

Notice

Basic Information

Estimated Contract Value (USD)	\$1.00 (Not shown to suppliers)
Reference Number	0000416324
Issuing Organization	Dallas County
Owner Organization	
Solicitation Type	IFB - Invitation for Bid (Formal)
Solicitation Number	2026-016-7101
Title	Replacement of Air Handler Units and BMS at Henry Wade Juvenile Center Project
Source ID	PU.AG.USA.2438.C21221001
Piggyback Solicitation	No

Details

Location	Dallas County, Texas
Description	Replacement of Air Handling Units (AHUs) and Building Management System

(BMS) at the Henry Wade Juvenile Justice Center (JJC) located in Dallas, Texas. The project generally consists of the removal and replacement of twelve (12) existing chilled water, electric heat, variable air volume (VAV) air handling units and the replacement of the existing, obsolete Building Management System (BMS), including associated controls, devices, and system integration components. In addition, the scope includes removal of the existing Johnson Controls BMS and integration of a new BMS platform that incorporates a UL 864-compliant smoke control system to maintain the facility's smoke evacuation and life-safety functions. The Henry Wade JJC is an occupied and secure detention facility. All work shall be performed in a manner that maintains facility operations, security requirements, and life-safety systems throughout the duration of the project.

Dates

Publication	03/12/2026 03:00 PM CDT
Question Acceptance Deadline	04/09/2026 03:00 PM CDT
Questions are submitted online	Yes
Closing Date	04/23/2026 02:00 PM CDT

Prebid Conference	03/26/2026 10:30 AM CDT
Onsite Visit	03/26/2026 12:30 PM CDT

Contact Information

Marina Valley
214-653-7618
marina.valley@dallascounty.org

Buyer Preferences, Guidelines & Requirements

Participation Requirements

- Minority Business Participation
- Small Business Participation
- Women-Owned Business Participation

Bonding Requirements

- Bid Bond	5.00 %
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Pre-Bidding Events

Event Type	Prebid Conference
Attendance	Recommended
Event date	03/26/2026 10:30 AM CDT
Location	Microsoft Teams

Event Note

PRE-BID MEETING LINK:

<https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fteams.microsoft.com%2Fmeet%2F27809549031820%3Fp%3D70JTW0m1WXV2gi4hKV&data=05%7C02%7CMarina.Valley%40dallascounty.org%7Cffc775c8297c4c6e2a7d08de7954b3fb%7C51adcfad72f1479cb28f52412e04014b%7C0%7C0%7C639081601859711844%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIlYiOiIwLjAuMDAwMCIsIiAiOiJXaW4zMilslkFOljoiTWFpbCisldUljoYfQ%3D%3D%7C0%7C%7C%7C&sdata=FsuRK4g9SUL2MbmTTovnxDL89LXQ2uv9181jgJCRXJs%3D&reserved=0>

MICROSOFT TEAMS:

Meeting ID: 278 095 490 318 20

OR

DIAL IN BY PHONE: 1-469-208-1731, ID: 287 960 880#

Event Type

Onsite Visit

Attendance

Recommended

Event date

03/26/2026 12:30 PM CDT

Location

Henry Wade Juvenile Justice Center 2600 Lone Star Drive Dallas, TX 75212

Event Note

Bid Submission Process

Bid Submission Type

Electronic or Physical Bid Submission

Pricing

Lump sum

Pricing

Lump sum

Bid Documents List

Item Name	Description	Mandatory	Limited to 1 file
Bid Documents	Defined in the solicitation	Yes	No
W-9	W-9 form must be signed in 2026	Yes	No
SBE Forms	Attachment S - Small Business Enterprise (SBE) Forms must be submitted with bid	Yes	No
Reference Letters	3 Letters of Reference, 3 year minimum of continuous operation	Yes	No
Bid Security or Bid Bond	Bid Security or Bid Bond	Yes	No

Documents

Documents

Document	Size	Uploaded Date	Language
Ts & Cs [pdf]	342 Kb	12/20/2024 02:00 PM CST	English
SBE [pdf]	536 Kb	12/19/2024 11:15 AM CST	English
Solicitation [pdf]	359 Kb	03/11/2026 05:01 PM CDT	English
Exhibit A [pdf]	16 Mb	03/11/2026 05:01 PM CDT	English
Exhibit B [pdf]	4 Mb	03/11/2026 05:01 PM CDT	English
Exhibit C [pdf]	442 Kb	03/11/2026 05:01 PM CDT	English
Exhibit D [pdf]	628 Kb	03/11/2026 05:05 PM CDT	English

Categories

Selected Categories

NIGP Categories (7)	
941	EQUIPMENT MAINT, REPAIR, AND RELATED SERVICES FOR POWER GENERATION AND TRANSMISSION EQUIP.
94155	HVAC Systems Maintenance and Repair, Power Plant HVAC Systems Maintenance and Repair, Power Plant
031	AIR CONDITIONING, HEATING, AND VENTILATING EQUIPMENT, PARTS AND ACCESSORIES (SEE CLASS 740 ALSO)
03167	HVAC Equipment, Accessories and Supplies (Not Otherwise Classified) HVAC Equipment, Accessories and Supplies (Not Otherwise Classified)
03118	Coil and Fan Units, Air Conditioning Coil and Fan Units, Air Conditioning
03126	Control Systems: Complete (For Automatic Temperature Control) Control Systems: Complete (For Automatic Temperature Control)
910	BUILDING MAINTENANCE, INSTALLATION AND REPAIR SERVICES
91017	Energy Computerized Control System (HVAC, Lighting, Utilities, etc) Installation, Maintenance and Repair Services Energy Computerized Control System (HVAC, Lighting, Utilities, etc) Installation, Maintenance and Repair Services
91036	Heating, Air Conditioning, and Ventilation Maintenance and Repair Services (Including Installation) Heating, Air Conditioning, and Ventilation Maintenance and Repair Services (Including Installation)
936	EQUIPMENT MAINTENANCE AND REPAIR SERVICES FOR GENERAL EQUIPMENT
93629	Facility Energy Management Systems Maintenance and Repair Facility Energy Management Systems Maintenance and Repair

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Courtesy Email

Sent using email addresses

admin@airefrezco.com;admin@greyconstruction.com;ah01@elevatedsolutionsteamllc.com;airkoolhac@att.net;albertv@serviceprodfw.com;alfulton@cowboyair.com;amanda@beachplumbinginc.com;amigoservices@sbcglobal.net;ana.barrios@fixadrip.com;angelacrefrigeration@yahoo.com;atco121@yahoo.com;avyelliott@gmail.com;byron@amsdfw.com;ckahn@kahnmechanical.com;daisy@daisyutilities.com;debbi@arrowinsulationinc.com;discountairandheat@yahoo.com;erasmozapata353@gmail.com;freeney@conceptsvcs.com;gary@atlanticblowers.com;gate.1@flash.net;gretchen@garnetdynamics.com;herplumbingco@gmail.com;jaspreet@garlandheatingandair.com;jehc@sbcglobal.net;jesus@cleanairsvcs.com;jose@integrafireprotection.com;julio@agaveplumbing.com;ken@hmfs28.com;michelle@3gfire.com;michelle@denalics.com;misty.sandoval@sandovalplumbers.com;nancy.sandoval@ansplumbingco.com;office@mrbackflowtx.com;oshman325@hotmail.com;ringram@ipmcco.com;sduron@duronbuildingspecialties.com;tammy@mwi.tx.com;tyburnett@hillsidemechanicalcontractors.com;vicjackson@achsource.com

DALLAS COUNTY STANDARD TERMS AND CONDITIONS

By returning the Bid Proposal with a price quote, vendors certify and agree that:

1. All charges – wages, salaries, taxes including payroll taxes, benefits, insurance, overhead, fees, permits, licenses, fees, labor, personnel, service, supervision, documentation, administration, training, implementation, materials, supplies, delivery, transportation, shipping , freight, fuel surcharges, mileages, parking, tolls, travel time, and all other associated cost direct and indirect including incidentals necessary to provide the goods and services outlined in this solicitation specified or implied are to be included in bid proposal cost. Services and Inside Delivery will be F.O.B.: Dallas County as indicated on each individual purchase order.

2. **TEXAS GOVERNMENT CODE CHAPTER 2271 VERIFICATION – BOYCOTT ISRAEL**

Effective September 1, 2017, the State of Texas requires all governmental entity, state agency or political subdivision (which includes counties) to obtain written verification from the Company that their Company does NOT boycott Israel and will not boycott Israel during the life of this contract, agreement or purchase order (hereafter referred to as “Contract”). By accepting this Contract, the Company (Professional or other applicable term defining the contracting party) verifies that it does not Boycott Israel, and agrees that during the term of this Contract will not Boycott Israel as that term is defined in Texas Government Code Section 808.001, as amended." The County cannot execute a contract for goods and services without this declaration. Please refer to Texas Government Code, Subtitle F, Title 10, Government Code Chapter 2270.

(a) This section applies only to a contract that:

(1) is between a governmental entity and a company with 10 or more full-time employees; and

(2) has a value of \$100,000 or more that is to be paid wholly or partly from public funds of the governmental entity.

3. **CONFLICT OF INTEREST QUESTIONNAIRE (CIQ) FORM**

Effective January 1, 2006, Chapter 176 of the Texas Local Government Code requires that any vendor or person considering doing business with a local government entity disclose in the Questionnaire Form CIQ, the vendor or person's affiliation or business relationship that might cause a conflict of interest with a local government entity. By law, this questionnaire must be filed with the records administrator of Dallas County no later than the 7th business day after the date the person becomes aware of facts that require the statement to be filed. See Section 176.006, Local Government Code. A person commits an offense if the person violates Section 176.006, Local Government Code. An offense under this section is a Class C misdemeanor. By submitting a response to this request, the vendor represents that it is in compliance with the requirements of Chapter 176 of the Texas Local Government Code. Contractor shall complete and file the Conflict of Interest Questionnaire with the Dallas County Clerk at 1201 Elm Street, 21st Floor, Dallas, Texas 75270.

4. **CERTIFICATE OF INTERESTED PARTIES FORM 1295**

In 2015, the Texas Legislature adopted House Bill 1295, which added section 2252.908 of the Government Code. The law states that a governmental entity or state agency may not enter into certain contracts with a business entity unless the business entity submits a disclosure of interested parties form to the governmental entity or state agency at the time the business entity submits the signed contract to the governmental entity or state agency. The form discloses any interested parties who have a controlling interest (10% or more ownership) in the business entity and those who actively participate in facilitating the contract or negotiate the terms of the contract (broker, intermediary, advisor, and/or attorney), if any. The disclosure requirement applies to a contract entered into on or after January 1, 2016.

The Texas Ethics Commission was required to adopt rules necessary to implement that law, prescribe the disclosure of interested parties form, and post a copy of the form on the commission's website. The commission adopted the Certificate of Interested Parties form (Form 1295) on October 5, 2015 and new rules (Chapter 46) on November 30, 2015.

The "Certificate of Interested Parties" form must be completed on the Texas Ethics Commission website, printed, signed, and submitted to the County by the authorized agent of the Business Entity with acknowledgment that disclosure is made under oath and under penalty of perjury prior to final contract execution.

To obtain additional information on HB 1295, to learn more about Texas Ethics Commission process to create a new account or to complete an electronic version of Form1295 for submission with a signed contract, please go to the following website: <https://www.ethics.state.tx.us/tec/1295-Info.htm>

Instructional Videos for Business Entities on how to file online can be found at https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

The identification number (section 3 of the form) to be used on the 1295 for this procurement is the IFB solicitation number.

5. **TITLE VI ASSURANCES/COMPLIANCE POLICY**

The County, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

Pursuant to Title VI requirements, any entity or person that enters into a contract with Dallas County including, but not limited to prime contractors, sub-contractors, and sub-recipients, may not discriminate on the basis of race, color, national origin, age, sex, disability, or religion in their selection and retention of subcontractors (including consultants), in connection with any federally funded program or activity (including any program or activity undertaken/funded by a Dallas County Division/Department that receives federal funds).

6. **TEXAS GOVERNMENT CODE CHAPTER 2252 ATTESTATION**

By entering into this Contract, Contractor attests that Contractor is not a company that is identified on a list prepared and maintained by the Texas State Comptroller under Section 2252.153, Tex. Gov't Code, as a company known to have contracts with or provide supplies or services to a foreign terrorist organization as designated by the U.S. Secretary of State.

7. **PRE-AWARD SURVEY**

After bid opening and before award, County may perform a pre-award survey of the bidder's facilities and equipment to be used in the performance of work under this solicitation. Bidder agrees to allow all reasonable requests for inspection of his or her facilities.

8. After bid opening and before award Dallas County reserves the right to request the bidder to provide, but not necessarily limited to, the following forms:

- a. Texas Government Code Chapter 2270 Verification Form
- b. Texas Government Code Chapter 2252 Certification Form
- c. 1295 Form
- d. W-9 Form

9. The bid award shall be based on, but not necessarily limited to, the following factors:

- e. Unit Price
- f. Total Bid Price
- g. Delivery Date
- h. Results of Testing Samples
- i. Special Needs and Requirements of Dallas County
- j. Dallas County's Experience with Products Bid
- k. Vendor's Past Performance Record with Dallas County
- l. Dallas County's Evaluation of Vendor's Ability
- m. Estimated Costs for Supplies, Maintenance, etc.
- n. Estimated Surplus Value
- o. Small Business Enterprise completed forms
- p. Dallas County reserves the right to award to a primary and secondary vendor(s).

