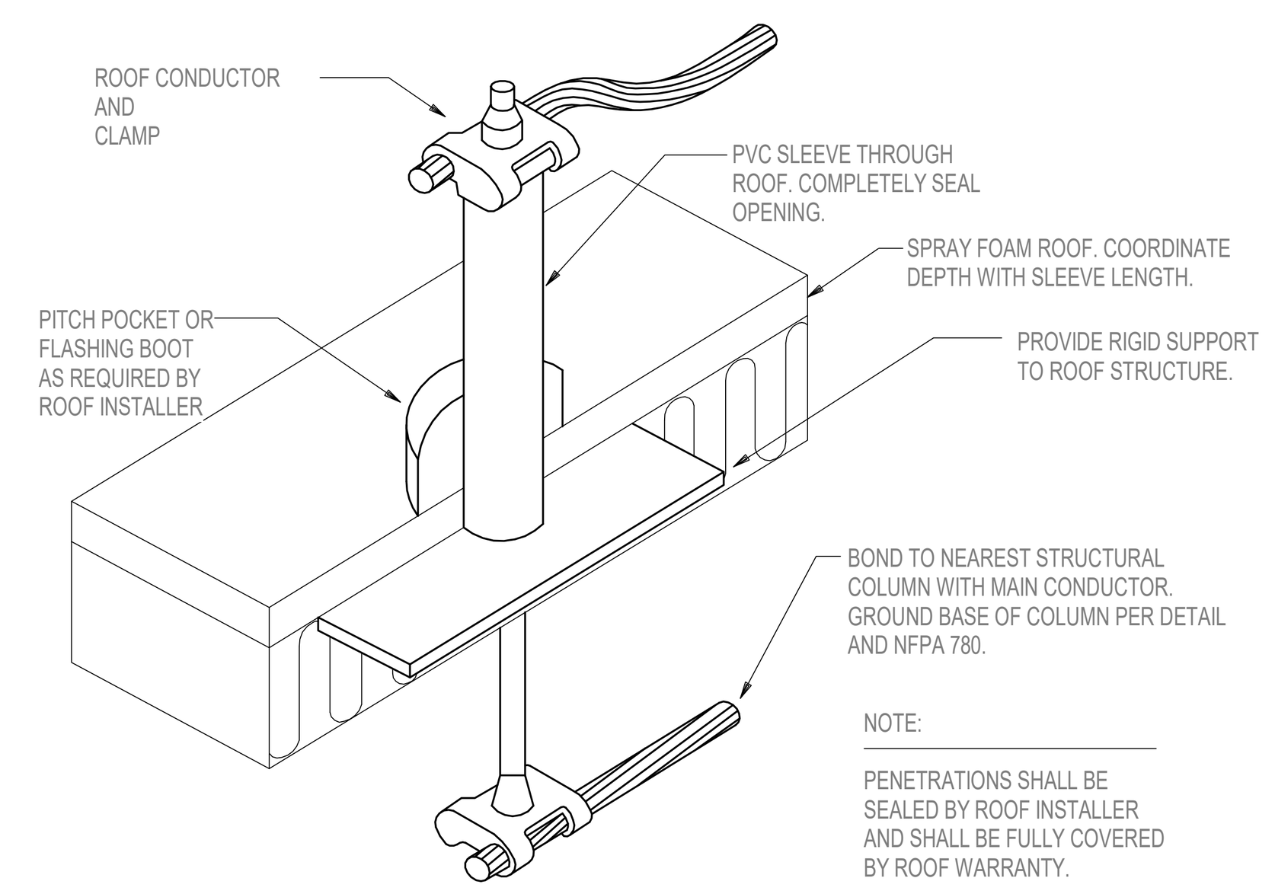
ELECTRICAL DETAILS

E-501



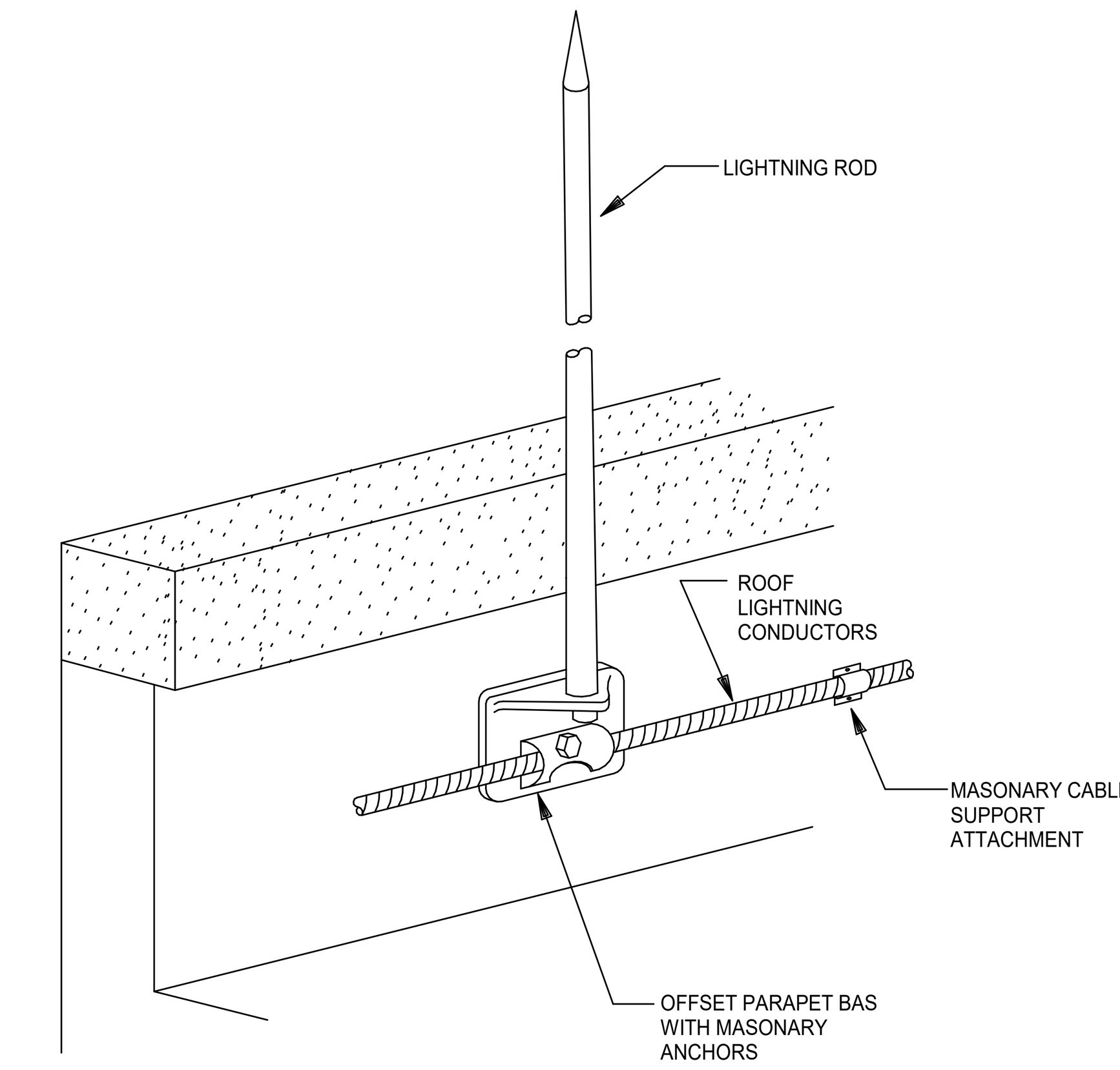
1 ADHESIVE MOUNT AIR TERMINAL DETAIL
SCALE NOT TO SCALE



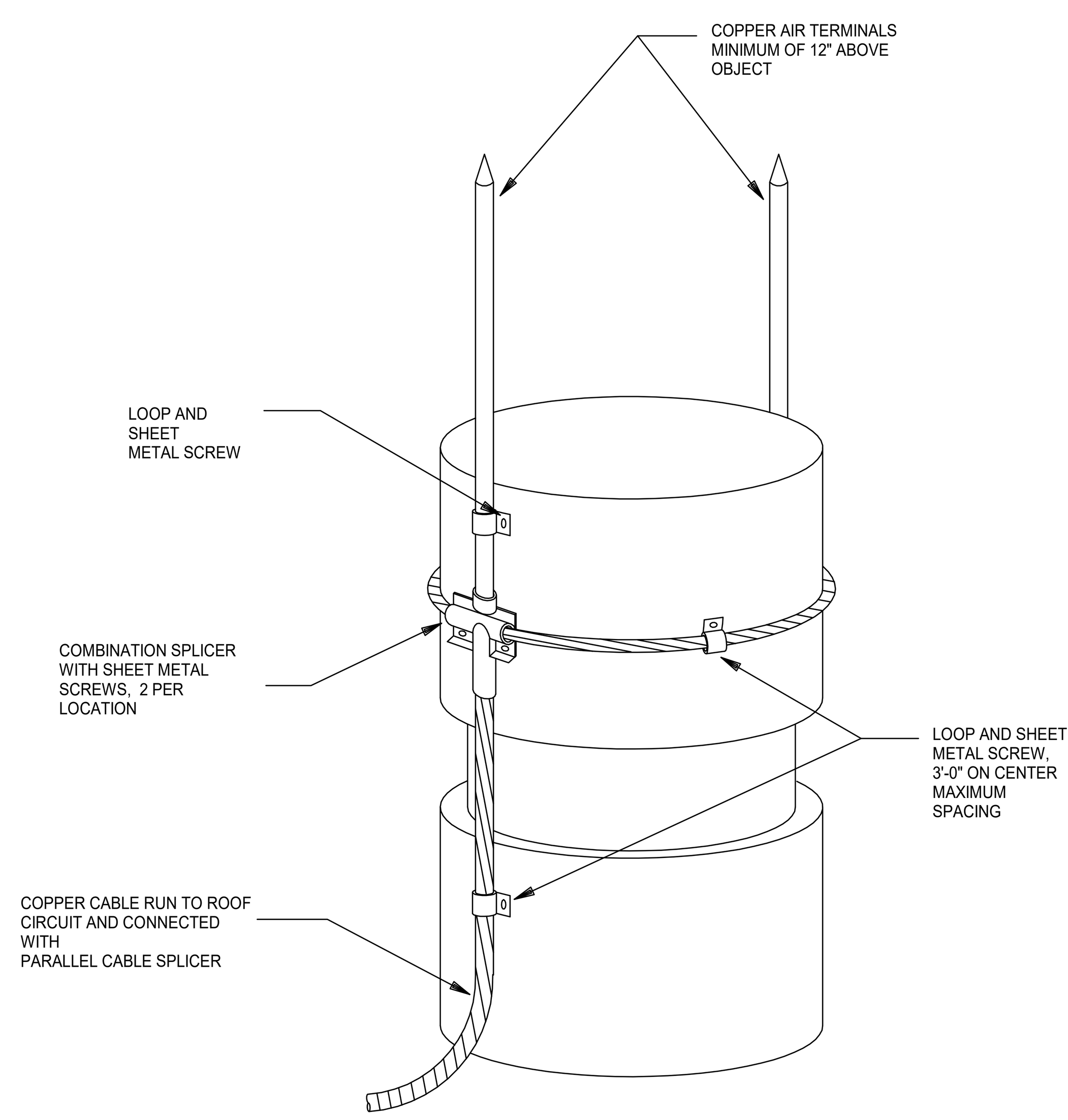
NOTE:

PENETRATIONS SHALL BE SEALED BY ROOF INSTALLER AND SHALL BE FULLY COVERED BY ROOF WARRANTY.

3 LIGHTNING PROTECTION ROOF PENETRATION
SCALE NOT TO SCALE

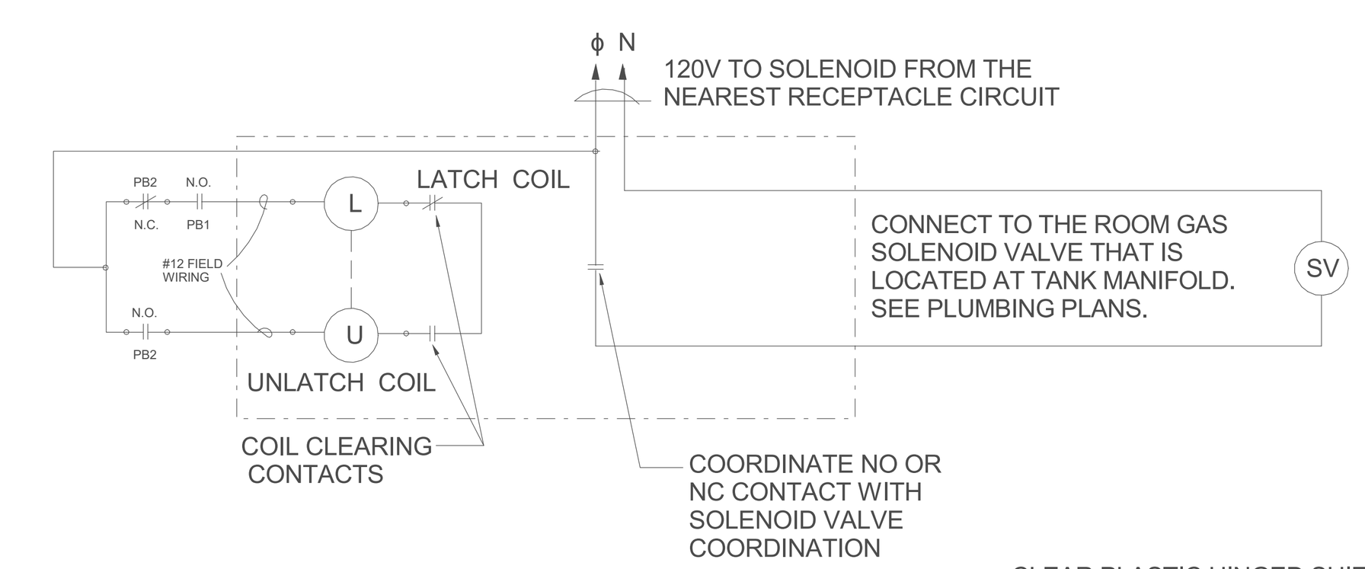


5 PARAPET WALL AIR TERMINAL
SCALE 1/8" = 1'-0"

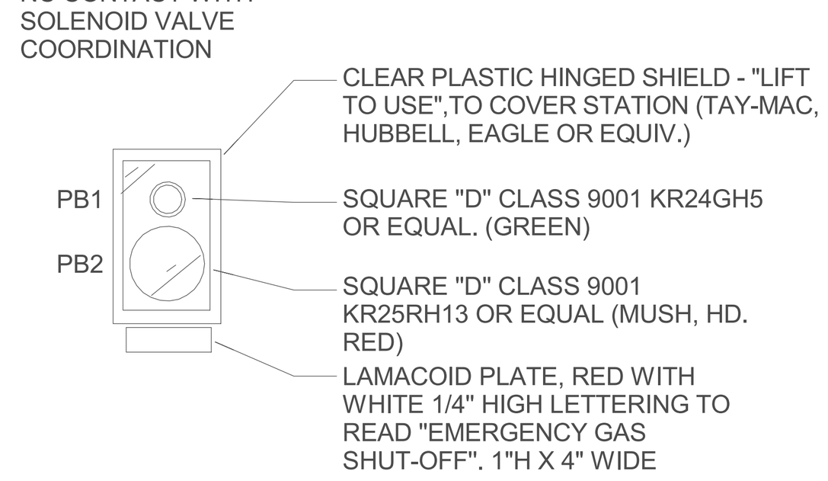


NOTE:
1. TYPICAL OF TWO (2) SIDES

2 AIR TERMINAL - EQUIPMENT
SCALE NOT TO SCALE



NOTES:
A. CONTACTORS SHALL BE SQUARE "D" OR EQUIVALENT CLASS 8903, NEMA 1 ENCLOSURE, MECHANICALLY HELD, PERMANENT MAGNET LATCH, 20A CONTACTS, SERIES LXG., MOUNT VERTICALLY AND PLUMB.



7 LAB GAS SHUTOFF DETAIL
SCALE 1/8" = 1'-0"

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2 ADDENDUM 3 12/10/14

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1	Revision 1	Date 1

ELECTRICAL DETAILS

E-502

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PANELBOARD AND WIRING SCHEDULE

PANEL: **100MNP1**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: MLO
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 10,000
LOCATION: CORRIDOR 100M
SUPPLY FROM:

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	REC 171	1-#10, 1-#10, 1-#10	20	1	1	1.1	0.7					2	1	20	1-#12, 1-#12, 1-#12	REC 174, 176	
	REC 182	1-#12, 1-#12, 1-#12	20	1	3			1.1	0.7			4	1	20	1-#12, 1-#12, 1-#12	REC 181	
	REC 182	1-#12, 1-#12, 1-#12	20	1	5					0.9	0.7	6	1	20	1-#12, 1-#12, 1-#12	REC 184	
	REC 184	1-#12, 1-#12, 1-#12	20	1	7	0.7	1.1					8	1	20	1-#10, 1-#10, 1-#10	REC 188	
	REC 183	1-#12, 1-#12, 1-#12	20	1	9			0.5	0.7			10	1	20	1-#12, 1-#12, 1-#12	REC 183	
	REC 100L	1-#12, 1-#12, 1-#12	20	1	11					0.5	1.3	12	1	20	1-#12, 1-#12, 1-#12	REC 100M, 100L, 173, 178	
	LTNG 171, 174, 176, 178	1-#12, 1-#12, 1-#12	20	1	13	0.4	1.8					14	1	20	1-#8, 1-#8, 1-#8	LTNG 100L, 100M, 173	
	LTNG 182, 186, 188	1-#10, 1-#10, 1-#10	20	1	15			1.3	0.6			16	1	20	1-#12, 1-#12, 1-#12	LTNG 184	
	LTNG 181, 183	1-#10, 1-#10, 1-#10	20	1	17					1.0	0.2	18	1	20	1-#12, 1-#12, 1-#12	REC DF 173	GFI
	SPARE	--	20	1	19	0.0	1.1					20	1	20	1-#12, 1-#12, 1-#12	REC SINK 176	
	DATA RACK 186	2-#12, 1-#12, 1-#12	20	2	21			0.1	0.0			22	1	20	--	SPARE	
					23					0.1	0.0	24	1	20	--	SPARE	
	SPARE	--	20	1	25	0.0	0.0					26	1	20	--	SPARE	
	SPARE	--	20	1	27			0.0	1.1			28	1	20	1-#12, 1-#12, 1-#12	REC SINK 174	
	SPARE	--	20	1	29					0.0	0.0	30	1	20	--	SPARE	
	SPARE	--	20	1	31	0.0	1.3					32	1	20	1-#10, 1-#10, 1-#10	REC 186	
	SPARE	--	20	1	33			0.0	0.0			34	1	20	--	SPARE	
	PROJECTOR 181, 182	1-#10, 1-#10, 1-#10	20	1	35					1.4	0.0	36	1	20	--	SPARE	
	POKE-THRU 181, 182	1-#12, 1-#12, 1-#12	20	1	37	0.7	0.0					38	1	20	--	SPARE	
	REC 100M, 178	1-#12, 1-#12, 1-#12	20	1	39			0.7	0.0			40	1	20	--	SPARE	
	PROJECTOR 183, 184	1-#10, 1-#10, 1-#10	20	1	41					1.1	0.0	42	1	20	--	SPARE	
	SPARE	--	20	1	43	0.0	0.0					44	1	20	--	SPARE	
	SPARE	--	20	1	45			0.0	0.0			46	1	20	--	SPARE	
	SPARE	--	20	1	47					0.0	0.0	48	1	20	--	SPARE	
	SPARE	--	20	1	49	0.0	0.0					50	1	20	--	SPARE	
GFI	SPARE	--	20	1	51			0.0	0.0			52	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	GFI
						8.9 kVA		6.8 kVA		7.2 kVA							
						74 A		57 A		60 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	2000 VA	100.00%	2000 VA	TOTAL CONNECTED LOAD:	22891 VA
LTNG	5051 VA	100.00%	5051 VA	TOTAL ESTIMATED DEMAND:	19971 VA
Other	0 VA	0.00%	0 VA	TOTAL CONNECTED CURRENT:	64 A
REC	15840 VA	81.57%	12920 VA	TOTAL ESTIMATED DEMAND CURRENT:	55 A
				25 % ADDITIONAL CAPACITY:	14 A
				TOTAL PANEL CURRENT:	69 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **200MNP1**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: MLO
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 10,000
LOCATION: CORRIDOR 200M
SUPPLY FROM:

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	REC 200M, 276, 274	1-#12, 1-#12, 1-#12	20	1	1	1.1	0.9					2	1	20	1-#12, 1-#12, 1-#12	REC 271, 273	
	REC 282	1-#12, 1-#12, 1-#12	20	1	3			1.1	0.9			4	1	20	1-#12, 1-#12, 1-#12	REC 282	
	REC 281	1-#12, 1-#12, 1-#12	20	1	5					1.1	1.1	6	1	20	1-#10, 1-#10, 1-#10	REC 283	
	REC 284	1-#12, 1-#12, 1-#12	20	1	7	1.1	1.1					8	1	20	1-#10, 1-#10, 1-#10	REC 284	
	REC 286	1-#12, 1-#12, 1-#12	20	1	9			0.7	0.7			10	1	20	1-#12, 1-#12, 1-#12	REC 286	
	REC 285, 288, 290, 291	1-#10, 1-#10, 1-#10	20	1	11					0.8	0.8	12	1	20	1-#10, 1-#10, 1-#10	REC 200L, 294	
	LTNG 274, 276	1-#12, 1-#12, 1-#12	20	1	13	0.1	1.0					14	1	20	1-#12, 1-#12, 1-#12	LTNG 271, 273, 294, 200L	
	LTNG 282	1-#12, 1-#12, 1-#12	20	1	15			1.0	0.9			16	1	20	1-#12, 1-#12, 1-#12	LTNG 284	
	LTNG 285, 286, 288, 290, 291, 292	1-#10, 1-#10, 1-#10	20	1	17					1.1	1.0	18	1	20	1-#10, 1-#10, 1-#10	LTNG 281, 283	
GFI	REC DF 273	1-#12, 1-#12, 1-#12	20	1	19	0.2	0.2					20	1	20	1-#12, 1-#12, 1-#12	REC DF 294	GFI
	REC SINK 276	1-#12, 1-#12, 1-#12	20	1	21			0.9	0.9			22	1	20	1-#12, 1-#12, 1-#12	REC 273	
	PROJECTOR 282	1-#12, 1-#12, 1-#12	20	1	23					1.2	1.0	24	1	20	1-#12, 1-#12, 1-#12	PROJECTOR 281	
	PROJECTOR 284	1-#12, 1-#12, 1-#12	20	1	25	1.2	1.1					26	1	20	1-#12, 1-#12, 1-#12	REC SINK 274	
	PROJECTOR 286	1-#10, 1-#10, 1-#10	20	1	27			1.1	0.5			28	1	20	1-#12, 1-#12, 1-#12	LTG 200L, 294	
	DATA RACK 292	2-#12, 1-#12, 1-#12	20	2	29					0.1	0.8	30	1	20	1-#10, 1-#10, 1-#10	LTNG 294	
					31	0.1	0.8					32	1	20	1-#10, 1-#10, 1-#10	REC 292	
	SPARE	--	20	1	33			0.0	0.0			34	1	20	--	SPARE	
	SPARE	--	20	1	35					0.0	0.0	36	1	20	--	SPARE	
	SPARE	--	20	1	37	0.0	0.0					38	1	20	--	SPARE	
	SPARE	--	20	1	39			0.0	0.0			40	1	20	--	SPARE	
	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	
	SPARE	--	20	1	43	0.0	0.0					44	1	20	--	SPARE	
	SPARE	--	20	1	45			0.0	0.0			46	1	20	--	SPARE	
	SPARE	--	20	1	47					0.0	0.0	48	1	20	--	SPARE	
	SPARE	--	20	1	49	0.0	0.0					50	1	20	--	SPARE	
GFI	SPARE	--	20	1	51			0.0	0.0			52	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	GFI
						8.7 kVA		8.7 kVA		8.8 kVA							
						73 A		73 A		73 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	2800 VA	100.00%	2800 VA	TOTAL CONNECTED LOAD:	26240 VA
LTNG	6300 VA	100.00%	6300 VA	TOTAL ESTIMATED DEMAND:	22670 VA
Other	0 VA	0.00%	0 VA	TOTAL CONNECTED CURRENT:	73 A
REC	17140 VA	79.17%	13570 VA	TOTAL ESTIMATED DEMAND CURRENT:	63 A
				25 % ADDITIONAL CAPACITY:	16 A
				TOTAL PANEL CURRENT:	79 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **300NNP1**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: MCB
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 22,000
LOCATION: CYLINDER/DEWAR STORAGE 300N
SUPPLY FROM: 406NDP1

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	REC 371, 373	1-#10, 1-#10, 1-#10	20	1	1	1.6	1.4					2	1	20	1-#10, 1-#10, 1-#10	REC 375	
	REC 381	1-#10, 1-#10, 1-#10	20	1	3			1.4	1.1			4	1	20	1-#12, 1-#12, 1-#12	REC 383, 385	
	REC 387	1-#10, 1-#10, 1-#10	20	1	5					1.4	0.7	6	1	20	1-#10, 1-#10, 1-#10	REC 395	
	REC 393, 394, 394	1-#10, 1-#10, 1-#10	20	1	7	0.7	0.2					8	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	9			0.2	0.2			10	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 384	1-#12, 1-#12, 1-#12	20	1	11					0.5	0.7	12	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 382	1-#12, 1-#12, 1-#12	20	1	13	0.7	0.7					14	1	20	1-#12, 1-#12, 1-#12	REC 382, EIDF 380	
	REC 376	1-#12, 1-#12, 1-#12	20	1	15			0.5	0.4			16	1	20	1-#12, 1-#12, 1-#12	REC 374	
	REC 382	1-#12, 1-#12, 1-#12	20	1	17					0.2	0.5	18	1	20	1-#12, 1-#12, 1-#12	REC 300L, 388	
	REC 300L, 378, 300M	1-#12, 1-#12, 1-#12	20	1	19	0.7	0.2					20	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	21			0.2	0.2			22	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	23					0.2	0.2	24	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	25	0.2	0.2					26	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	27			0.2	0.5			28	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	29					0.2	0.5	30	1	20	1-#12, 1-#12, 1-#12	EQUIP 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	31	1.1	0.5					32	1	20	1-#12, 1-#12, 1-#12	EQUIP 382	
	WATER FOUNTAIN 300L	1-#12, 1-#12, 1-#12	20	1	33			0.2	0.2			34	1	20	1-#12, 1-#12, 1-#12	REC 382	
	SPARE	--	20	1	35					0.0	0.2	36	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	37	0.2	0.2					38	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	39			0.2	0.2			40	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 382	1-#12, 1-#12, 1-#12	20	1	41					0.2	0.0	42	1	20	--	SPARE	
	SPARE	--	20	1	43	0.0	0.0					44	1	20	--	SPARE	
	SPARE	--	20	1	45			0.0	0.0			46	1	20	--	SPARE	
	SPARE	--	20	1	47					0.0	0.0	48	1	20	--	SPARE	
	SPARE	--	20	1	49	0.0	0.0					50	1	20	--	SPARE	
GFI	SPARE	--	20	1	51			0.0	0.0			52	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	GFI
						8.6 kVA		5.6 kVA		5.5 kVA							
						72 A		47 A		46 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	1000 VA	100.00%	1000 VA	TOTAL CONNECTED LOAD:	19720 VA
REC	18720 VA	76.71%	14360 VA	TOTAL ESTIMATED DEMAND:	15360 VA
				TOTAL CONNECTED CURRENT:	55 A
				TOTAL ESTIMATED DEMAND CURRENT:	43 A
				25 % ADDITIONAL CAPACITY:	11 A
				TOTAL PANEL CURRENT:	53 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **300NNP2**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: MCB
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 22,000
LOCATION: CYLINDER/DEWAR STORAGE 300N
SUPPLY FROM: 406NDP1