Dallas County shall award this contract to the responsive bidder(s) offering the lowest and best bid in accordance to Local Government Code 262.021(5-a) who comply with all of the requirements, terms and conditions prescribed herein. Dallas County reserves the right to reject any or all bids in whole or in part, to make multiple awards, partial awards, award by item by item basis, award by types, award by sections, or lump sum total, and waive any immaterial deviations in the bid as may be considered in the best interest of the County.

10. **INVOICING/BILLING**

Invoices will be submitted to the Dallas County Auditor's Office. All billings must have appropriate supporting documentation before such billings will be approved. Billing shall cover goods and services not previously invoiced. Vendor shall reimburse the Dallas County for any monies paid to Contractor for goods or services not provided or when goods/services provided do

not meet the contract agreement or solicitation requirements. Payments made by the County shall not preclude the right of the County from thereafter disputing any items involved or billed under the contract agreement or solicitation and shall not be construed as acceptance of any part of the goods or services. Contractor understands and agrees that any funds paid under this contract are contingent upon satisfactory delivery of the Services as described in this contract and subject to routine processing. No payment, on any basis, will be made for unsatisfactory work.

Contractor agrees to submit complete, fully documented and accurate itemized statement of invoices with appropriate/applicable attachments and documentation, as required by the County for all goods, services, and work performed **following acceptance of goods, services or work by the County.**

At minimum, the original invoices submitted against the IFB, must reference all of the following information:

- a. Contractor/Vendor Name
- b. Contractor/Vendor Address
- c. Contractor/Vendor Contact Information
- d. Contractor/Vendor Telephone Number and Fax Number
- e. Contractor/Vendor Remittance to Address
- f. Invoice Date
- g. Invoice Number (uniquely numbered, no duplicates)
- h. Valid Dallas County Purchase Order Number must appear on all itemized invoices and packing slips
- i. Solicitation Number
- j. Date of Services or Date Purchase
- k. Description of Services and Goods
- l. Cost of Services and Goods

Invoices and support documentation are to be sent to:

Original Invoice: Dallas County Auditor's Office
Attn: Accounts Payable
500 Elm Street, Suite 4200
Dallas, TX 75202
214.653.6478
Accounts.Payable@dallascounty.org

Copy of invoice(s) shall be sent to: REQUESTING USER DEPARTMENT NAME AND ADDRESS INDICATED ON THE PURCHASE ORDER

All invoices must reference a Dallas County Purchase Order Number

Payment will be made upon receipt and acceptance by the County of completed services, goods and/or products ordered and receipt of a valid invoice, in accordance with the Texas Government

Code, Chapter 2251. The County will incur no penalty for late payment if payment is made within thirty (30) or fewer days from the statement if there is an uncontested billing. Any payment not made within thirty (30) days of its due date shall bear interest in accordance with Chapter 2251 of the Texas Government Code. Invoices received without all the required supporting documentation and information will not be processed and will be returned to the Contractor unpaid for correction.

11. If applicable, a packing list or other suitable shipping documents shall accompany each shipment and shall show:
 - (a) Name and address of vendor
 - (b) Name and address of receiving department
 - (c) Dallas County Purchase Order number and
 - (d) Description of material shipped, including item numbers, quantity, number of containers, and package number, if any.

12. **ACH ELECTRONIC PAYMENTS**

ACH Electronic Payments

Dallas County offers ACH vendor and supplier payment services for all vendors and suppliers providing goods, services or products to Dallas County.

Dallas County is moving away from making payments by paper checks and we are strongly encouraging vendors and suppliers to accept electronic payments. Below is the option that is currently available in lieu of a paper check. Dallas County has chosen the Paymode-X ACH payment service through Bank of America for this efficient form of payment.

There is no cost or fee to the vendor or supplier of any kind resulting from the acceptance of an ACH payment from Dallas County via PaymodeX. This allows Dallas County to directly deposit invoice payments into the vendor's bank account along with complete remittance information that can be accessed at any time.

For more information regarding Paymode-X, please visit our website at: <http://portal.paymode.com/dallascounty/> or call customer service @ 877.443.6944 or contract the Dallas County Auditor's Office – Account Payable Division at 214.653.6473.

13. Upon request by Dallas County, bidders agree to furnish samples and/or demonstrations of products bid, as applicable. The product(s) requested will be furnished at no additional cost to Dallas County and will be of sufficient amounts and/or time frames agreed by County and bidder to ensure effective testing of the products(s). Any testing product used beyond the agreed upon amount or time frame may be considered for payment by Dallas County, if in the best interest of the County. Any product that fails testing shall be considered sufficient reason to reject the bid or product. Any product used by Dallas County, during the contract period that does not perform as specified and/or approved during testing shall be considered grounds for cancellation of the contract.
14. Whenever an article or material is defined by describing a proprietary product or by using the name of a manufacturer, the term "or equal" if not inserted shall be implied. The specified article or material shall be understood as descriptive and not restrictive. As determined by Dallas County, equal is considered as articles or materials which can effectively and economically

perform the required task; is comparative in quality and performance and, if required, is acceptably similar or matches the specified structural design.

If the amount shown in words and its equivalent in figures do not agree, the written words shall be binding. Ditto marks are not considered writing or printing and shall not be used.

15. The Contractor shall be considered an Independent Contractor and not an agent, servant, employee, or representative of the County in the performance of the work. No term or provision hereof or act of the Contractor shall be construed as changing that status.
16. The Contractor agrees that it will protect, defend, indemnify, and save whole and harmless the County and all of its officers, agents, and employees from and against all claims, demands, causes or action, damages, judgments, loss and expenses, including attorney's fees, of whatsoever nature, character, or description that any person or entity has or may have arising from or on account of any injuries or damages (including but not restricted to death) received or sustained by any person, persons, or property, on account of, arising out of, or in connection with the performance of the work, including without limiting the generality of the foregoing, any negligent act or omission of the Contractor or any agent, servant, employee or sub-contractor of the Contractor in the execution or performance of this Contract. Contractor further agrees to protect, indemnify and hold County harmless against and from any and all claims and against and from any and all loss, cost, damage, judgments or expense, including attorney's fees arising out the breach of any of the requirements and provisions of this contract of any failure of Contractor, its employees, officers, agents, contractors, invitees, or assigns in any respect to comply with and perform all the requirements and provisions hereof.
17. The Contractor agrees, during the performance of the work, to comply with all applicable codes and ordinances of the appropriate City, County or the State of Texas as they may apply, as these laws may now read or as they may hereafter be changed or amended.
18. The Contractor shall obtain from the appropriate City, Dallas County or the State of Texas the necessary permit(s), if any, required by the ordinances of the City, County or State for the performance of the Work.
19. The Contractor shall not sell, assign, transfer or convey this Contract, in whole or in part, without the prior written consent of the County.
20. Should Dallas County authorize the original awardee to subcontract (assign) any portion of this contract, the original awardee will maintain the ultimate legal responsibility for all services according to contract specifications. In the event of a subcontract, the original awardee must maintain a continuous effective business relationship with the subcontractor(s) including, but not limited to, regular payments of all monies owed to any subcontractor. Failure to comply with these requirements, in whole or part, will result in termination of this contract and/or legal ramifications, due to nonperformance.

Should Dallas County authorize the original contractor to transfer this contract, in whole or part, the secondary contractor will maintain all the legal responsibilities set forth in the context of this contract.

21. In case any one or more of the provisions contained in this Contract shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision thereof and this Contract shall be considered

as if such invalid, illegal, or unenforceable provision had never been contained herein.

22. The parties herein agree that this Contract shall be enforceable in Dallas County, Texas, and if legal action is necessary to enforce it, exclusive venue shall lie in Dallas County, Texas.
23. This Contract shall be governed by and construed in accordance with the laws of the State of Texas and all applicable Federal Laws.
24. **Scanned or Re-typed Response:**

If in its response, bidder/offeror either electronically scans, re-types, or in some way reproduces the County's published bid or proposal specifications, then in the event of any conflict between the terms and provisions of the County's published bid or proposal specifications, or any portion thereof, and the terms and provisions of the response made by bidder/offeror, the County's bid or proposal specifications as published shall control.

Furthermore, if an alteration of any kind to the County's published bid or proposal specifications is only discovered after the contract is executed and is or is not being performed; the contract is subject to immediate cancellation.

25. This Contract embodies the complete agreement of the parties hereto, superseding all oral or written previous and contemporary agreements between the parties and relating to matters herein, and except as otherwise provided herein cannot be modified without written agreement of the parties.
26. Multi-year service/lease-purchase agreements or any continuing contracts are solicited and awarded based on governmental fiscal funding. If for any reason, funds are not appropriated to continue the service/lease- purchase agreement, the said agreement/contract shall be automatically terminated on the expiration date or date in which the funds have been eliminated. Any/all services/leased equipment will be removed from the respective county department/facilities without penalty to Dallas County. Any/all charges incurred as a result of this action are the responsibility of the contractor.
27. Contractors are not officially authorized to begin work and/or deliver items covered under this agreement until formal approval and/or a signed contract is executed by the proper county authorities. Dallas County accepts no liability, of any kind, for products/services delivered/furnished without proper authorization.
28. Except for proposals received under Local Government Code 262.030 and/or 262.0295, in accordance with the aforementioned statutes, Dallas County will uphold the confidentiality of bidder trade secrets to the extent allotted by law. All confidential information must be clearly identified and separated, by the bidder and prior to submission of the proposal.
29. **OPEN RECORDS**

All responses submitted to Dallas County become the property of Dallas County and are subject to the Public Information Act (Texas Government Code Chapter 552). The interested

firms/individuals should familiarize themselves with the provisions of that Act. In no event shall Dallas County, or any of its agents, representatives, consultants, directors, officers, or employees, be liable to a firm/individual for the disclosure of all or any portion of a response submitted pursuant to the IFB.

If a firm/individual has special concerns about information that it desires to make available to Dallas County, but which it believes constitutes a trade secret, proprietary information or other information excepted from disclosure, such firm/individual should specifically and conspicuously designate ((i.e. mark confidential) each page of that information, which the Bidder believes, should not be disclosed outside Dallas County. Disclosure of requested information will be subject to the Texas Public Information Act.

30. **TERMINATION**

The County may, at its option and without prejudice to any other remedy to which it may be entitled at law or in equity, or elsewhere under this contract, terminate this Contract, in whole or part, by giving 10 days advance written notice thereof to the Contractor with the understanding that all (products/services) being (delivered/performed) under this Contract shall cease upon the date specified in such notice. The County shall compensate the Contractor in accordance with the terms of this contract for the (products/services) (delivered/performed) prior to the date specified in such notice.

31. **TERMINATION FOR DEFAULT OR NON-PERFORMANCE**

Default, material breach, or non-performance of the bidder in terms of specifications or non-compliance with the terms of this contract shall be a basis for termination of the contract by the County. Termination in whole or in part, by the County may be made at its option and without prejudice to any other remedy to which it may be entitled at law or in equity, or elsewhere under this Contract, by giving ten (10) days' advance written notice setting forth the nature of the material failure or non-performance to the Contractor and/or bidder with the understanding that all work being performed under this contract shall cease upon the date specified in such notice. The termination will not be effective if the material failure is fully cured prior to the end of the stated in written notice NOT LESS THAN TEN (10) day period.

Termination under this will not relieve Contractor from liability for any default or breach under this contract agreement or any other act or omission of Contractor.

The County shall not pay for work, equipment, services or supplies which are unsatisfactory. Contractor may be given a reasonable opportunity prior to termination to correct any deficiency. This however shall in no way be construed as negating the basis for termination for non-performance. In addition and as authorized by Commissioners Court, vendors terminated for non-performance will be disbarred from award consideration on future county solicitation for a period of not less than thirteen (13) months.

32. **MONETARY RESTITUTION**

In the event the contract is prematurely terminated due to default, non-performance and/or withdrawal by the contractor, Dallas County reserves the right to seek monetary restitution (to include but not limited to; withholding of monies owed) from the contractor to cover costs for interim services and/or to cover the difference of a higher cost (difference between termination vendor's rate and new company's rate) beginning the date of vendor's termination through the contract expiration date. In the event a civil suit is filed to enforce this provision, Dallas County will seek its attorney's fees and cost of suit from the Contractor.

33. **NON-EXCLUSIVITY**

This contract and/or agreement is non-exclusive and shall not in any way preclude Dallas County from entering into similar agreements and/or arrangements with other Vendors, Contractors, or from acquiring similar, equal or like goods and/or services from other entities or sources including state contracts.