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EQUIP 384	1-#12, 1-#12, 1-#12	20	1	1	0.5	0.5					2	1	20	1-#12, 1-#12, 1-#12	EQUIP 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	3			0.5	0.2			4	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 392	1-#12, 1-#12, 1-#12	20	1	5					0.2	0.2	6	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 392	1-#12, 1-#12, 1-#12	20	1	7	0.4	0.0					8	1	20	--	SPARE	
	REC 384	1-#12, 1-#12, 1-#12	20	1	9			0.2	0.2			10	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	11					0.2	0.0	12	1	20	--	SPARE	
	EQUIP 384	1-#12, 1-#12, 1-#12	20	1	13	0.5	0.5					14	1	20	1-#12, 1-#12, 1-#12	EQUIP 384	
	REC 384A	1-#12, 1-#12, 1-#12	20	1	15			0.5	0.7			16	1	20	1-#12, 1-#12, 1-#12	REC 384A	
	REC 384	1-#12, 1-#12, 1-#12	20	1	17					0.2	0.2	18	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	19	0.2	0.2					20	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	21			0.2	0.2			22	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	23					0.2	0.2	24	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	25	0.2	0.2					26	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	27			0.2	0.2			28	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	29					0.2	0.2	30	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384	1-#12, 1-#12, 1-#12	20	1	31	0.2	0.2					32	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384A	1-#12, 1-#12, 1-#12	20	1	33			0.2	0.0			34	1	20	--	SPARE	
	REC 384A	1-#12, 1-#12, 1-#12	20	1	35					0.2	0.5	36	1	20	1-#12, 1-#12, 1-#12	REC 378A	
	REC 378A	1-#12, 1-#12, 1-#12	20	1	37	0.2	0.0					38	1	20	--	SPARE	
	SPARE	--	20	1	39			0.0	0.0			40	1	20	--	SPARE	
	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	
	SPARE	--	20	1	43	0.0	0.0					44	1	20	--	SPARE	
	SPARE	--	20	1	45			0.0	0.0			46	1	20	--	SPARE	
	SPARE	--	20	1	47					0.0	0.0	48	1	20	--	SPARE	
	SPARE	--	20	1	49	0.0	0.0					50	1	20	--	SPARE	
GFI	SPARE	--	20	1	51			0.0	0.0			52	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	GFI
						3.6 kVA		3.2 kVA		2.3 kVA							
						31 A		28 A		20 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	2000 VA	100.00%	2000 VA	TOTAL CONNECTED LOAD:	9200 VA
REC	7200 VA	100.00%	7200 VA	TOTAL ESTIMATED DEMAND:	9200 VA
				TOTAL CONNECTED CURRENT:	26 A
				TOTAL ESTIMATED DEMAND CURRENT:	26 A
				25 % ADDITIONAL CAPACITY:	6 A
				TOTAL PANEL CURRENT:	32 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **300NNP3**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: MCB
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 22,000
LOCATION: CYLINDER/DEWAR STORAGE 300N
SUPPLY FROM: 406NDP1

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	REC 390	1-#12, 1-#12, 1-#12	20	1	1	0.7	0.5					2	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	3			0.2	0.2			4	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	5					0.2	0.2	6	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	7	0.2	0.2					8	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	9			0.2	0.2			10	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	11					0.2	0.2	12	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	13	0.2	0.2					14	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	15			0.2	0.2			16	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	17					0.2	0.2	18	1	20	1-#12, 1-#12, 1-#12	REC 390	
	EQUIP 390	1-#12, 1-#12, 1-#12	20	1	19	0.5	0.5					20	1	20	1-#12, 1-#12, 1-#12	EQUIP 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	21			0.5	0.2			22	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	23					0.2	0.0	24	1	20	--	SPARE	
	REC 390	1-#12, 1-#12, 1-#12	20	1	25	0.2	0.2					26	1	20	1-#12, 1-#12, 1-#12	REC 390	
	REC 390	1-#12, 1-#12, 1-#12	20	1	27			0.2	0.0			28	1	20	--	SPARE	
	EQUIP 390	1-#12, 1-#12, 1-#12	20	1	29					0.5	0.5	30	1	20	1-#12, 1-#12, 1-#12	EQUIP 390	
	SPARE	--	20	1	31	0.0	0.0					32	1	20	--	SPARE	
	REC 374	1-#12, 1-#12, 1-#12	20	1	33			0.2	0.0			34	1	20	--	SPARE	
	SPARE	--	20	1	35					0.0	0.2	36	1	20	1-#12, 1-#12, 1-#12	REC 374	
	REC 374	1-#12, 1-#12, 1-#12	20	1	37	0.2	0.0					38	1	20	--	SPARE	
	SPARE	--	20	1	39			0.0	0.0			40	1	20	--	SPARE	
	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	
	SPARE	--	20	1	43	0.0	0.0					44	1	20	--	SPARE	
	SPARE	--	20	1	45			0.0	0.0			46	1	20	--	SPARE	
	SPARE	--	20	1	47					0.0	0.0	48	1	20	--	SPARE	
	SPARE	--	20	1	49	0.0	0.0					50	1	20	--	SPARE	
GFI	SPARE	--	20	1	51			0.0	0.0			52	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	GFI
						3.5 kVA		2.2 kVA		2.4 kVA							
						30 A		18 A		21 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	2000 VA	100.00%	2000 VA	TOTAL CONNECTED LOAD:	8120 VA
REC	6120 VA	100.00%	6120 VA	TOTAL ESTIMATED DEMAND:	8120 VA
				TOTAL CONNECTED CURRENT:	23 A
				TOTAL ESTIMATED DEMAND CURRENT:	23 A
				25 % ADDITIONAL CAPACITY:	6 A
				TOTAL PANEL CURRENT:	28 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **300NNP4**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 225 A
MAINS TYPE: MCB
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 22,000
LOCATION: CYLINDER/DEWAR STORAGE 300N
SUPPLY FROM: 406NDP1

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	REC 394	1-#12, 1-#12, 1-#12	20	1	1	0.5	0.7					2	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	3			0.2	0.2			4	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	5					0.2	0.2	6	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	7	0.2	0.2					8	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	9			0.2	0.2			10	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	11					0.2	0.2	12	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	13	0.2	0.2					14	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	15			0.2	0.2			16	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	17					0.2	0.2	18	1	20	1-#12, 1-#12, 1-#12	REC 394	
	EQUIP 394	1-#12, 1-#12, 1-#12	20	1	19	0.5	0.5					20	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	21			0.2	0.0			22	1	20	--	SPARE	
	REC 394	1-#12, 1-#12, 1-#12	20	1	23					0.5	0.5	24	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	25	0.2	0.1					26	2	20	2-#12, 1-#12, 1-#12	DATA RACK 396	
	REC 394	1-#12, 1-#12, 1-#12	20	1	27			0.2	0.1			28					
	REC 394A	1-#12, 1-#12, 1-#12	20	1	29					0.5	0.2	30	1	20	1-#12, 1-#12, 1-#12	REC 394A	
	SPARE	--	20	1	31	0.0	0.2					32	1	20	1-#12, 1-#12, 1-#12	REC 394A	
	SPARE	--	20	1	33			0.0	0.2			34	1	20	1-#12, 1-#12, 1-#12	REC 376	
	SPARE	--	20	1	35					0.0	0.0	36	1	20	--	SPARE	
	REC 376	1-#12, 1-#12, 1-#12	20	1	37	0.2	0.0					38	1	20	--	SPARE	
	REC 300M	1-#12, 1-#12, 1-#12	20	1	39			0.2	0.0			40	1	20	--	SPARE	
	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	
	SPARE	--	20	1	43	0.0	0.0					44	1	20	--	SPARE	
	SPARE	--	20	1	45			0.0	0.0			46	1	20	--	SPARE	
	SPARE	--	20	1	47					0.0	0.0	48	1	20	--	SPARE	
	SPARE	--	20	1	49	0.0	0.0					50	1	20	--	SPARE	
GFI	SPARE	--	20	1	51			0.0	0.0			52	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	GFI
						3.7 kVA		1.9 kVA		2.9 kVA							
						32 A		16 A		25 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	700 VA	100.00%	700 VA	TOTAL CONNECTED LOAD:	8440 VA
REC	7740 VA	100.00%	7740 VA	TOTAL ESTIMATED DEMAND:	8440 VA
				TOTAL CONNECTED CURRENT:	23 A
				TOTAL ESTIMATED DEMAND CURRENT:	23 A
				25 % ADDITIONAL CAPACITY:	6 A
				TOTAL PANEL CURRENT:	29 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **300NNP5**
VOLTAGE: 208Y/120V,3P,4W
AMPERES: 150 A
MAINS TYPE: MCB
SPD:
MOUNTING: FLUSH
PANEL INTERRUPTING RATING: 22,000
LOCATION: CYLINDER/DEWAR STORAGE 300N
SUPPLY FROM: 406NDP1