34. **NEPOTISM**

No person (1) who is an employee, agent, consultant, officer, or official of the contractor and who exercises or has exercised any functions or responsibilities with respect to assisted contract activities; or (2) who is in a position to participate in a decision-making process or gains inside information with regard to such activities, may obtain a personal or financial interest or benefit, direct or indirect, in any contract, subcontract, or agreement with respect thereto, or the proceeds thereunder, either for themselves or those with whom they have family or business ties, during their tenure.

35. **RIGHT TO PROTEST**

Vendors aggrieved in connection with a specific solicitation, evaluation, or the award of any bid, purchase order, or contract, may formally protest to the Purchasing Director only if the Vendor has reason to believe that, with respect to a specific solicitation, (a) there was a material violation of state or federal statutory requirements, County Purchasing Department rules and regulations, or this Code of Ethics (including the Restricted Contact Period), or (b) the procurement process gave an unfair advantage or unfair disadvantage to one or more Vendors.

Procurement processes that may give an unfair advantage or disadvantage to one or more Vendors include, but are not limited to, the following:

- i. The specification unfairly limits competition for no legitimate purpose;
- ii. The contract award is compromised by improprieties in post-award negotiations;
- iii. The evaluation factors or criteria are applied in a manner that is different than disclosed in

the solicitation; and

iv. There are irregularities in the receipt or opening of solicitation responses.

Protests must be in written form and must contain the following information (if applicable):

i. The protesting Vendor's name, address, telephone number, fax number, and email address;

ii. The identifying number of the solicitation and/or contract;

iii. The date the Vendor became aware of the facts forming the basis of the protest;

iv. A detailed statement of the factual grounds for the protest, including copies of any relevant documents or evidence and the statute, rule, or regulation that was violated, if applicable; and

v. A sworn certification that the protest is brought in good faith and for good cause. If a protest is based on an ambiguity or a problem in a solicitation, and is made after the solicitation response deadline, it must also include a certification that the protesting Vendor was not aware of the ambiguity or problem (and did not have an opportunity to ask for clarification or a correction) before the solicitation response deadline.

Protests must timely raise all claims and describe the evidence supporting those claims with specificity. Any claims that are not timely raised may be deemed waived. In the event of a protest during a solicitation response period, a protesting Vendor who wishes to continue in the solicitation process during such protest must still submit a bid or proposal according to the rules set forth in the solicitation.

Protests, including any protest appeals requests, must be sent by mail or email to the Dallas County Purchasing Director at Founders Square, 900 Jackson St., 6th Floor, Suite 680 Dallas, Texas 75202 or Michael.Frosch@dallascounty.org. Mail-in requests must be postmarked and email requests must be received by the Purchasing Director no later than (a) five (5) business days after the date that the protesting Vendor knew or should have known of the facts giving rise to the protest, or (b) before the contract is awarded, if the Vendor is aware of the facts giving rise to the protest prior to the contract award, whichever is earlier.

It is the responsibility of the Vendor to ensure that solicitation protests are delivered to the Purchasing Director within the time period stated herein. Protests that are late or delivered to an incorrect address or individual, or that otherwise do not comply with these rules (including providing the sworn certification as described above), will be declared invalid.

Written Decision. All protests will be initially reviewed by the Purchasing Director, who must rule on the protest and provide a written decision, including the reasons for the decision and the decision date, to the protesting Vendor within ten (10) business days (the “Written Decision”). Any appeal of the Written Decision must be made within five (5) business days of the receipt thereof.

Appeals Process. Appeals of the Written Decision should be sent to the Purchasing Director at the address above, who shall notify the Appeals Committee, consisting of the County Administrator, the County Auditor, and the County Budget Director. The Purchasing Director shall serve as staff to the Appeals Committee and will be present at the Appeals Hearing. The protesting Vendor shall be notified of the time and place of the Appeals Hearing and will be provided an opportunity to present arguments. The documentary evidence at the Appeals Hearing is limited to the documentary evidence submitted for the original protest unless, for good cause shown, the Appeals Committee grants authority for the protesting Vendor to provide additional documentary evidence. The protesting Vendor shall seek approval to submit additional documentary evidence for good cause as soon as possible, but no later than (a) five (5) days before the hearing, or (b) within seventy-two (72) hours from when the protesting Vendor knew or should have known about the additional evidence, whichever period is shorter. The request should include copies of the additional documents that the protesting Vendor seeks authority to use at the hearing. The Appeals Committee may appoint an independent hearing examiner to conduct the hearing and provide a written recommendation, if needed. A written final decision, including the reasons for the final decision and the decision date, will be provided to the protesting Vendor within ten (10) business days of the Appeals Hearing (the “Final Decision”). Requests for an appeal of the Final Decision must be mailed or emailed to the Purchasing Director within five (5) business days of the Final Decision, who will notify the Commissioners Court of the request.

A Commissioners’ Hearing may take place at the discretion of the Commissioners Court. A single vote of a Commissioner on the Commissioners Court is required for a Hearing to be granted. The Commissioners may, at any time during the process, review the written record of the previous decisions on the matter. All decisions of the Commissioners Court, including whether to allow a Commissioners’ Hearing, are final.

Right to Appear before the Commissioners Court. All individuals and entities have the right to an appearance before the Commissioners Court subject to the rules of the Court, this Code of Ethics, and, during an Active Solicitation, the Restricted Contact Period provisions in Section 6 herein. However, a protesting Vendor does not have an automatic right to a Commissioners’ Hearing on any protest appeal under this Code of Ethics, which will be granted only at the discretion of the Commissioners Court.

Notification. Protest hearings are open to the public. Public notification of any hearings, including Appeals Hearings and Commissioners’ Hearings, shall be posted on the Dallas County Purchasing website at www.dallascounty.org/department/purchasing

Solicitations and Contracts Pending. Filing a protest under this Section will not trigger an automatic stay of any procurement process or contract award. It is in the discretion of the Purchasing Director and the Commissioners Court whether to stay any procurement process or contract award with respect to any Vendor protest. Whether a stay is granted shall not compromise any protesting Vendor’s right to the protest procedures outlined herein.

Records. Records of all protests, including the protest filed, related evidence, and any Written and Final Decisions (including the outcome of any Commissioners' Hearing, if applicable) will be maintained by the Purchasing Department for a period of no less than four (4) years.

36. Contractors are required to comply with the Equal Employment Opportunity Act requiring that no person shall be discriminated against on the basis of race, color, religion, sex or national origin in all phases of employment during the performance of this Contract. The successful bidder shall take affirmative action to ensure that applicants are employed and treated during employment, without regard to their race, age, color, religion, sex or national origin. This action shall include, but not be limited to, employment, upgrading, demotion, transfer, recruitment, advertising, layoff, termination, compensation and selection for training. The successful bidder shall state to all employees and advertisements that all employees and qualified applicants will receive consideration for employment without regard to race, color, age, religion, sex, or natural origin.
37. No official or employee shall have any financial interest, direct or indirect, in any contract with the County or be financially interested, directly or indirectly, in the sale to the County of any land, materials, supplies or services, except on behalf of the County as an official or employee. Any violation of this section, with knowledge, express or implied, of the person or corporation contracting with the County shall render the contract involved voidable by the Commissioners Court of Dallas County. It is the responsibility of the contractor during all phases of the contract process to notify the County in writing of any potential conflict of interest.
38. In the best interest of the County, as determined by the Dallas County Commissioners Court, any bidder/proposer who is currently involved, either directly or indirectly, with any litigation against or involving Dallas County may be disqualified and/or not considered for an award.
39. Pursuant to Sec. 9.001 of the Texas Business Organization Code, non-Texas entities, including, but not limited to corporations, limited partnerships, and limited liability companies must have an application for registration filed with the Texas Secretary of State and shall provide to Dallas County a Certificate of Status issued by the Texas Secretary of State that serves as official evidence of the entity's existence or authority to transact business in Texas. To transact business with Dallas County, all entities must be in legal compliance pursuant to applicable laws, and shall provide to Dallas County evidence of said compliance.
40. Vendor hereby assigns to purchaser any and all claims for overcharges associated with this contract which arise under the antitrust laws of the United States, 15 USCA Section 1 et seq., and which arise under the antitrust laws of the State of Texas, Tex. Bus. & Com. Code, Section 15.01, et seq.
41. Where applicable, MSDS Forms must be provided with delivered products. In addition WITHOUT EXCEPTION, within 30 days after award, the successful bidder(s) MUST furnish Material Safety Data Sheets for all applicable awarded contract items to: Erin Spargo, Ph.D., Southwestern Institute of Forensic Sciences/Office of the Medical Examiner Facility, 2355 Stemmons Freeway, Dallas, Texas 75207. Dallas County reserves the right to withhold payments owed and/or terminate the contract due to non-performance if the aforementioned documents are not provided accordingly.

42. **INTERLOCAL AGREEMENT (City/State Participation Program)**

In accordance with Article 791.025 of the Texas Government Code, governmental agencies (local, state) may request to utilize County contract by executing an interlocal agreement with Dallas County to do so. Vendors are to indicate on the bid proposal page whether they are willing to extend pricing from this contract to other governmental agencies in accordance with the outlined specifications. Dallas County is indemnified against any and all claims that may arise from Interlocal Agreements entered into by the Contractor and governmental agencies.

43. **FEDERAL DEBARRED VENDORS**

No products and/or services utilizing Federal funds may be procured from vendors that are listed on the Federal Excluded Parties List aka System for Award Management (SAM). Government requirements for non-procurement suspension and debarment are contained in the OBM guidance 2CFR, part 180 that implements Executive Orders 12549 and 12689 Debarment and Suspension. Dallas County reserves the right to reject from award consideration and/or terminate any contract with any vendor found to be suspended, ineligible and/or debarred as outlined herein.

44. **TWELVE (12) MONTH WAITING PERIOD FOR EMPLOYMENT OF CERTAIN FORMER COUNTY EMPLOYEES**

In accordance with the County's Transparency Policy, any firm awarded a contract for the Procurement of goods or services shall be prohibited from hiring any individual who has previously worked for the County and in that capacity either evaluated, recommended, approved, monitored, or managed a contract involving that firm no sooner than twelve months after that individual has ceased to work for or be employed by the County. Failure to adhere to such a contractual requirement may result in the termination of the contract with the County.

IFB

ATTACHMENT S
SBE PROGRAM AND FORMS



SBE LANGUAGE

7.0 SMALL BUSINESS ENTERPRISE (SBE) PROGRAM

7.1. Definitions.

- 7.1.1. The term “**Commercially Useful Function**” is defined as a business that is directly responsible for providing the supplies or services to Dallas County as required by the solicitation or request quotes, bids or proposals. A firm is considered to perform a commercially useful function when responsible for the execution of a distinct element of the work of a contract and carries out its responsibilities by actually performing, managing and supervising the work involved. Example: a business that stocks sufficient quantities of supplies in direct inventory which is being held for sale or resale, to cover anticipated future demands for the suppliers is considered to be performing a commercially useful function.
- 7.1.2. A “**Contractor**” is defined as one who participates, through a contract or any other contractual agreement in a County funded contract opportunity for work, labor, services, supplies, equipment, materials, goods or any combination of the aforementioned. For purposes of this Section, a Contractor is any individual, company, or other entity seeking to do work for Dallas County regardless of the method used to procure the services or products, including but not limited to bid or solicitation. A Contractor includes but is not limited to a contractor, consultant, or vendor.
- 7.1.3. The term “**Director of Small Business Enterprise**” shall mean the Director of the County’s Office of Small Business Enterprise and/or her/his designee.
- 7.1.4. The term “**Contract Administration**” shall mean the County Purchasing Department and/or his or her designee.
- 7.1.5. The “**Contract Administration Supervisor**” shall mean the Purchasing Director and/or his or her designee.
- 7.1.6. **Equal Employment Opportunity Requirements.** It is the policy of Dallas County to ensure non-discrimination in the award and administration of contracts. The Contractor or Subcontractor shall not discriminate on the basis of race, color, national origin, disability, veteran status, religion, or sex in the performance of any Dallas County contract.
- 7.1.7. **Good Faith Effort Plan.** The plan submitted with a Submittal detailing the Respondent’s efforts to achieve the set aspirational goal or documenting the Good Faith Efforts to meet the goals for all elements the Solicitation. A Good Faith Effort Plan must be submitted with a Submittal for any Dallas County projects in which goals have been established.
- 7.1.8. **Metropolitan Statistical Area (MSA).** The Dallas County MSA includes the following counties: Dallas, Tarrant, Denton and Collin.
- 7.1.9. **Small Business Enterprise.** It is the policy of Dallas County to support the growth and development of Small Business Enterprise (“SBE”) and ensure that SBEs have an equal opportunity to compete for and participate in Dallas County contracts. Thus, Dallas County Commissioners Court has created the

Office of Small Business Enterprise to establish and oversee a Diversity Program to ensure that SBEs have an equal opportunity to compete for and participate in Dallas County contracts. It is Dallas County's intent to:

- Ensure nondiscrimination in the award and administration of Dallas County contracts;
- Create a level playingfield on which small businesses can compete fairly for Dallas County contracts; and
- Ensure that only firms who attempt in good faith to meet the SBE good faith efforts are considered for applicable contract awards.

Consequently, the contractor shall carry out applicable requirements of the good faith effort in its proposal/bid hereunder and, if awarded the contract, the award and administration of the Contract.

7.2 SBE Goals, Good Faith Efforts and Eligibility.

The Director of Small Business Enterprise and the Contract Administration Supervisor sets the annual SBE participation contracting/subcontracting aspirational SBE goals for each contract. The contracting/subcontracting goals for this contract will be based on meeting or exceeding the **minimum aspirational SBE goal of 40%**, unless good cause exists for failing to meet the goal. The SBE aspirational goal is based on the total dollar amount of the contract.

To be recognized as an SBE, firms (contractors and/or subcontractors):

- a) Must be certified as an SBE by the following County approved entities: North Texas Regional Certification Agency (NCTRCA), DFW Minority Supplier Development Council and/or the Women's Business Council of Southwest, at the time of the proposal/bid submission. Other certifications are not acceptable;
- b) To be recognized by the County as a **qualified SBE firm**, as defined pursuant to Section 3 of the Small Business Act and relevant regulations, an SBE is a firm for which the gross revenues or number of employees averaged over the past three years, inclusive of any affiliates, is as defined by 13 C.F.R. Sec. 121.201; and
- c) Must also perform a commercially useful function on the project and have a local presence in Dallas County Metropolitan Statistical Area (MSA) in order to be counted for SBE points. The MSA includes the following counties: Dallas, Tarrant, Denton and Collin.

7.3 Utilization

The aspirational SBE or certified sub-contractor goal is expressed as a percentage of the total dollar amount of the contract going to SBE or certified Sub-Contractor for those areas which the Contractor has sub-contracted or anticipates sub-contracting. The aspirational goal shall also apply to contract amendments that require work beyond the scope of services originally required to accomplish the project.

The Respondent agrees to employ good faith efforts through the award of subcontractors to eligible SBEs and certified firms to the fullest extent possible.

Dallas County's Good Faith Effort Plan (GFEP) will be used to document SBE participation. However, all subcontractors and/or suppliers, whether certified or not, must be listed in the GFEP. The information provided

in the GFEP Form will be utilized in the development of the final contract/agreement. The GFEP Form can be found in the attachments. This form is required and considered to be a part of the response to the IFB.

Should the Good Faith Effort Plan or any of the specified documents listed below be incomplete, not signed, and/or not submitted, the bid can be deemed non-responsive.

7.4 Each Contractor must include with its proposal/bid, the following documents:

- Completed and signed **Good Faith Effort Plan**, executed by an authorized representative;
- Completed and signed **Small Business Utilization Affidavit**, executed by an authorized representative; and
- A signed and executed **Subcontractor Intent Form**, executed by an authorized representative (prime and subcontractor).

Note: All forms must be complete in their entirety and submitted as part of a Respondent's submittal.

The County reserves the right to accept or reject any certified firm and in its sole discretion is not bound by the certifying bodies' determination, if the County has a concern regarding the eligibility of the firm to meet SBE guidelines or standards. A Contractor whose proposed certified firm is rejected may contest in writing to the Office of Small Business Enterprise, in accordance with the SBE Policy. The denial of SBE certification by the Office of Small Business Enterprise is excluded from the Dallas County Purchasing Code of Ethics Protests Procedure and is exclusively governed by the appeal process set forth in the SBE Policy.

7.5 SBE Reporting. The Contractor and its subcontractors are required to electronically submit subcontractor payment information using the County's Compliance Reporting System (CRS), accessed through a link on the Dallas County SBE webpage. The Contractor and all subcontractors will be provided a unique log-in credential and password to access Compliance Reporting System.

Training on the use of the system will be provided by both Dallas County's CRS Support Staff and by the Office for Small Business Enterprise. Additional information and free online training for CRS can be found at <https://dallascounty.diversitycompliance.com>. After the prime receives payment from the County, electronic submittals will require data entry of the amount paid to each subcontractor listed on the Contractor's Good Faith Effort Plan.

7.6 Contracting. If awarded the contract, the Contractor agrees to be bound by the policies and guidelines set forth in the County's SBE Policy, which may be incorporated into the contract. If a conflict exists between the SBE section of the solicitation and the County SBE Policy, the language in the solicitation governs.

**MANDATORY
SBE SOLICITATION ATTACHMENTS**



SMALL BUSINESS UTILIZATION AFFIDAVIT

It is the policy of Dallas County to encourage the inclusion of qualified Small Business Enterprises (SBEs) to the greatest extent feasible on the County's construction, procurement and professional services contracts. Neither the County, nor its Contractors and their subcontractors shall discriminate on the basis of race, age, color, religion, national origin, or sex in the award and performance of contracts. In consideration of this policy, Dallas County has adopted the Small Business Enterprise Policy for all County contracts.

Small Business Enterprise Participation Goals

The solicitation bidding plan establishes subcontracting goals and requirements for all prospective bidders to ensure reasonable degree of SBE meaningful business utilization and participation in County contracts. It is the goal of Dallas County that a certain percentage of work under each contract be executed by one or more SBEs. For the purposes of participation percentages, Dallas County does not include amounts paid to the prime by the sub-contractor.

The apparent proposer shall agree to meet the established goals or must demonstrate and document a "good faith effort" to include SBEs in subcontracting opportunities. The apparent proposer who fails to adequately document good faith efforts to subcontract or purchase significant material supplies from SBEs may be denied award of the contract by Dallas County based on the contractor's failure to be a "responsive" or "responsible" bidder.

By signing below, I agree to provide Dallas County, Small Business Enterprise Department a completed copy of all required forms. I understand that, for the purpose of SBE subcontracting participation, any amounts paid to the prime from the sub-contractor should not be included in the above listed participation amount. Finally, I understand that if I fail to provide all of the required documents within five (5) business days after notification, my bid may be deemed "non-responsive" and I may be denied award of the contract.

Solicitation Number: _____

Company Name: _____

Typed or Printed Name of Certifying Official of Company

Date

Signature of Certifying Official of Company

Title



Small Business Enterprise Program Utilization Form

Solicitation/Project Name: _____ Solicitation #: _____

Firm Name: _____ Firm Phone # _____

Firm Address: _____ City: _____ State: _____ Zip: _____

Compliance Contact: _____ Phone #: _____ Email Address: _____

Is Your Firm Certified: _____ Certifying Agency: DFWMSDC _____ NCTRCA _____ WBC-Southwest _____ Other: _____

Total Bid Amount: _____ Amount self-performed: _____ Percentage self-performed: _____

Utilization Plan

List the firms that will be utilized on the project. Provide copies of correspondence.

SBE certified subcontractors/suppliers									
Firm Name & SBE Certification #	Tier	Person Contacted & Date	Address	Phone & Email Address	Type of Work	NAICS Code	Local or Non-Local	Dollar Amount	% of contract
							Total	\$	%



Non SBE certified subcontractors/suppliers									
Firm Name	Tier	Person Contacted & Date	Address	Phone & Email Address	Type of Work	NAICS Code	Local or Non-Local	Dollar Amount	% of Total Contract
							Total	\$	%

Prime Printed Name: _____ Title: _____ Signature: _____ Date: _____

For Use by SBE Office Only

SBE Compliance Officer: _____ Date: _____

SBE Notes:



Good Faith Efforts Form

The Good Faith Efforts Form must be fully completed if the aspirational goal is **not** met.

1. Did you speak with or receive assistance from a staff member in the Small Business Enterprise

Department? _____ (Y/N) Name of staff member _____

2. Did you utilize a Dallas County SBE vendor list? If not, please explain?

Vendor List Accessed	Date of Access

3. Did you provide written notice to potential SBE subcontractors, suppliers, and vendors? Written notice should include plans, specifications, subcontractor/supplier opportunities, and deadline for submission to respondent no less than 7 days before bid submission. Please provide copies of all correspondence, including accepted and rejected SBE bids or proposals, i.e. letters, memos, emails and phone calls.

Firm Name & Address	Phone #	Person Contacted & Date	Type of Work	NAICS Code	SBE Certification No.	Response to Solicitation	Bid/Quote Amount	Company Selected (Y or N)

4. If applicable, did you participate in the pre-bid meeting? _____



5. Did you identify and select specific work items to be performed and/or procurement to be fulfilled by SBEs? Please subdivide total contract work into smaller portions or quantities to permit maximum active participation by SBEs.

1.	2.	3.
4.	5.	6.

6. Did you advertise in trade publications or with local advocacy organizations? The advertisement must identify and describe subcontracting opportunities in detail, including a contact person and deadlines. Please provide a copy.

Publication Name	Date of Publication

Prime Printed Name: _____ Title: _____ Signature: _____ Date: _____



DALLAS COUNTY
SUBCONTRACTOR INTENT FORM

To: Dallas County - Small Business Enterprise Department

Date:

Project Name:

Solicitation #:

Subcontractor on the project will provide the following good(s)/service(s):

to Prime Contractor on the project

SBE subcontractor is certified by the following agency: DFW Minority Supplier Development Council NCTRCA Women's Business Council SW

SBE Certification #: (Certification must be kept current/valid for the entire duration of this contract. Failure to comply with this provision could be subject to removal from contract.)

For the purposes of SBE subcontracting participation, Dallas County does not include amounts paid to the prime by the sub-contractor.

Total Contract Amount for prime: \$ Estimated Work Start Date:

Sub Participation Amount: \$ % Estimated Work End Date:

The undersigned intends to enter into a formal agreement with the subcontractor listed, conditioned upon being awarded the Dallas County contract. The undersigned understands that, for the purpose of SBE subcontracting participation, any amounts paid to the prime from the sub-contractor should not be included in the above listed participation amount. Before any subcontractor/supplier substitutions are made, the prime contractor must submit an SBE Substitution Request Form to The SBE Department for approval. Failure to comply with these provisions could result in termination of the contract, sanctions against the prime contractor, and/or ineligibility for future Dallas County contracts. The subcontractor's participation will be entered in B2GNow, Dallas County's compliance system, based upon this intent form.

Officer's Signature (Prime Contractor)

Officer's Signature (Subcontractor)

Printed Name (Prime Contractor)

Printed Name (Subcontractor)

Title (Prime Contractor)

Title (Subcontractor)

Date

Date

Please select or list all Chambers or Advocacy groups you are a member of:

Table with 2 columns: Group Name, Prime (checkbox), Sub (checkbox). Rows include Greater Dallas Asian American Chamber of Commerce, Greater Dallas Black Chamber of Commerce, Greater Dallas Hispanic Chamber of Commerce, U.S. Pan Asian American Chamber of Commerce, Asian Contractors Association, Regional Black Contractors Association, Regional Hispanic Contractors Association.

Solicitation Number No.: 2026-016-7101, Pre-Bid Meeting Date: 03/26/2026 @ 10:30 a.m. (CST)
Project Title: IFB Replacement of Air Handler Units and BMS at Henry Wade Juvenile Center Project, Bid
Due Date: 04/23/2026 @ 2:00 p.m. (CST)



INVITATION FOR BID

Scope of Work/Specifications

I. Introduction, Purpose and Intent

Dallas County is soliciting bids from qualified contractors for the Replacement of Air Handling Units (AHUs) and Building Management System (BMS) at the Henry Wade Juvenile Justice Center (JJC) located in Dallas, Texas.

The project generally consists of the removal and replacement of twelve (12) existing chilled water, electric heat, variable air volume (VAV) air handling units and the replacement of the existing, obsolete Building Management System (BMS), including associated controls, devices, and system integration components.

In addition, the scope includes removal of the existing Johnson Controls BMS and integration of a new BMS platform that incorporates a UL 864-compliant smoke control system to maintain the facility’s smoke evacuation and life-safety functions.

The Henry Wade JJC is an occupied and secure detention facility. All work shall be performed in a manner that maintains facility operations, security requirements, and life-safety systems throughout the duration of the project.

The purpose of this Invitation for Bid (IFB) is to obtain a qualified and experienced contractor to furnish all labor, materials, supervision, equipment, coordination, and incidentals necessary to complete the AHU and BMS replacement project in accordance with the plans, specifications, and contract documents.

The Work includes, but is not limited to:

- Demolition and removal of existing AHUs and associated components.
- Installation of new AHUs matching required capacity and performance characteristics.
- Removal and replacement of the existing BMS with a new system, including updated sequences of operation, control diagrams, and points integration.
- Integration of smoke control functions into the new BMS in compliance with UL 864 requirements and coordination with the existing fire alarm system.
- Phasing and coordination necessary to minimize disruption to ongoing operations.

The Contractor shall provide a complete and fully operational system and shall comply with all applicable federal, state, and local codes and regulations.

It is the intent of Dallas County to award a contract to the lowest responsive and responsible bidder whose bid meets the requirements of this solicitation.

The successful Contractor shall:

- Provide a complete, turnkey installation.
- Coordinate all demolition, installation, programming, testing, and closeout activities.
- Maintain continuous operation of critical HVAC and life-safety systems or provide approved temporary measures during system transitions.
- Coordinate scheduling, access, and security requirements with Dallas County Facilities Management and Henry Wade JJC staff.
- Provide all required documentation, warranties, training, and record drawings as specified.