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	LTNG 300L	1-#10, 1-#10, 1-#10	20	1	1	1.1	0.6					2	1	20	1-#12, 1-#12, 1-#12	LTNG 371, 373, 375, 381, 383	
	LTNG 385, 387, 393, 395	1-#12, 1-#12, 1-#12	20	1	3			0.5	0.5			4	1	20	1-#12, 1-#12, 1-#12	LTNG 300N, 300M, 374, 376, 378	
	LTNG 382	1-#12, 1-#12, 1-#12	20	1	5					0.8	0.8	6	1	20	1-#12, 1-#12, 1-#12	LTNG 384	
	LTNG 390	1-#12, 1-#12, 1-#12	20	1	7	0.8	0.8					8	1	20	1-#10, 1-#10, 1-#10	LTNG 394	
	LTNG 384A, 388, 392, 394A, 396	1-#12, 1-#12, 1-#12	20	1	9			0.2	0.8			10	1	20	1-#10, 1-#10, 1-#10	REC 396	
	SPARE	--	20	1	11					0.0	0.0	12	1	20	--	SPARE	
	SPARE	--	20	1	13	0.0	0.0					14	1	20	--	SPARE	
	SPARE	--	20	1	15			0.0	0.0			16	1	20	--	SPARE	
	SPARE	--	20	1	17					0.0	0.0	18	1	20	--	SPARE	
	SPARE	--	20	1	19	0.0	0.0					20	1	20	--	SPARE	
	SPARE	--	20	1	21			0.0	0.0			22	1	20	--	SPARE	
	SPARE	--	20	1	23					0.0	0.0	24	1	20	--	SPARE	
	SPARE	--	20	1	25	0.0	0.0					26	1	20	--	SPARE	
	SPARE	--	20	1	27			0.0	0.0			28	1	20	--	SPARE	
	SPARE	--	20	1	29					0.0	0.0	30	1	20	--	SPARE	
	SPARE	--	20	1	31	0.0	0.0					32	1	20	--	SPARE	
	SPARE	--	20	1	33			0.0	0.0			34	1	20	--	SPARE	
	SPARE	--	20	1	35					0.0	0.0	36	1	20	--	SPARE	
	SPARE	--	20	1	37	0.0	0.0					38	1	20	--	SPARE	
GFI	SPARE	--	20	1	39			0.0	0.0			40	1	20	--	SPARE	GFI
GFI	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	GFI
						3.3 kVA		2.0 kVA		1.6 kVA							
						28 A		17 A		14 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
LTNG	6173 VA	100.00%	6173 VA	TOTAL CONNECTED LOAD:	6923 VA
Other	0 VA	0.00%	0 VA	TOTAL ESTIMATED DEMAND:	6923 VA
REC	750 VA	100.00%	750 VA	TOTAL CONNECTED CURRENT:	19 A
				TOTAL ESTIMATED DEMAND CURRENT:	19 A
				25 % ADDITIONAL CAPACITY:	5 A
				TOTAL PANEL CURRENT:	24 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **406NP1**
VOLTAGE: 480Δ,3P,3W
AMPERES: 400 A
MAINS TYPE: MCB
SPD:
MOUNTING: SURFACE
PANEL INTERRUPTING RATING: 35,000
LOCATION: PENTHOUSE PH406
SUPPLY FROM:

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EF-17	3-#12, 1-#12, 1-#12	15	3	1	0.4	16.5					2	3	125	3-#1/0, 1-#1/0, 1-#6	AHU-8 SF	
					3			0.4	16.5			4					
					5					0.4	16.5	6					
	AHU-8 RF	3-#4, 1-#4, 1-#8	70	3	7	0.3	3.7					8	3	40	3-#8, 1-#8, 1-#10	RF-3	
					9			0.3	3.7			10					
					11					0.3	3.7	12					
	406NT2	3-#12, 1-#12, 1-#12	20	3	13	0.0	0.3					14	3	20	3-#12, 1-#12, 1-#12	AUTOCLAVE 378	
					15			0.0	0.3			16					
					17					0.0	0.3	18					
	SPARE	--	20	1	19	0.0	0.0					20	1	20	--	SPARE	
	SPARE	--	20	1	21			0.0	0.0			22	1	20	--	SPARE	
	SPARE	--	20	1	23					0.0	0.0	24	1	20	--	SPARE	
	SPARE	--	20	1	25	0.0	0.0					26	1	20	--	SPARE	
	SPARE	--	20	1	27			0.0	0.0			28	1	20	--	SPARE	
	SPARE	--	20	1	29					0.0	0.0	30	1	20	--	SPARE	
						21.2 kVA		21.2 kVA		21.2 kVA							
						76 A		76 A		76 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	63500 VA	100.00%	63500 VA	TOTAL CONNECTED LOAD:	63500 VA
				TOTAL ESTIMATED DEMAND:	63500 VA
				TOTAL CONNECTED CURRENT:	76 A
				TOTAL ESTIMATED DEMAND CURRENT:	76 A
				25 % ADDITIONAL CAPACITY:	19 A
				TOTAL PANEL CURRENT:	95 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

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CONTRACT DOCUMENTS

IMPROVE FACILITIES -
JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

ELECTRICAL SCHEDULES

E-601

PANELBOARD AND WIRING SCHEDULE

PANEL: **406NP2** **MAINS TYPE:** MCB **PANEL INTERRUPTING RATING:** 10,000
VOLTAGE: 208Y/120V,3P,4W **SPD:** **LOCATION:** PENTHOUSE PH406
AMPERES: 100 A **MOUNTING:** SURFACE **SUPPLY FROM:**

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	FC-1	1-#10, 1-#10, 1-#10	20	1	1	1.6	2.1					2	1	20	1-#8, 1-#8, 1-#8	REC PH 406	
	LTNG PH 406	1-#12, 1-#12, 1-#12	20	1	3			0.8	0.5			4	1	20	1-#12, 1-#12, 1-#12	EQUIP PH 406	
	EQUIP PH 406	1-#12, 1-#12, 1-#12	20	1	5					0.5	0.5	6	1	20	1-#12, 1-#12, 1-#12	EQUIP PH 406	
	EQUIP PH 406	1-#12, 1-#12, 1-#12	20	1	7	0.5	0.2					8	1	20	1-#12, 1-#12, 1-#12	REC PH 406	
	LTNG OUTSIDE PH 406	1-#12, 1-#12, 1-#12	20	1	9			0.0	0.0			10	1	20	--	SPARE	
	EQUIP	1-#12, 1-#12, 1-#12	20	1	11					0.0	0.0	12	1	20	--	SPARE	
	SPARE	--	20	1	13	0.0	0.0					14	1	20	--	SPARE	
	SPARE	--	20	1	15			0.0	0.0			16	1	20	--	SPARE	
	SPARE	--	20	1	17					0.0	0.0	18	1	20	--	SPARE	
	SPARE	--	20	1	19	0.0	0.0					20	1	20	--	SPARE	
	SPARE	--	20	1	21			0.0	0.0			22	1	20	--	SPARE	
	SPARE	--	20	1	23					0.0	0.0	24	1	20	--	SPARE	
	SPARE	--	20	1	25	0.0	0.0					26	1	20	--	SPARE	
GFI	SPARE	--	20	1	27			0.0	0.0			28	1	20	--	SPARE	GGI
GFI	SPARE	--	20	1	29					0.0	0.0	30	1	20	--	SPARE	GFI
						4.3 kVA		1.3 kVA		1.0 kVA							
						36 A		12 A		8 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	4560 VA	100.00%	4560 VA	**TOTAL CONNECTED LOAD:**	6661 VA
LTNG	841 VA	100.00%	841 VA	**TOTAL ESTIMATED DEMAND:**	6661 VA
REC	1260 VA	100.00%	1260 VA	**TOTAL CONNECTED CURRENT:**	18 A
				TOTAL ESTIMATED DEMAND CURRENT:	18 A
				25 % ADDITIONAL CAPACITY:	5 A
				TOTAL PANEL CURRENT:	23 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

ELEC - WALL AND FLOOR FITTING SCHEDULE

NOTES:
(1) PROVIDE 1-INCH SPARE CONDUIT WITH PULLSTRINGS FROM LINE VOLTAGE SIDE OF FITTING TO ABOVE CEILING SPACE.
(2) PROVIDE 1-INCH SPARE CONDUIT WITH PULLSTRINGS FROM LOW VOLTAGE SIDE OF FITTING TO ABOVE CEILING SPACE.
(3) REFER TO AV SERIES SHEETS FOR AV ROUGH-IN REQUIREMENTS AND COORDINATE CONDUIT PATHWAYS AND COVERPLATES.

DEVICE			CONNECTIONS				
DESIGNATION	BASIS OF DESIGN	DESCRIPTION	POWER	VOICE	DATA	A/V	NOTES
P1	LEGRAND 8AT	FIRE RATED POKE THRU WITH 5 GANGS AND FLUSH STYLE LID	3 DUPLEX		2	1-1/4" C. TO ACCESSIBLE CEILING IN SAME ROOM AS P1.	(1)

Wireless Access Point Schedule

Type	Count	Description	Model	Antenna
WAP A	33	CISCO 9164i WIRELESS ACCESS POINT	CW9164-B	N/A
WAP B	16	CISCO 9120e WIRELESS ACCESS POINT	C9120AXE-B	6dBi Narrow Beam Antenna
WAP C	3	CISCO 9120e WIRELESS ACCESS POINT	C9120AXE-B	6dBi Small Form Factor Antenna