Solicitation Number No.: 2026-016-7101, Pre-Bid Meeting Date: 03/26/2026 @ 10:30 a.m. (CST)
Project Title: IFB Replacement of Air Handler Units and BMS at Henry Wade Juvenile Center Project, Bid
Due Date: 04/23/2026 @ 2:00 p.m. (CST)

Bidders are responsible for reviewing all solicitation documents and shall include in their bid all work necessary for a complete and functional installation, whether specifically stated or reasonably implied by the Contract Documents.

II. Specification

Refer to 2024-DC048-002_Wade JJC_IFC_DWGs (**Exhibit A**) and 2024-DC048-002_Wade JJC_IFC_SPECS_260222 (**Exhibit B**)

III. References & Minimum Qualifications

Dallas County requires bidders to submit reference letters from at least three (3) sources or customers for whom the bidder has provided services of similar size and scope. This requirement applies to all solicitations resulting in a service contract.

- **Letters of Reference:** Bidders must provide three (3) formal letters of reference from previous clients. Each letter must include documentation verifying satisfactory performance and a description of the services rendered.
- **Business Longevity:** Bidders must provide evidence that the firm has been in continuous operation for a minimum of three (3) years.
- **Minimum Qualifications:** Start-up companies and newly formed entities do not meet the minimum experience requirements for this solicitation. All bidders must be established entities with the requisite operational history

IV. Pre-Bid Meeting Schedule, Questions, and Inquiries

During the solicitation process bidders are required to limit their communication regarding this project to the Buyer referenced herein. A pre-bid meeting will be held by the County whereby the bidders will have an opportunity to ask the requesting department(s) questions and/or obtain clarification. The pre-bid meeting will be the only time when bidder and requesting department(s) will communicate directly, thereafter, all communication associated with this project shall be address through the County’s purchasing platform, (<https://www.bidnetdirect.com/texas/dallas-county>), to the assigned Buyer. The County will respond to all questions by way of addendum which will be posted as part of the solicitation. The County, its agents, and employees shall not be responsible for any information given by way of verbal communication.

Pre-bid conference **March 26, 2026 at 10:30 a.m. (CST)**, the pre-bid meeting will be conducted through a conference call.

PRE-BID MEETING LINK:

<https://gcc02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fteams.microsoft.com%2Fmeet%2F27809549031820%3Fp%3D70JTW0m1WXV2gi4hKV&data=05%7C02%7CMarina.Vailey%40dallascounty.org%7Cffc775c8297c4c6e2a7d08de7954b3fb%7C51adcfad72f1479cb28f52412e04014b%7C0%7C0%7C639081601859711844%7CUnknown%7CTWFpbGZsb3d8eyJFbXB0eU1hcGkiOnRydWUsIIYiOiIwLjAuMDAwMCIiOiJXaW4zMmIiOiJFOljoITWFpbCIiIldUIjoiyfQ%3D%3D%7C0%7C%7C%7C&sdata=FsuRK4g9SUL2MbmTTovnXDL89LXQ2uv9181jgJCRXJs%3D&reserved=0>

Solicitation Number No.: 2026-016-7101, Pre-Bid Meeting Date: 03/26/2026 @ 10:30 a.m. (CST)
Project Title: IFB Replacement of Air Handler Units and BMS at Henry Wade Juvenile Center Project, Bid
Due Date: 04/23/2026 @ 2:00 p.m. (CST)

MICROSOFT TEAMS:

Meeting ID: 278 095 490 318 20

OR

DIAL IN BY PHONE: 1-469-208-1731, ID: 287 960 880#

The deadline for the submission of questions is on **April 09, 2026 at 3:00 p.m. (CST)** through BidNet.

V. Term and Commencement Date

This will be a one-time contract with **no renewal options** commencing upon award by Commissioners Court, upon meeting any insurance and/or bonding requirements (if applicable) and/or fully executing the contract (if applicable).

VI. Award Method

The County's intent is to award this solicitation in its *entirety*, but the County reserves the right to award in the method that is most advantageous to the County.

The County reserves the sole discretion to determine whether a solicitation response is responsive. County reserves the right to reject any or all bids and to waive minor irregularities or discrepancies in any solicitation response as may be in the best interest of County. Late bids will not be considered for award.

For this solicitation the bidder must bid on all lines to be considered responsive.

Upon expiration of the Contract, the Contractor agrees to hold over under the terms and conditions of this contract for such a period of time as is reasonably necessary to re-solicit (not to exceed 90 calendar days unless mutually agreed on in writing).

VII. Bid Submittal and Exception Requirements

To be considered for award, the bid response must be submitted by **April 23, 2026 at 2:00 p.m. (CST)**. Bid responses shall be submitted electronically through BidNet, the County's online public solicitation platform (<https://www.bidnetdirect.com/texas/dallas-county>). Although the County prefers submissions in electronic form, a bidder may elect to submit their bid in hard copy. To submit in hard copy, the vendor may deliver or ship to: Dallas County Purchasing Department, Records Building 500 Elm Street, Suite 5500, Dallas, Texas 75202. When submitting a bid in hard copy, the County requires **two (2)** duplicate hardcopies (one original and one copy) to be submitted.

Any exceptions to the specifications/scope of work and/or terms and conditions shall be included in the solicitation response and shall appear in its own tab. Exception shall reference the page number, section and language for which exception is taken. The County reserves the right to reject any exception not in the best interest to the County or may lead the bid to be considered nonresponsive and not considered for award.

Solicitation Number No.: 2026-016-7101, Pre-Bid Meeting Date: 03/26/2026 @ 10:30 a.m. (CST)
Project Title: IFB Replacement of Air Handler Units and BMS at Henry Wade Juvenile Center Project, Bid
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Note: On December 19, 2024, Dallas County implemented a new public solicitation platform and will be posting all solicitations for goods, services, and construction through BidNet. Vendors seeking to do business with Dallas County will be required to register, use this link to begin your registration. (<https://www.bidnetdirect.com/texas/dallas-county>). By registering, vendors will be able to receive, at no cost, solicitation notices, view open solicitations, and submit their response online to desired business opportunities.

VIII. Communication

Upon release of the solicitation and during the process, vendors /firms and their employees of related companies as well as paid or unpaid personnel acting on their behalf shall not contact or participate in any type of contact in relation to this solicitation with Dallas County employees, department heads and/or elected officials. Such contact may result in the vendor being disqualified. All questions and request for information related to this solicitation must be coordinated through Marina Valley.

All questions regarding this solicitation are to be submitted in writing to **Marina Valley**, Dallas County Purchasing Department via **BidNet** (<https://www.bidnetdirect.com/texas/dallas-county>), the County’s procurement platform. If the bidder does not have access to the County’s solicitation platform, the bidder may submit their questions in writing via email to marina.valley@dallascounty.org. Please reference the IFB Solicitation number in the subject of the email.

All questions, comments and requests for clarification must reference the IFB solicitation number on all correspondence to Dallas County. Any oral communications shall be considered unofficial and non-binding.

Only written responses to written communication shall be considered official and binding upon the County. The County reserves the right, at its sole discretion, to determine appropriate and adequate responses to the written comments, questions, and requests for clarification.

NOTE: All addenda and/or any other correspondence (general information, question and responses) to this IFB will be made available exclusively through the Dallas County website for retrieval. Bidders are solely responsible for frequently checking this website for updates to this IFB. Addenda can be located at the following web address: <http://www.dallascounty.org/departments/purchasing/currentbids.php> (go to the appropriate IFB number, click on the appropriate hyperlink to view and/or download solicitation.)

IX. Location and Invoicing

The County shall pay invoices in 30 days. In order for the County to pay invoices in 30 days, the vendor’s invoice must be correct, and reflect the work or goods delivered to the County. The 30 days begin when the County has received a correct invoice reflecting the work or goods delivered. If the County receives an invoice that is not correct and/or reflective of work or goods that have been delivered, the County will request a corrected invoice and the 30-day period will begin once the correct invoice has been received. All work described in the vendor invoice must have been delivered in compliance with the terms of the contract.

Invoices shall be submitted monthly to the County for payment, unless both parties agree to alternative arrangement based on project milestones. Each invoice submitted for payment shall include, at a minimum, the following information:

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- Name and address of the department for which services were provided
- Purchase order number
- Contact information of County staff who placed order (name, phone number, department)
- Date of order or Service
- Detailed description of each service
- Price of good or services (charges for all services covered by PO/contract are to be separately stated and explained)
- Unit pricing
- Total cost of goods/services

Submitting invoices without the above information may cause delays in payment processing. Incorrect invoices or invoices sent to the wrong address will delay payment. Vendors who fail to follow these instructions risk having the contract with the County cancelled. Invoices must be submitted via email to: DC-Invoices@dallascounty.org

X. Documents Submitted with Bid

1. Attachment S - Small Business Enterprise (SBE) Forms must be submitted with bid.

XI. Opening of Bids

Bid reading shall be conducted at 2:30pm (CST) on the day the bids are due. The reading will be conducted via a live meeting online at (insert bid opening link here). Bids will be publicly opened in compliance with public bid opening statutory requirements.

XII. Review of Bids

1. The County will review bids complying with the due date and time to determine whether bids are responsive and responsible and whether the bid meets minimum requirements.
2. The County may conduct all necessary inquiries or investigations, including but not limited to, contacting references to verify the statements, documents, and information submitted in connection with the bid.
3. Please be aware that Dallas County may use sources of information not supplied by the bidder concerning the abilities to perform this work or meet the minimum requirements. Such sources may include current or past customers of the organization; current or past suppliers; articles from industry newsletters or other publications or from non-published sources made available to Dallas County.

XIII. Bid Pricing

1. Bid pricing shall be **firm** for the entire contract unless otherwise stated herein. Costs not included or calculated in the applicable unit prices as bid will not be paid by the County, regardless of the intentions of the bidder when the bid was submitted and regardless that those costs were actually incurred.

XIV. Insurance Requirements

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Any Contractor or Vendor that conducts business with Dallas County, whether it is for goods and/or services, must maintain lawful worker's compensation/self-insured employee coverage requirements and adequate liability limitations

Within ten (10) days after contract award or prior to the commencement of any work or delivery, the Purchasing Agent requires the successful Contractor(s)/Vendor(s) to submit verification of the following coverage. The insurance coverages, except Workers Compensation and Professional Liability, required by this Contract, shall name Dallas County and its elected and appointed boards, officers, officials, agents, representatives, directors, employees and volunteers, as additional insured(s) (as the interest of each insured may appear).

Contractor at its own expense, consistent with its status as an independent contractor will carry, purchase and maintain insurance coverage, the minimum insurance coverage set forth immediately below, with companies authorized to do insurance business in the State of Texas or eligible surplus lines insurers operating in accordance with the *Texas Insurance Code*, having an A.M. Best Rating of "A" or better, and in amounts not less than the following minimum limits of coverage:

The policies may provide coverage, which contains deductibles or self-insured retention. Such deductibles and/or self-insured retention shall not be applicable with respect to the coverage provided to Dallas County under such policies. The Contractor shall be solely responsible for all deductibles and/or self-insured retention.

All insurance required herein shall be maintained in full force and effect throughout the term of this contract, including all extensions or renewals.

- 1.1. Workers Compensations and Employer's Liability Insurance or self-insured employee in the amount and in compliance with the provisions as provided for by Texas Law as established by the Texas Workers Compensation Act, Title 5, Subtitle A, Texas Labor Code for all his employees assigned to operate or work under this Contract. In the event the Contractor elects to sublet any work, Contractor shall require Sub-Contractors to provide Workers' Compensation Insurance for all of the latter's employees unless the Contractor affords such employees protection. Contractors shall be responsible for workers' compensation insurance for subcontractors or sub-lessees who directly or indirectly provide service under Dallas County contract.

Workers' Compensation Insurance with statutory limits, and Employer's Liability Insurance with limits of not less than \$500,000:

Employers Liability - Each Accident	\$500,000
Employers Liability - Each Employee	\$500,000
Employers Liability - Policy Limit	\$500,000

Policies under this Section shall apply to State of Texas and include the following endorsements in favor of Dallas County:

- a. Waiver of Subrogation
- b. Thirty (30) day Notice of Cancellation

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- 1.2. Commercial General Liability: Contract shall maintain Commercial General Liability Insurance coverage must include the following: (a) Premises; (b) Operations; (c) Independent Contractor's Protective Liability; (d) Products and Completed Operations; (e) Medical Expense; (f) Personal and Advertising Injury; (g) Contractual Liability; (h) Broad form property damage, to include fire legal liability. Such insurance shall carry in an amount not less than One Million and 00/100 (\$1,000,000.00) for bodily injury (including death), property damage, and blanket contractual coverage per occurrence with a general aggregate of Two Million and 00/100 (\$2,000,000.00) and products and completed operations aggregate of Two Million and 00/100 (\$2,000,000.00).

Policies under this Section shall apply to State of Texas and include the following endorsements in favor of Dallas County:

- a. Waiver of Subrogation
- b. Thirty (30) day Notice of Cancellation
- c. Additional Insureds: Dallas County and its elected and appointed boards, officers, officials, agents, representatives, directors, employees and volunteers.

- 1.3. Automobile Liability Insurance: Contractor shall maintain Automobile Liability Insurance covering all owned, hired and non-owned automobiles used in connection with work with limits not less than Five Hundred Thousand 00/100 (\$500,000.00) Combined Single Limit of Liability for Bodily Injury and Property Damage. Such insurance is to include coverage for loading and unloading hazards.

Policies under this Section shall apply to State of Texas and include the following endorsements in favor of Dallas County:

- a. Waiver of Subrogation
- b. Thirty (30) day Notice of Cancellation
- c. Additional Insureds: Dallas County and its elected and appointed boards, officers, officials, agents, representatives, directors, employees and volunteers.

- 1.4. Builders Risk Insurance: Contractor shall maintain during the term of this contract, at its own expense, All Builders Risk Insurance in the amount equal to one hundred percent (100%) of the initial contract amount plus values of subsequent modifications and change orders. Covered perils shall include but not be limited to: Contractor's labor and workmanship, materials, fixtures, equipment, defects, fire, wind, lightning, and other weather-related hazards, damage, extended coverage, vandalism, and malicious mischief, and theft.

Policies under this Section are subject to the laws of the State of Texas and include the following endorsements in favor of Dallas County

- a. Name Dallas County as loss payee as its interest may appear
- b. Thirty (30) day Notice of Cancellation

- 1.5. Bid Security or Bid Bond (for contracts in excess of \$100,000): All bids shall be accompanied by a cashier's check, certified check, or a bid bond in an amount of not less than five percent (5%) of the total bid. All cashier's check or certified check shall made payable without conditions to Dallas County and must reference the IFB number on the check or bond. Bid bond

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executed by a solvent corporate surety or corporate sureties which are on the approved list of the United States Department of Treasury (Federal register Circular 570 - "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies", Sections 9304 through 9308 of Title 31 of the United States Code. Surety Companies Acceptable on Federal Bonds. The Surety must also be duly authorized to do business in the State of Texas.

- 1.6. Performance Bond (for contracts in excess of \$50,000): Contractor within ten (10) days after contract award or prior to the commencement of any work or delivery services under this contract Contractor shall furnish to the County a Performance Bond in the amount equal to one hundred percent (100%) of the contract amount, executed by a solvent corporate surety or corporate sureties which are on the approved list of the United States Department of Treasury (Federal register Circular 570 - "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies", Sections 9304 through 9308 of Title 31 of the United States Code. Surety Companies Acceptable on Federal Bonds. The Surety must also be duly authorized to do business in the State of Texas.
- 1.7. Payment or Material and Labor Bond (for contracts in excess of \$25,000): Contractor within ten (10) days after contract award or prior to the commencement of any work or delivery services under this contract Contractor shall furnish to the County a Payment or Material and Labor Bond in the amount equal to one hundred percent (100%) of the contract amount, executed by a solvent corporate surety or corporate sureties which are on the approved list of the United States Department of Treasury (Federal register Circular 570 - "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies", Sections 9304 through 9308 of Title 31 of the United States Code. Surety Companies Acceptable on Federal Bonds. The Surety must also be duly authorized to do business in the State of Texas.

The bonds must clearly and prominently display on the bond or on an attachment to the bond the name, mailing address, physical address, and telephone number, including the area code, of the surety company to which any notice of claim should be sent, or the toll-free telephone number maintained by the Texas Department of Insurance under Chapter 521.051 of the Texas Insurance Code, and a statement that the address of the surety company to which any notice of claim should be sent may be obtained from the Texas Department of Insurance by calling the toll free telephone number.

In the event the contract is prematurely terminated due to Contractor's breach and/or nonperformance of the contract, the County reserves the right to act on the performance bond and/or seek monetary restitution. In the event civil suit is filed to enforce this provision, County will seek its attorney's fees and costs of suit from Contractor which amount Contractor shall pay in the event that County prevails in such action.

All bonds shall be delivered to the Dallas County Purchasing Agent located at 500 Elm Street, 5th Floor, Suite 5500, Dallas, Texas 75202. No work shall be authorized until the bond has been submitted to Dallas County Purchasing Agent.

Contractor agrees that, with respect to the above- referenced insurance, all insurance contracts/policies will contain the following required provisions:

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- a. Endorsement: Except Workers Compensation and Professional Liability, name Dallas County and its elected and appointed boards, officers, officials, agents, representatives, directors, employees and volunteers as additional insured(s) (as the interest of each insured may appear) as to all applicable coverage;
- b. Endorsement: Provide for thirty (30) days prior written notice will be given to the County for cancellation, non-renewal or material reduction/change in coverage provided under all policies, except in cases of cancellation for non-payment, in the event of which notice shall be provided as required by state law to Dallas County;
- c. Endorsement: Contractor agrees to waive subrogation against Dallas County, its officers and employees for injuries, including death, property damage or any other loss;
- d. Provide for endorsement that the “other insurance” clause shall not apply to County where County is the additional insured on the policy;
- e. All insurance required herein shall be maintained in full force and effect until all work or services required to be performed under the terms of the contract is satisfactorily completed and formally accepted;
- f. All insurance coverage shall be on a per occurrence basis, if coverage is written on a claims-made basis, the retroactive date shall be prior to or coincide with the date of the Contract and the certificate of insurance shall state that the coverage is claims-made and indicate the retroactive date. The coverage shall be continuous for the duration of the contract agreement and for not less than two (2) years following the end of the contract agreement. Coverage, including renewals, shall have the same retroactive date as the original policy applicable to the contract agreement;
- g. Contractor shall be solely responsible for the deductible and/or self-insured retention for any loss;
- h. Contractor insurance policies coverage shall be written on a primary basis and non-contributory with any other insurance coverages and/or self-insurance carried by Dallas County;
- i. Default/Cumulative Rights/Mitigation. It is not a waiver of default if the non-defaulting party fails to immediately declare a default or delays in taking any action. The rights and remedies provided by this contract agreement are cumulative, and either Party’s use of any right or remedy will not preclude or waive its right to use any other remedy. These rights and remedies are in addition to any other rights the Parties may have by law, statute, ordinance or otherwise. Contractor has a duty to mitigate damages.
- j. Approval and acceptance of Contractor’s services and work by County shall not constitute nor be deemed a release of the responsibility and liability of Contractor for the accuracy and competency of Contractor’s services or work; nor shall such approval and acceptance be deemed to be an assumption of such responsibility by the County for any defect, error or omission in the services performed by Contractor in this regard;
- k. Contractor shall provide that all provisions of this contract agreement concerning liability, duty and standard of care, shall be underwritten by contractual liability coverage sufficient to include obligation within applicable policies;
- l. Contractor and their freight contractors must be prepared to show coverage verification prior to entering upon County premises;
- m. Failure to comply with lawful requirements or adequate liability requirements may result in delay of payments, subject to the orders of the Commissioners Court, not to exceed a

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period of up to two years from the termination of this contract agreement, or cancellation of this contract agreement or both (Dallas County Commissioners Court Order 2003-1792, September 30, 2003);

- n. Insurance Certificates: The certificates of insurance shall list County as the certificate holder. Any and all copies of Certificates of Insurance shall reference any applicable (Bid Number, Commissioners Court Order Number, or contract number for which the insurance is being supplied). All insurance policies or duly executed certificates for the same required to be carried by Contractor under this contract agreement, together with satisfactory evidence of the payment of the premium thereof, shall be delivered to the: Dallas County Purchasing Agent located at 500 Elm Street, Suite 5500, Dallas, Texas 75202; and
- o. All insurance required to be carried by Contractor or subcontractors under this contract agreement shall be acceptable to the County in form and content, in its sole discretion. All policies shall be issued by an insurance company acceptable and satisfactory to County and authorized to do business in the State of Texas. Acceptance of or the verification of insurance by County shall not relieve or decrease the liability of Contractor.

2. Insurance Lapse

In the event successful firm fails to maintain insurance as required by this contract, successful firm shall immediately cure such lapse in insurance coverage at successful firm's sole expense and pay County in full for all costs and expenses incurred by County under this contract as a result of such failure to maintain insurance by successful firm, including costs and reasonable attorney's fees relating to County's attempt to cure such lapse in insurance coverage. Such costs and attorney's fees, not to exceed fifteen hundred and 00/100 dollars (\$1,500.00), shall be automatically deducted from monies or payments owed to successful firm by County. Moreover, the County shall retain five percent (5%) of the value of the Contract that shall be placed into an account from monies or payments owed to Contractor by County to cover County's potential exposure to liability during the period of such lapse. The five percent (5%) retainage shall be held by County until six (6) months after the date lapse in coverage is cured or Term of the Contract has ended or has otherwise been terminated, canceled or expired and shall be released if no claims are received or lawsuits filed against County for any matter that should have been covered by the required insurance. The County shall retain the funds if a claim is received or lawsuit and use the funds to defend, pay costs of defense or settle the claim.

XV. Rejection or Acceptance of Bids

The County reserves the right to accept or reject in part or in whole any bids submitted. The Purchasing Agent will recommend to Commissioners Court award to the lowest responsive and responsible bidder as determined by the Purchasing Agent.

XVI. Late and Withdrawn Bids

All bids must be submitted no later than the bid due date and time established by this solicitation. Bid arriving after the due date and time will not be accepted. Late bids delivered by carrier will be return to the bidder unopened.

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A bidder has the right to withdraw their bid prior to the bid due date and time, thereafter, the bidder shall submit a formal request to the Dallas County Purchasing Agent requesting to withdraw their bid.

XVII. Confidentiality

Any information deemed confidential, shall be clearly noted as such on each page of the solicitation response by the bidder. County cannot guarantee it will not be compelled to disclose all or part of any public record under the Texas Open Record Act. Respondents who include information in a bid that is legally protected as trade secret or confidential shall clearly indicate the information which constitutes a trade secret or confidential information by marking that part of the bid “trade secret” or “confidential” at the appropriate place. If a request is made under the Texas Open Records Act to inspect information designated as trade secret or confidential in a bid, the bidder shall, upon request, immediately furnish sufficient written reasons and information as to why the information designated as a trade secret or confidential should be protected from disclosure to Attorney General of Texas for final determination.

XVIII. Disqualification of Bidders

Bidders may be disqualified for, but not limited to, the following reasons:

- Reason to believe collusion exists among the bidders
- The bidder is involved in any litigation against Dallas County
- The bidder is in arrears on an existing contract or has failed to perform on a previous contract with Dallas County

XIX. Permits Required by Law

Contractor shall comply with all requirements of federal, state, and local statutory requirements and regulations pertinent to or affecting any phase of this contract.

XX. Records and Audit

The Contractor shall keep accurate records of all components of invoices to the County as they relate to this contract. These records shall be retained for a minimum of two years after the conclusion of the Contract. The County reserves the right to audit any records it deems necessary for the execution of this Contract.

XXI. Assignment of Contract

The Contractor shall not assign, transfer, sublet, convey or otherwise dispose of the Contract of any part therein or its right, title or interest therein or its power to execute the same to any other persons, firm, partnership, company or corporation without the prior written consent of the County. Should the Contractor assign, transfer, sublet, convey or otherwise dispose of its right, title or interest or any part thereof in violation of this section, the County may, at its discretion, cancel the Contract and all rights, title and interest of the Contractor shall therein cease and terminate, and the Contractor shall be declared in default.

XXII. Default by Contractor

The following events shall be deemed to be events of default by Contractor under the Contract:

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- Contractor shall become insolvent, or shall make a transfer in fraud of creditors, or shall make an assignment for the benefit of creditors;
- Contractor attempts to assign the Contract without the prior written consent of the County;
- Contractor shall fail to perform, keep or observe any term, provision or covenant of the Contract; or
- Contractor fails to properly and timely pay Contractor personnel, suppliers or other contractors and the failure impacts the County in any manner.

In the event a default occurs, the Director shall give the Contractor written notice of the default. If the default is not corrected to the satisfaction and approval of the Director within the time specified in such notice, the County may immediately cancel the Contract. At the direction of the Director, the Contractor shall vacate the facility, if applicable, and shall have no right to further operate under the Contract.

The Contractor, in accepting the Contract, agrees that the County shall not be liable to prosecution for damages or lost anticipated profits if the County cancels or terminates the Contract.

No Waiver: No waiver by the County of any default or breach of any covenant, condition, or stipulation shall be treated as a waiver of any subsequent default or breach of the same or any other covenant, condition, or stipulation.

XXIII. Termination

The County may terminate this agreement in whole or in part by giving thirty days written notice thereof to Contractor. The County will compensate Contractor in accordance with the terms of the agreement for all goods and services delivered and accepted prior to the effective date of such termination notice.