ELEC - LUMINAIRE SCHEDULE

TYPE	DESCRIPTION	BASIS OF DESIGN	LAMPS	BALLAST/DRIVER	HEIGHT	VOLTAGE	REMARKS
F6	RECESSED CONTINUOUS 4" APERTURE LED WITH EXTRUDED ALUMINUM HOUSING, EXTRUDED ALUMINUM TRIM, FORMED STEEL REFELECTOR, CONTINUOUS FROSTED ACRYLIC UNINTERRUPTED LENS, ELDOLED DIM TO BLACK 120 VOLT DRIVER, 4000K LED LIGHT ENGINE PRODUCING 3959 DELIVERED LUMENS PER 4'-0" SECTION, L70 RATED LIFE OF 50,000 HOURS, UL LSTED FOR DRY LOCATIONS, AND FIVE YEAR LIMITED WARRANTY. LENGTH AND CONFIGURATION AS SHOWN ON DRAWINGS. CEILING TYPE SHALL BE CONFIRMED DURING SHP DRAWING REVIEW FOR PROPER FLANGE/GRID MOUN. WHERE THE DRAWINGS INDICATE THE FIXTURES ARE DIMMED, TWO (2) ADDITIONAL CONDUCTORS ARE REQUIRED.	FOCAL POINT FSM4L FL 1000LF 40K 1C MVOLT ELCOLED 0-10V 1% SERIES OR APPROVED EQUAL	LED	LED DRIVER	CEILING	120	
F6E	SAME AS "F6" EXCEPT WITH EMERGENCY RELAY.		LED	LED DRIVER	CEILING	120	
F8	RECESSED 2X4 GRID TROFFER WITH 3-1/4" DEEP 20 GUAGE STEEL HOUSING, A12.125 PRISMATIC ACRYLIC DIFFUSER, MULTI-VOLT ELDOLED 100-1% DIMMABLE DRIVER, FIELD REPLACEMENT LED LAMP ARRAY, 4800 LUMEN 4000K 50,000 HOUR L70 RATED LIGHT ENGINE, FIVE YEAR WARRANTY, AND CSA LISTING FOR DRY LOCATIONS. WHERE DRAWINGS INDICATE THE FIXTURES ARE DIMMED, TWO (2) ADDITIONAL CONDUCTORS ARE REQUIRED.	LITHONIA 2GTL4 40L A12 EZ1 SERIES METALUX 2GR-LD1-38-A125-UNV-L840-C-D1-U OR ARROVED EQUAL	LED	LED DRIVER	CEILING	120	
F8 2X2	SAME AS "F8" EXCEPT 2X2 FIXTURE.	LITHONIA 2GTL2 40L A12 EZ1 SERIES METALUX 2GR-LD1-38-A125-UNV-L840-C-D1-U OR ARROVED EQUAL	LED	LED DRIVER	CEILING	120	
F8E	SAME AS "F8" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	CEILING	120	
F10	PENDANT MOUNTED 2" APERATURE LED WITH EXTRUDED HOUSING, FORMED STEEL 98% REFLECTIVE PAINTED REFLECTOR, SNAP-IN 90% TRANSMISSIVE TEXTURED POLYCARBONATE LENS, ELDOLED DIM TO BLACK 120V DRIVER, 4000K LED LIGHT ENGINE PRODUCING 2056DELIVERED LUMENS PER 4'-0" SECTION, L70 RATED LIFE OF 50,000 HOURS, LIGHTING FACTS LABEL, CSA LISTED FOR DRY LOCATIONS, AND FIVE YEAR LIMITED WARRANTY.	MARK SLD2 FT CRD H 1 L40 UNIV ELDOLED 120 FA SERIES OR APPROVED EQUAL	LED	LED DRIVER	9'-0" AFF	120	
F10E	SAME AS "F22" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	9'-0" AFF	120	
F14	RECESSED 6" LED DOWNLIGHT WITH 1000 LUMEN OUTPUT SELF-FLANGED CLEAR ALZAK LOWER REFLECTOR, WHITE TRIME RING, HIGHLY TRANSMISSIVE LENS, 55 DEGREE CUT-OFF TO SOURCE AND SOURCE IMAGE FOR A SMOOTH TRANSITION FROM TOP OF THE REFLECTOR TO BOTTOM, GALVENIZED STEEL MOUNTING FRAME, ADJUSTABLE 16-GAUGE GALVANIZED STEEL MOUNTING BARSWITH CONTINUOUS 4" VERTICAL ADJUSTMENT FROM BELOW CEILING, GALVANIZED STEEL JUNCTION BOX WITH HINGED ACCESS COVERS, SOLID STATE LED LIGHT ENGINE AVAILABLE IN 4000K COLOR TEMPERATURES, CLASS P, THERMALLY PROTECTED SOLID-STATE 0-10V DIMMING DRIVER, RATED SYSTEM LIFE OF 50,000 HOURS AT 70% OUTPUT, MAXIMUM 40 DEGREE CELCIUS OPERATING TEMPERATURE, FIXTURES ARE WET LOCATION LISTED, AND 3-YEAR LIMITED WARRANTY. WHERE THE DRAWINGS INDICATE THE FIXTURES ARE DIMMED, TWO (2) ADDITIONAL CONDUCTORS ARE REQUIRED.	LITHONIA LDN6 40K 10 L06 AR 120 TRW OMEGA EQUAL PATHWAY EQUAL PORTFOLIO LD6A10D010TEERM6A10840 6LM1LIWF HB26 OR APPROVED EQUAL	LED	LED DRIVER	CEILING	120	
F14E	SAME AS "F14" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	CEILING	120	
F22	PENDANT MOUNTED 8-14" WIDE X 1-3/4" TALL DIRECT/INDIRECT LED WITH RECTANGULAR FORMED COLD-ROLLED STEEL HOUSING, DIE-CAST SCULPTED END CAPS, HIGH-PERFORMANCE DIFFUSER, WHITE ENAMELED REFLECTOR, 43.4 INPUT WATT 0-10V DIMMING DRIVER, 4000K LED ARRAY DELIVERING 4800 LUMENS PER 4'-0" SECTION, L80 RATED LIFE OF 50,000 HOURS, 50% INDIRECT 50% DIRECT DISTRIBUTION, AIRCRAFT CABLE SUSPENSION, AND FIVE YEAR LIMITED FIXTURE WARRANTY.	PEERLESS BRM9L S 4FT 80CRI 40K 1200LF OR APPROVED EQUAL	LED	LED DRIVER	18" BELOW CEILING	120	
F22a	PENDANT MOUNTED 8-14" WIDE X 1-3/4" TALL DIRECT/INDIRECT LED WITH RECTANGULAR FORMED COLD-ROLLED STEEL HOUSING, DIE-CAST SCULPTED END CAPS, HIGH-PERFORMANCE DIFFUSER, WHITE ENAMELED REFLECTOR, 43.4 INPUT WATT 0-10V DIMMING DRIVER, 4000K LED ARRAY DELIVERING 2000 LUMENS PER 4'-0" SECTION, L80 RATED LIFE OF 50,000 HOURS, 50% INDIRECT 50% DIRECT DISTRIBUTION, AIRCRAFT CABLE SUSPENSION, AND FIVE YEAR LIMITED FIXTURE WARRANTY.	PEERLESS BRM9L S 4FT 80CRI 40K 500LF OR APPROVED EQUAL	LED	LED DRIVER	18" BELOW CEILING	120	
F22b	PENDANT MOUNTED 8-14" WIDE X 1-3/4" TALL DIRECT/INDIRECT LED WITH RECTANGULAR FORMED COLD-ROLLED STEEL HOUSING, DIE-CAST SCULPTED END CAPS, HIGH-PERFORMANCE DIFFUSER, WHITE ENAMELED REFLECTOR, 43.4 INPUT WATT 0-10V DIMMING DRIVER, 4000K LED ARRAY DELIVERING 2800 LUMENS PER 4'-0" SECTION, L80 RATED LIFE OF 50,000 HOURS, 50% INDIRECT 50% DIRECT DISTRIBUTION, AIRCRAFT CABLE SUSPENSION, AND FIVE YEAR LIMITED FIXTURE WARRANTY.	PEERLESS BRM9L S 4FT 80CRI 40K 700LF OR APPROVED EQUAL	LED	LED DRIVER	18" BELOW CEILING	120	
F22c	PENDANT MOUNTED 8-14" WIDE X 1-3/4" TALL DIRECT/INDIRECT LED WITH RECTANGULAR FORMED COLD-ROLLED STEEL HOUSING, DIE-CAST SCULPTED END CAPS, HIGH-PERFORMANCE DIFFUSER, WHITE ENAMELED REFLECTOR, 43.4 INPUT WATT 0-10V DIMMING DRIVER, 4000K LED ARRAY DELIVERING 3600 LUMENS PER 4'-0" SECTION, L80 RATED LIFE OF 50,000 HOURS, 50% INDIRECT 50% DIRECT DISTRIBUTION, AIRCRAFT CABLE SUSPENSION, AND FIVE YEAR LIMITED FIXTURE WARRANTY.	PEERLESS BRM9L S 4FT 80CRI 40K 900LF OR APPROVED EQUAL	LED	LED DRIVER	18" BELOW CEILING	120	
F22E	SAME AS "F22" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	18" BELOW CEILING	120	
F22Ea	SAME AS "F22a" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	18" BELOW CEILING	120	
F22Eb	SAME AS "F22b" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	18" BELOW CEILING	120	
F22Ec	SAME AS "F22c" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	18" BELOW CEILING	120	
F30	4'-0" LONG SURFACE MOUNTED LED STRIP WITH DIE-FORMED COLD ROLLED STEEL HOUSING, MULTI-VOLT SOLID STATE 10% THD ELECTRONIC BALLAST, WHITE POLYESTER POWDER ENAMEL FINISH, WIRE GUARD.	LITHONIA CSS L48 AL03 MVOLT SWW3 80CRI OR APPROVED EQUAL	LED	LED DRIVER	CEILING	120	
F30E	SAME AS "F30" EXCEPT WITH EMERGENCY RELAY.	-	LED	LED DRIVER	CEILING	120	
F31	2'-0" LONG SURFACE MOUNTED LED STRIP WITH DIE-FORMED COLD ROLLED STEEL HOUSING, MULTI-VOLT SOLID STATE 10% THD ELECTRONIC BALLAST, WHITE POLYESTER POWDER ENAMEL FINISH, WIRE GUARD.	LITHONIA CSS L48 AL03 MVOLT SWW3 80CRI OR APPROVED EQUAL	LED	LED DRIVER	CEILING	120	
F36	ASSYMETRIC LED DIRECT OUTDOOR SCONCE WITH 10-1/4" X 8-1/2" X 9-5/8" DIE CAST ALUMINUM HOUSING, TEMPERED CLEAR GLASS LENS IN DIE CAST ALUMINUM DOOR FRAME, FOUR (4) CAPTIVE STAINLESS STEEL SOCKET HEAD FASTNERS, THREADED STAINLESS STEEL INSERTS, PURE ANODIZED ALUMINUM REFLECTOR SYSTEM, MOLDED SILICONE RUBBER U-CHANNEL GASKETING, INTEGRAL ELECTRONIC DRIVER, 52 WATT LED ARRAY, 4000K LED ARRAY, 80 CRI, 2982 DELIVERED LUMENS, UL LISTED FOR WET LOCATIONS, AND IP65 RATING.	BEGA 2434LED KIM EQUAL GARDCO EQUAL WE-EF OLV344LED/622-7520 OR APPROVED EQUAL	LED	LED DRIVER	REFER TO ARCH SECTIONS	120	
X1	ARCHITECTUAL EDGE-LIT EXIT SIGN WITH INJECTION-MOLDED ACRYLIC PANELS, SINGLE FACE, MIRRORED BACKGROUND, BRUSHED ALUMINUM HOUSING TRIM, PLUG-IN POWER CONNECTORS, THREE YEAR UNCONDITIONAL WARRANTY, LED LAMPS ON PRINTED CIRCUIT BOARD, AND SOLID-STATE ELECTRONICS. PANEL LETTERS SHALL BE MOLDED TEXTURED 6" HIGH WITH 3/4" STROKE. ARCHITECT TO PANEL AND LETTER COLOR.	ISOLITE ELT AC 1C BA OR APPROVED EQUAL					
X2	ARCHITECTUAL EDGE-LIT EXIT SIGN WITH INJECTION-MOLDED ACRYLIC PANELS, DOUBLE FACE, BRUSHED ALUMINUM HOUSING TRIM, PLUG-IN POWER CONNECTORS, THREE YEAR UNCONDITIONAL WARRANTY, LED LAMPS ON PRINTED CIRCUIT BOARD, AND SOLID-STATE ELECTRO	ISOLITE ELT AC 2C BA OR APPROVED EQUAL					