XXIV. Miscellaneous

1. After executing the contract or issuance of a purchase order, no consideration will be given to any claim of misunderstanding.
2. Bidders shall submit with their bid, the required Contractor's qualification statement with supporting information as stated herein along with all other supporting documentation requested.
3. Bidders shall thoroughly familiarize themselves with the provisions of these specifications/scope of work.
4. A bid may be disqualified if the corporation or individual bidder is in arrears or in default to the County for delinquent taxes or assessments or on any debt or contract, whether as defaulter or bondsman; or who has defaulted upon any obligation to the County by failing to perform satisfactorily any previous agreement or Contract within the past seven years. Also, bidders may be disqualified for poor prior performance on similar Contracts with other entities.
5. The Contractor agrees to abide by the rules and regulations as prescribed herein. The Contractor will, in all solicitations or advertisements for personnel to perform services under the Contract, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, gender, or national origin.

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6. If either party hereto is prevented from completing its obligations under the Contract by act of God, strike, lockout, material or labor restrictions by any governmental authority, civil riot, flood, or any other cause beyond the control of the parties hereto, then such party shall be excused from such performance for such period of time as is reasonably necessary after such occurrence to remedy the effects thereof.
7. The section headings in these Specifications are for convenience in reference and are not intended to define or limit the scope of any of the conditions, terms or provisions of these specifications.
8. Should any question arise as to the proper interpretation of the terms and conditions of these specifications, the decision of the department director and/or Purchasing Agent or his authorized representative shall be final.

XXV. Indemnity

The selected bidder agrees to defend, indemnify and hold the County, its officers, agents and employees, harmless against any and all claims, lawsuits, judgments, costs, and expenses for personal injury (including death), property damage or other harm for which recovery of damages is sought, suffered by any person or persons, that may arise out of or be occasioned by the selected bidder's breach of any of the terms or provisions of the contract, or by any other negligent or strictly liable act or omission of the selected bidder, its officers, agents, employees, or subcontractors, in the performance of the contract; except that the indemnity provided for in this paragraph shall not apply to any liability resulting from the sole negligence or fault of the County, its officers, agents, or employees and in the event of joint and concurrent negligence or fault of the selected bidder(s) and County, responsibility, and indemnity, if any, shall be apportioned comparatively in accordance with the laws of the State of Texas, without waiving any governmental immunity available to the County under Texas law and without waiving any defenses of the parties under Texas law. The provisions of this paragraph are solely for the benefit of the parties hereto and are not intended to create or grant any rights, contractual or otherwise, to any other person or entity.

XXVI. Development Costs

Neither Dallas County nor its representatives shall be liable for any expenses incurred in connection with preparing a response to this IFB. Respondents are encouraged to prepare their bids simply and economically, providing a straightforward and concise description of your firm's ability to meet the requirements of the IFB.

XXVII. Certificate of Interested Parties (Form 1295)

Section 2252.908 of the Texas Government Code: An Act Addressing Disclosure of Interested Parties.

Effective January 1, 2016, Dallas County, must comply with the "Disclosure of Interest Parties, requirements established under Section 2252.908 of the Texas Government Code as implemented by the Texas Ethics Commission. Briefly stated, all contracts requiring an action or vote by the governing body of the entity or agency before the contract may be signed (regardless of the dollar amount) or that has a value of at least \$1 million will require the on-line completion of Form 1295 "Certificate of Interested Parties", in accordance with Texas Government Code Statute §2252.908. Form 1295 is also required for any and all contract amendments, extensions or renewals. All business entities are required to complete and file electronically with the Texas Ethics Commission using the online filing application.

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Step 1: Business Entity completes Form 1295 in electronic format on the Texas Ethics Commission website: (https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm)

Step 2: Upon receipt of a completed Interested Parties Disclosure Form, Texas Ethics Commission issues a Certification of Filing to the Business Entity and the Business Entity download(s), print, sign(s) and notarize(s) Form 1295. An authorized agent of the business entity will need to sign the printed copy of the form and have the form notarized.

Step 3: At the time of submission of the solicitation to Dallas County the Business Entity must submit the completed notarized Form 1295 with the Certification of Filing with their contract (i.e.: bid, rfp, rfq, soq, etc.) to Dallas County. Upon receipt, Dallas County may proceed with the award and/or execution of the contract.

Step 4: Not later than the 30th day after the date the contract has been signed by all parties, Dallas County must notify the Texas Ethics Commission (in electronic format) of the receipt of (1) Form 1295, and (2) the Certification of Filing.

Step 5: Not later than the 7th business day after receipt of the above notice, Texas Ethics Commission makes the disclosure available to the public by posting the disclosure on its website.

County Offices and Departments submitting contracts to Commissioners Court for award/execution are responsible for acknowledging and filing the Form 1295.

Definitions:

- (a) “Contract” includes an amended, extended, or renewed contract.
- (b) “Business entity” includes an entity through which business is conducted with a governmental entity or state agency, regardless of whether the entity is a for-profit or nonprofit entity. The term does not include a governmental entity or state agency.
- (c) “Controlling interest” In accordance with the Texas Ethics Commission, Chapter 46.3(c) and applicable to Texas Government Code §2252.908 - (1) an ownership interest or participating interest in a business entity by virtue of units, percentage, shares, stock, or otherwise that exceeds 10 percent; (2) membership on the board of directors or other governing body of a business entity of which the board or other governing body is composed of not more than 10 members; or (3) service as an officer of a business entity that has four or fewer officers, or service as one of the four officers most highly compensated by a business entity that has more than four officers.
- (d) “Interested party” (1) a person who has a controlling interest in a business entity with whom a governmental entity or state agency contracts; or (2) a person who actively participates in facilitating a contract or negotiating the terms of a contract with a governmental entity or state agency, including a broker, intermediary, adviser, or attorney for the business entity.
- (e) “Intermediary” for purposes of this rule, means, a person who actively participates in the facilitation of the contract or negotiating the contract, including a broker, adviser, attorney, or representative of or agent for the business entity who:
 - (1) receives compensation from the business entity for the person’s participation;
 - (2) communicates directly with the governmental entity or state agency on behalf of the business entity regarding the contract; and
 - (3) is not an employee of the business entity.

Solicitation Number No.: 2026-016-7101, Pre-Bid Meeting Date: 03/26/2026 @ 10:30 a.m. (CST)
Project Title: IFB Replacement of Air Handler Units and BMS at Henry Wade Juvenile Center Project, Bid
Due Date: 04/23/2026 @ 2:00 p.m. (CST)

To obtain additional information on Section 2252 and to learn more about the Texas Ethics Commission process to create a new account or to complete an electronic version of Form 1295 for submission with a signed contract, please go to the following website:

<https://www.ethics.state.tx.us/tec/1295-Info.htm>

Instructional Videos for Business Entities on how to file online can be found at:

https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

XXVIII. Conflict of Interest

No County elected or appointed official or representative, or any employees shall have any financial interest, direct or indirect, in any contract with the County or be financially interested, directly or indirectly, in the sale to the County of any land, materials, supplies, goods or services, except on behalf of the County as an official or employee. Any violation of this Section, with knowledge, expresses or implied, of the person or corporation contracting with the County shall render this Agreement involved voidable by the Commissioners Court of Dallas County. It is the responsibility of Contractor during all phases of this Agreement to notify the County in writing of any potential conflict of interest. Contractor covenants that neither it nor any member of its corporation presently has any interest or shall acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of this Agreement. Contractor further covenants that in the performance of this Agreement no person having such interest shall be employed or appointed by Contractor.

XXIX. Small Business Enterprise (SBE) Program

See Attachment S – Small Business Enterprise Program (SBE) and SBE forms

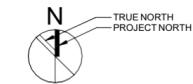


FLOOR PLAN NOTES

1. CONTRACTOR TO COORDINATE AND PROVIDE BACKING FOR ALL ITEMS IN CONTRACT, AS WELL AS ITEMS NOTED WHICH ARE IDENTIFIED AS NOT IN CONTRACT (NOC) OR ITEMS WHICH ARE OWNER-PROVIDED OR VENDOR-PROVIDED. SUCH ITEMS MAY INCLUDE, BUT ARE NOT LIMITED TO, SIGNAGE, VISUAL BOARD UNITS, CONFERENCING TRAYS, RAILS OR OTHER ACCESSORIES, BULLETIN BOARDS, DISPLAY CASES, COMPUTER OR TELEVISION DISPLAYS, MONITORS, SECURITY CAMERAS, WIRELESS ACCESS POINTS, LOCKERS, AND OTHER CASEWORK OR EQUIPMENT.
2. DO NOT SCALE DRAWINGS. USE DIMENSIONS INDICATED.
3. CONTRACTOR SHALL VERIFY BUILDING DIMENSIONS, PARTITION AND WALL LOCATIONS, AND FLOOR ELEVATIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES PRIOR TO START OF WORK.
4. ALL EXISTING CONSTRUCTION REMAINING BUT AFFECTED BY THE WORK UNDER THIS CONTRACT SHALL BE RESTORED AND REFINISHED TO MATCH THE MATERIALS, FINISH AND ALIGNMENT OF THE EXISTING ADJACENT CONSTRUCTION.
5. COORDINATE QUANTITY, SIZE AND LOCATION OF ALL FLOOR, ROOF AND WALL OPENINGS FOR MECHANICAL AND ELECTRICAL WORK FOR A COMPLETE INSTALLATION. PROVIDE OPENINGS SHOWN OR REQUIRED FOR COMPLETION OF WORK.
6. COORDINATE SIZE AND LOCATION OF ALL ACCESS PANELS WITH APPROPRIATE TRADES.
7. ALL DIMENSIONS ARE TO FACE OF GYPSUM BOARD, NOMINAL FINISH FACE OF CONCRETE, OR NOMINAL FACE OF MASONRY UNLESS OTHERWISE NOTED.