PANELBOARD AND WIRING SCHEDULE

PANEL: **406EP3** **MAINS TYPE:** MCB **PANEL INTERRUPTING RATING:** 10,000
VOLTAGE: 208Y/120V,3P,4W **SPD:** **LOCATION:** PENTHOUSE PH406
AMPERES: 225 A **MOUNTING:** SURFACE **SUPPLY FROM:**

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EQUIP	1-#8, 1-#8, 1-#8	20	1	1	2.0	0.2					2	1	20	1-#12, 1-#12, 1-#12	REC 374	
	REC 374	1-#12, 1-#12, 1-#12	20	1	3			0.2	0.2			4	1	20	1-#12, 1-#12, 1-#12	REC 374	
	REC 374	1-#12, 1-#12, 1-#12	20	1	5					0.2	0.2	6	1	20	1-#12, 1-#12, 1-#12	REC 376	
	REC 376	1-#12, 1-#12, 1-#12	20	1	7	0.2	0.2					8	1	20	1-#12, 1-#12, 1-#12	REC 376	
	REC 300M	1-#12, 1-#12, 1-#12	20	1	9			0.2	0.2			10	1	20	1-#12, 1-#12, 1-#12	REC 300M	
	REC 382	1-#12, 1-#12, 1-#12	20	1	11					0.2	0.2	12	1	20	1-#12, 1-#12, 1-#12	REC 378A	
	REC 382	1-#12, 1-#12, 1-#12	20	1	13	0.2	0.2					14	1	20	1-#12, 1-#12, 1-#12	REC 382	
	REC 384	1-#12, 1-#12, 1-#12	20	1	15			0.2	0.2			16	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 384A	1-#12, 1-#12, 1-#12	20	1	17					0.2	0.2	18	1	20	1-#12, 1-#12, 1-#12	REC 384	
	REC 390	1-#12, 1-#12, 1-#12	20	1	19	0.2	0.2					20	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394	1-#12, 1-#12, 1-#12	20	1	21			0.2	0.2			22	1	20	1-#12, 1-#12, 1-#12	REC 394	
	REC 394A	1-#12, 1-#12, 1-#12	20	1	23					0.2	0.1	24	2	20	2-#12, 1-#12, 1-#12	EQUIP 378A	
	EQUIP 374	2-#12, 1-#12, 1-#12	20	2	25	0.1	0.1					26					
					27			0.1	0.1			28	2	20	2-#12, 1-#12, 1-#12	EQUIP 374	
	EQUIP 300M	2-#12, 1-#12, 1-#12	20	2	29					0.1	0.1	30					
					31	0.1	0.1					32	2	20	2-#12, 1-#12, 1-#12	EQUIP 382	
	EQUIP 384	2-#12, 1-#12, 1-#12	20	2	33			0.1	0.1			34					
					35					0.1	0.1	36	2	20	2-#12, 1-#12, 1-#12	EQUIP 384A	
	EQUIP 390	2-#12, 1-#12, 1-#12	20	2	37	0.1	0.1					38					
					39			0.1	0.1			40	2	20	2-#12, 1-#12, 1-#12	EQUIP 390	
	EQUIP 394	2-#12, 1-#12, 1-#12	20	2	41					0.1	0.1	42					
					43	0.1	0.1					44	2	20	2-#12, 1-#12, 1-#12	EQUIP 394A	
	REC PH406	1-#12, 1-#12, 1-#12	20	1	45			0.5	0.1			46					
	REC PH406	1-#12, 1-#12, 1-#12	20	1	47					0.2	0.2	48	1	20	1-#12, 1-#12, 1-#12	REC PH406	
	REC PH406	1-#12, 1-#12, 1-#12	20	1	49	0.2	0.2					50	1	20	1-#12, 1-#12, 1-#12	REC PH406	
	LTNG PH406	1-#12, 1-#12, 1-#12	20	1	51			0.0	0.1			52	2	20	2-#12, 1-#12, 1-#12	EQUIP Space 210	
	SPARE	--	20	1	53					0.0	0.1	54					
						4.4 kVA		2.8 kVA		2.4 kVA							
						37 A		24 A		20 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	4400 VA	100.00%	4400 VA	**TOTAL CONNECTED LOAD:**	9620 VA
LTNG	0 VA	0.00%	0 VA	**TOTAL ESTIMATED DEMAND:**	9620 VA
REC	5220 VA	100.00%	5220 VA	**TOTAL CONNECTED CURRENT:**	27 A
				TOTAL ESTIMATED DEMAND CURRENT:	27 A
				25 % ADDITIONAL CAPACITY:	7 A
				TOTAL PANEL CURRENT:	33 A

NOTES: WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **(E) 400EP2** **MAINS TYPE:** MCB **PANEL INTERRUPTING RATING:** <ENGINEER TO SPECIFY>
VOLTAGE: 480Y/277V,3P,4W **SPD:** **LOCATION:** PENTHOUSE PH403
AMPERES: 800 A **MOUNTING:** SURFACE **SUPPLY FROM:**

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EXISTING 400ET1 (45KVA)	--	70	3	1	15.0	0.3					2	3	20	3-#12, 1-#12, 1-#12	EQUIP	
					3			15.0	0.3			4					
					5					15.0	0.3	6					
	EXISTING CRCU-1A	--	30	3	7	5.0	50.0					8	3	225	--	EXISTING AHU-3	
					9			5.0	50.0			10					
					11					5.0	50.0	12					
	EXISTING CU-2	--	20	3	13	1.3	--					14	1	--	--	SPACE	
					15			1.3	--			16	1	--	--	SPACE	
					17					1.3	--	18	1	--	--	SPACE	
	EF-15	3-#4, 1-#4, 1-#8	70	3	19	7.7	41.2					20	3	300	3-#500, 1-#500, 1-#4	AHU-9	
					21			7.7	41.2			22					
					23					7.7	41.2	24					
	EF-14	3-#4, 1-#4, 1-#8	70	3	25	7.7	--					26	1	--	--	SPACE	
					27			7.7	--			28	1	--	--	SPACE	
					29					7.7	--	30	1	--	--	SPACE	
	CU-1	3-#12, 1-#12, 1-#12	20	3	31	0.3	--					32	1	--	--	SPACE	
					33			0.3	0.0			34	1	20	--	SPARE	
					35					0.3	0.0	36	1	20	--	SPARE	
	SPARE	--	20	1	37	0.0	0.0					38	1	20	--	SPARE	GFI
	SPARE	--	20	1	39			0.0	0.0			40	1	20	--	SPARE	GFI
	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	GFI
						128.4 kVA		128.4 kVA		128.4 kVA							
						464 A		464 A		464 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	171495 VA	100.00%	171495 VA	**TOTAL CONNECTED LOAD:**	385314 VA
Spare	213819 VA	100.00%	213819 VA	**TOTAL ESTIMATED DEMAND:**	385314 VA
				TOTAL CONNECTED CURRENT:	463 A
				TOTAL ESTIMATED DEMAND CURRENT:	463 A
				25 % ADDITIONAL CAPACITY:	116 A
				TOTAL PANEL CURRENT:	579 A

NOTES: - WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.

PANELBOARD AND WIRING SCHEDULE

PANEL: **(E) 163EP1** **MAINS TYPE:** MCB **PANEL INTERRUPTING RATING:** <ENGINEER TO SPECIFY>
VOLTAGE: 208Y/120V,3P,4W **SPD:** **LOCATION:**
AMPERES: 100 A **MOUNTING:** SURFACE **SUPPLY FROM:**

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EXISTING EQUIPMENT	--	--	1	1	--	--					2	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	3			--	--			4	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	5					--	--	6	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	7	--	--					8	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	9			--	--			10	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	11					--	--	12	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	13	--	--					14	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	15			--	--			16	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	17					--	--	18	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	19	--	--					20	1	--	--	EXISTING EQUIPMENT	
	EQUIP SEC-A EIDF 180	1-#12, 1-#12, 1-#12	20	1	21			0.5	--			22	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	23					--	--	24	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	25	--	--					26	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	27			--	--			28	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	29					--	--	30	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	31	--	--					32	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	33			--	--			34	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	35					--	--	36	1	--	--	EXISTING EQUIPMENT	
	EQUIP SS_1 186	2-#12, 1-#12, 1-#12	20	2	37	0.1	--					38	1	--	--	EXISTING EQUIPMENT	
					39			0.1	--			40	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	41					--	--	42	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	43	--	--					44	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	45			--	--			46	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	47					--	0.0	48	1	20	1-#12, 1-#12, 1-#12	LTG	
	EXISTING EQUIPMENT	--	--	1	49	--	0.0					50	1	20	1-#12, 1-#12, 1-#12	LTG	
	EXISTING EQUIPMENT	--	--	1	51			--	0.0			52	1	20	--	SPARE	
	SPARE	--	20	1	53					0.0	0.0	54	1	20	--	SPARE	
						0.1 kVA		0.6 kVA		0.0 kVA							
						1 A		5 A		0 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	708 VA	100.00%	708 VA	**TOTAL CONNECTED LOAD:**	708 VA
LTNG	0 VA	0.00%	0 VA	**TOTAL ESTIMATED DEMAND:**	708 VA
LTG	0 VA	0.00%	0 VA	**TOTAL CONNECTED CURRENT:**	2 A
				TOTAL ESTIMATED DEMAND CURRENT:	2 A
				25 % ADDITIONAL CAPACITY:	0 A
				TOTAL PANEL CURRENT:	2 A

NOTES: - WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
- EXISTING PANELBOARD. PROVIDE NEW BREAKERS FOR NEW LOADS. RETURN ALL REMOVED BREAKERS TO OWNER.

PANELBOARD AND WIRING SCHEDULE

PANEL: **(E) 263EP1** **MAINS TYPE:** MCB **PANEL INTERRUPTING RATING:** <ENGINEER TO SPECIFY>
VOLTAGE: 208Y/120V,3P,4W **SPD:** **LOCATION:**
AMPERES: 225 A **MOUNTING:** SURFACE **SUPPLY FROM:**

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EXISTING EQUIPMENT	--	--	1	1	--	--					2	1	--	--	EXISTING EQUIPMENT	
	EQUIP SEC-A EIDF 280	1-#12, 1-#12, 1-#12	20	1	3			0.5	--			4	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	5					--	0.0	6	1	20	1-#12, 1-#12, 1-#12	LTG	
	EQUIP	1-#12, 1-#12, 1-#12	20	1	7	0.0	--					8	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	9			--	--			10	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	11					--	--	12	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	13	--	0.1					14	2	20	2-#12, 1-#12, 1-#12	EQUIP SS_2 292	
	EXISTING EQUIPMENT	--	--	1	15			--	0.1			16					
	LTG	1-#12, 1-#12, 1-#12	20	1	17					0.0	--	18	1	--	--	EXISTING EQUIPMENT	
	DDC SECOND FLOOR POWER	1-#12, 1-#12, 1-#12	20	1	19	0.2	0.0					20	1	20	--	SPARE	
	EXISTING EQUIPMENT	--	--	1	21			--	--			22	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	23					--	--	24	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	25	--	--					26	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	27			--	--			28	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	29					--	0.1	30	1	20	1-#12, 1-#12, 1-#12	TRAP PRIMER 174	
	EXISTING EQUIPMENT	--	--	1	31	--	--					32	1	--	--	EXISTING EQUIPMENT	
	DDC THIRD FLOOR POWER	1-#12, 1-#12, 1-#12	20	1	33			0.2	--			34	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	35					--	--	36	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	37	--	--					38	1	--	--	EXISTING EQUIPMENT	
	DATA RACK 292	2-#12, 1-#12, 1-#12	20	2	39			0.1	--			40	1	--	--	EXISTING EQUIPMENT	
					41					0.1	0.5	42	1	20	1-#12, 1-#12, 1-#12	TRAP PRIMER 274	
	EXISTING EQUIPMENT	--	--	1	43	--	--					44	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	45			--	--			46	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	47					--	--	48	1	--	--	EXISTING EQUIPMENT	
	EQUIP SEC-A EIDF 380	1-#12, 1-#12, 1-#12	20	1	49	0.5	0.1					50	2	20	2-#12, 1-#12, 1-#12	DATA RACK 186	
	DATA RACK 396	2-#12, 1-#12, 1-#12	20	2	51			0.1	0.1			52					
					53					0.1	0.0	54	1	20	--	SPARE	
						0.9 kVA		1.1 kVA		0.8 kVA							
						7 A		9 A		7 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	2308 VA	100.00%	2308 VA	**TOTAL CONNECTED LOAD:**	2768 VA
LTNG	0 VA	0.00%	0 VA	**TOTAL ESTIMATED DEMAND:**	2768 VA
REC	360 VA	100.00%	360 VA	**TOTAL CONNECTED CURRENT:**	8 A
Power	100 VA	100.00%	100 VA	**TOTAL ESTIMATED DEMAND CURRENT:**	8 A
LTG	0 VA	0.00%	0 VA	**25 % ADDITIONAL CAPACITY:**	2 A
				TOTAL PANEL CURRENT:	10 A

NOTES: - WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
- EXISTING PANELBOARD. PROVIDE NEW BREAKERS FOR NEW LOADS. RETURN ALL REMOVED BREAKERS TO OWNER.

PANELBOARD AND WIRING SCHEDULE

PANEL: **(E) 363EP1** **MAINS TYPE:** MCB **PANEL INTERRUPTING RATING:** <ENGINEER TO SPECIFY>
VOLTAGE: 208Y/120V,3P,4W **SPD:** **LOCATION:** Space 176
AMPERES: 100 A **MOUNTING:** SURFACE **SUPPLY FROM:**

NOTES	CIRCUIT DESCRIPTION	HOT, NEUT, GND	OCP	P	CKT	A		B		C		CKT	P	OCP	HOT, NEUT, GND	CIRCUIT DESCRIPTION	NOTES
	EXISTING EQUIPMENT	--	--	1	1	--	--					2	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	3			--	--			4	1	--	--	EXISTING EQUIPMENT	
	EQUIP SS_3 396	2-#12, 1-#12, 1-#12	20	2	5					0.5	0.0	6	1	20	1-#12, 1-#12, 1-#12	Motor 394	
					7	0.5	0.0					8	1	20	1-#12, 1-#12, 1-#12	Motor 390	
	Motor 384	1-#12, 1-#12, 1-#12	20	1	9			0.0				10					
	EQUIP 382	1-#8, 1-#8, 1-#8	20	1	11					2.0	2.0	12	1	20	1-#6, 1-#6, 1-#6	EQUIP 394	
	EQUIP 390	1-#6, 1-#6, 1-#6	20	1	13	2.0	2.0					14	1	20	1-#6, 1-#6, 1-#6	EQUIP 384	
	LTG	1-#12, 1-#12, 1-#12	20	1	15			0.0	0.0			16	1	20	1-#12, 1-#12, 1-#12		
		1-#12, 1-#12, 1-#12	20	1	17					0.0	0.5	18	1	20	1-#12, 1-#12, 1-#12	EPO 390	
	SPARE	--	20	1	19	0.0	0.0					20	1	20	--	SPARE	
	EXISTING EQUIPMENT	--	--	1	21			--	--			22	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	23					--	--	24	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	25	--	--					26	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	27			--	--			28	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	29					--	--	30	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	31	--	--					32	1	--	--	EXISTING EQUIPMENT	
	EXISTING EQUIPMENT	--	--	1	33			--	0.0			34	1	20	--	SPARE	
	SPARE	--	20	1	35					0.0	0.0	36	1	20	--	SPARE	
	SPARE	--	20	1	37	0.0	0.0					38	1	20	--	SPARE	
	SPARE	--	20	1	39			0.0	0.0			40	1	20	--	SPARE	
	SPARE	--	20	1	41					0.0	0.0	42	1	20	--	SPARE	
						4.5 kVA		0.0 kVA		5.0 kVA							
						43 A		0 A		47 A							

LOAD CLASSIFICATION	CONNECTED LOAD	DEMAND FACTOR	ESTIMATED DEMAND	PANEL TOTALS	
EQUIP	9480 VA	100.00%	9480 VA	**TOTAL CONNECTED LOAD:**	9480 VA
LTNG	0 VA	0.00%	0 VA	**TOTAL ESTIMATED DEMAND:**	9480 VA
Motor	0 VA	0.00%	0 VA	**TOTAL CONNECTED CURRENT:**	26 A
LTG	0 VA	0.00%	0 VA	**TOTAL ESTIMATED DEMAND CURRENT:**	26 A
				25 % ADDITIONAL CAPACITY:	7 A
				TOTAL PANEL CURRENT:	33 A

NOTES: - WHERE NOT LISTED, WIRE AND CONDUIT SHALL BE BE MINIMUM PER SPECIFICATIONS. SPARE BREAKERS TO BE 20A/1P.
- EXISTING PANELBOARD. PROVIDE NEW BREAKERS FOR NEW LOADS. RETURN ALL REMOVED BREAKERS TO OWNER.

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CONTRACT DOCUMENTS

IMPROVE FACILITIES - JACOBS SCIENCE BUILDING

UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY

PROJECT	202277/XKJS22
DATE	3.14.23

REVISIONS

No.	Description	Date

ELECTRICAL SCHEDULES

E-602