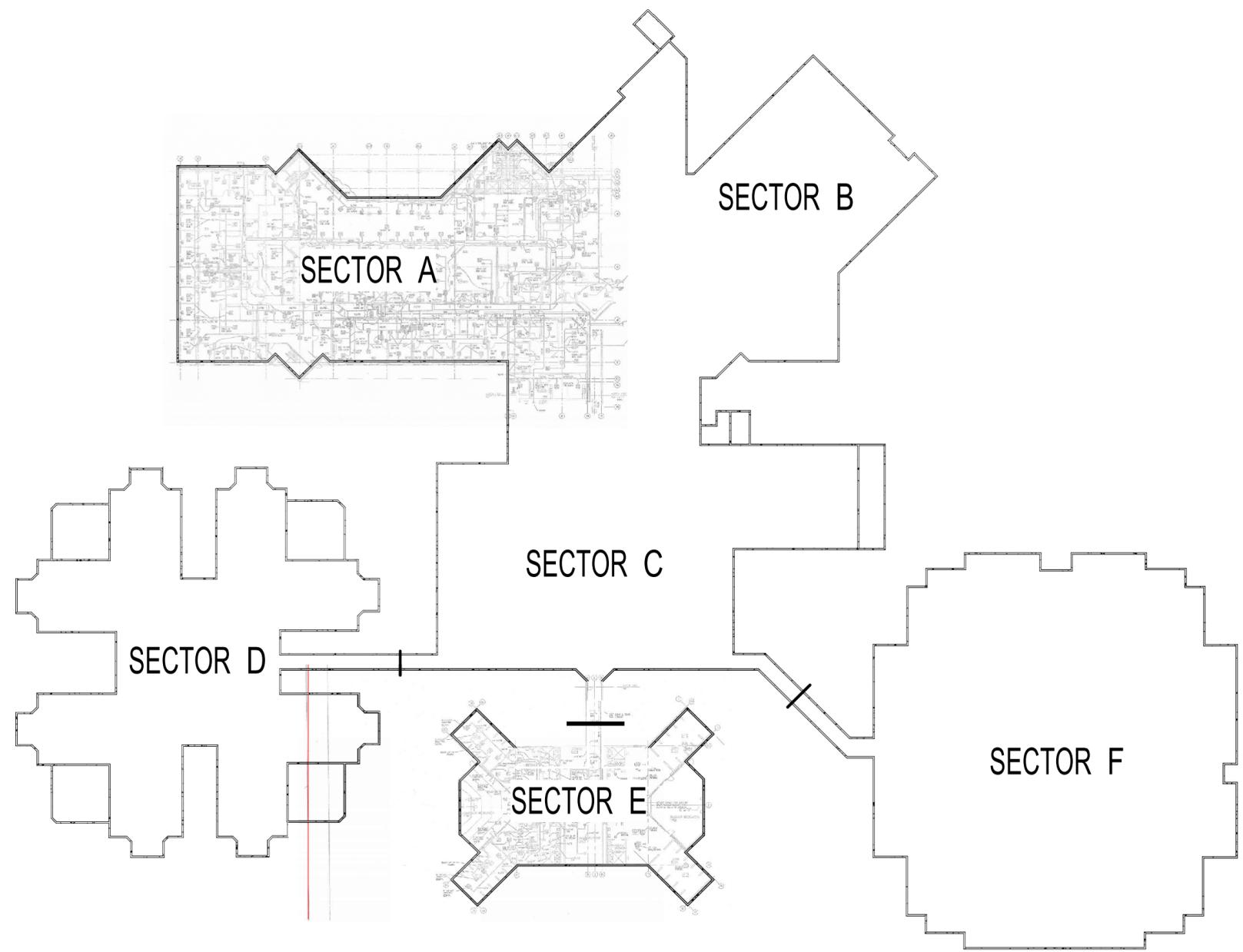


FLOOR PLAN LEGEND



ROOM NAME
101

ROOM NAME & NUMBER

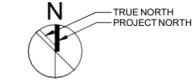


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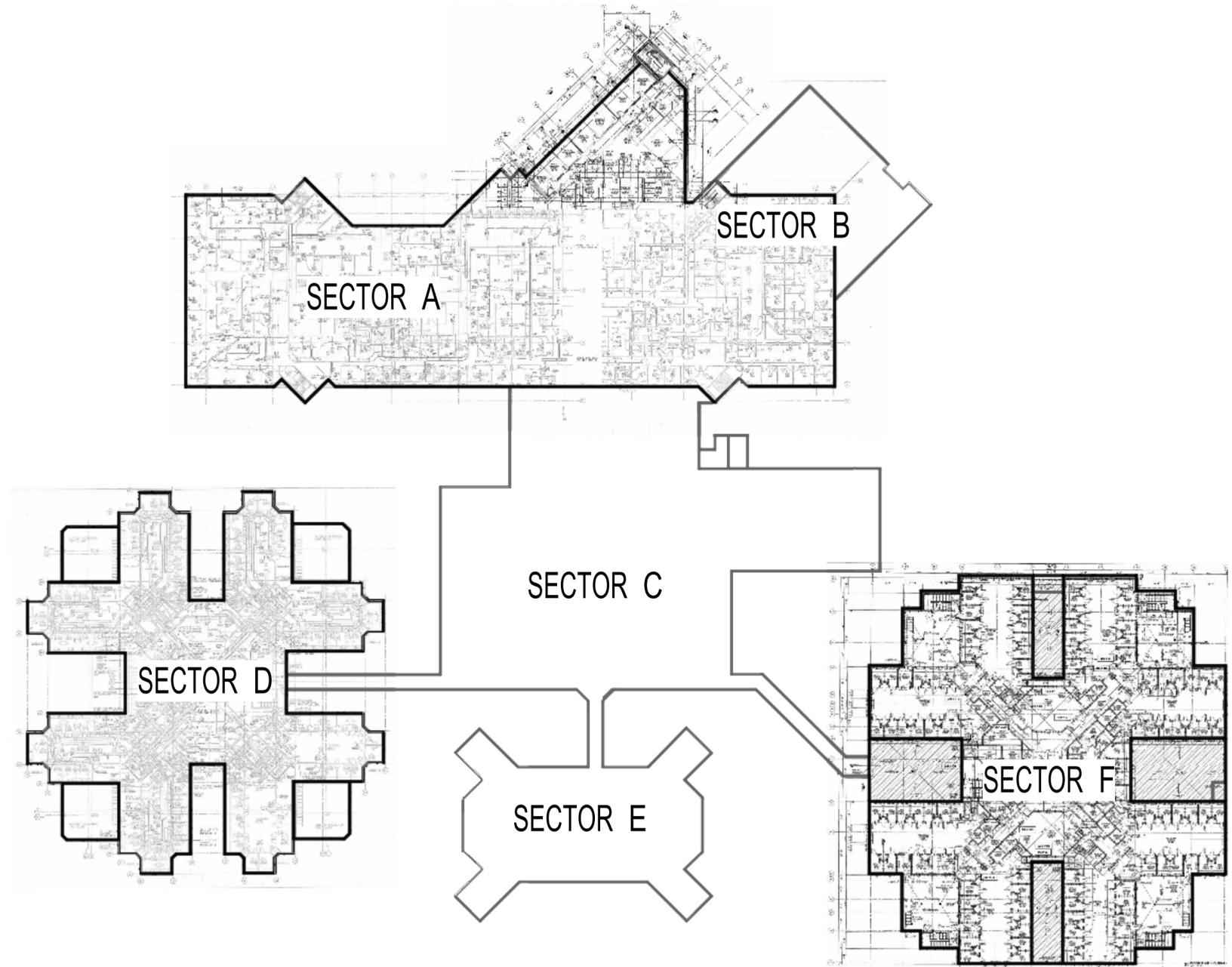


FLOOR PLAN LEGEND



ROOM NAME
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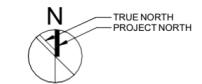


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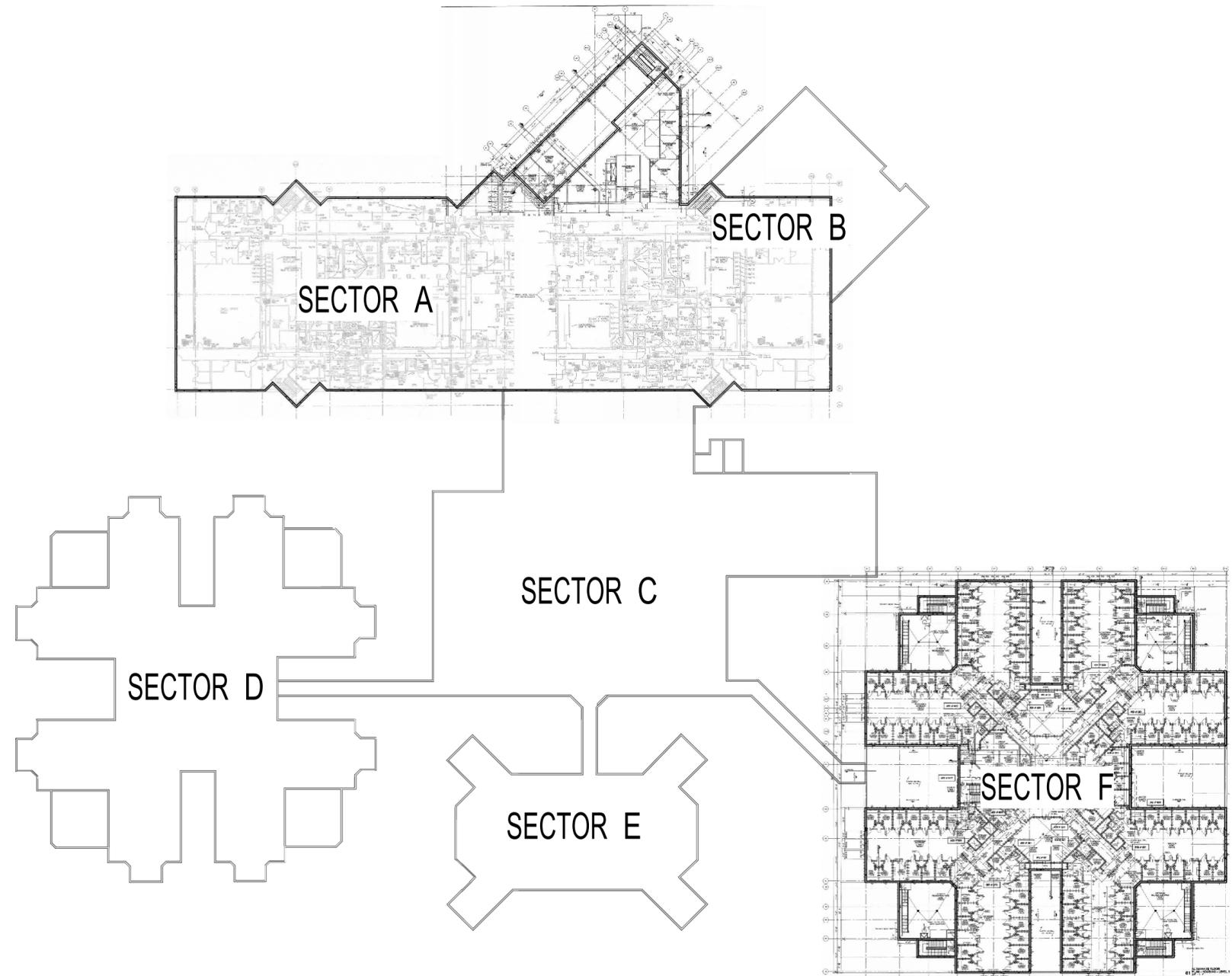


FLOOR PLAN LEGEND



ROOM NAME
101

ROOM NAME & NUMBER



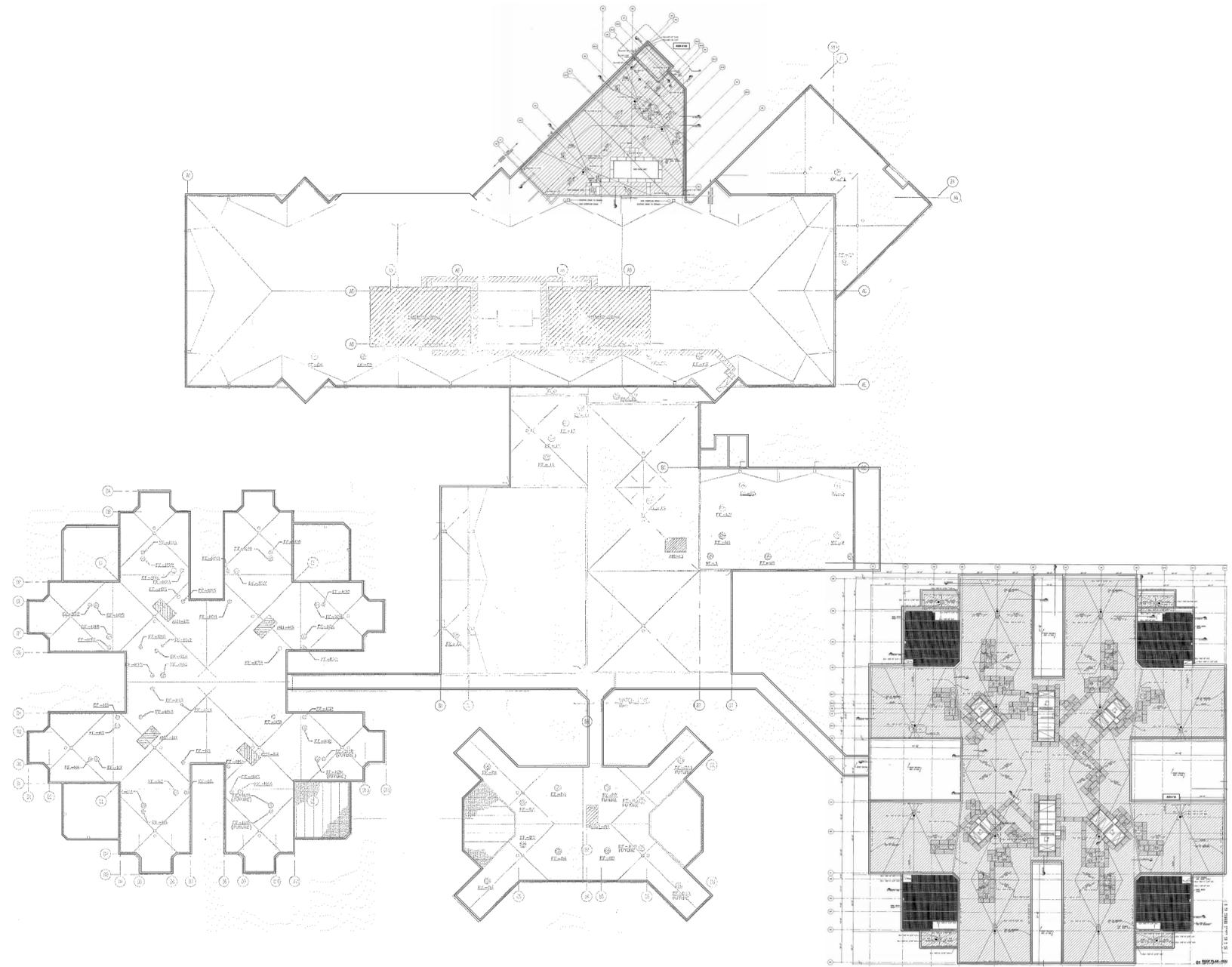
ROOF PLAN NOTES

1. COORDINATE SIZES AND FINAL LOCATIONS OF ALL EQUIPMENT SUPPORTS WITH THE APPROPRIATE EQUIPMENT MANUFACTURER.
2. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL PIPES, CURBS, VENTS, DUCTS, CONDUITS AND OTHER FEATURES EXTENDING THROUGH ROOF SURFACES WHICH REQUIRE FLASHING AND COORDINATE SIZE AND LOCATION OF SAME.



ROOF PLAN LEGEND - FOR REFERENCE ONLY

- EXHAUST FAN
- VENT THROUGH ROOF
- TBA ROOF MOUNTED TIE-BACK ANCHOR
- - - HORIZONTAL LIFELINE CABLE SYSTEM
- DP DAVIT PEDISTAL FOR 8'-6" DAVIT ARM
- TR LIGHTNING PROTECTION ROOF PENETRATION
PROVIDE STEPPED CONDUIT FLASHING
(SEE DETAIL 'TR' ON LIGHTNING PROTECTION DWGS)
- ← INDICATES SLOPE DIRECTION OF ROOF
(MIN 1/4" PER FOOT)
- ⊕ SURFACE MTD WEATHERPROOF RECEPTACLE/JUNCTION
BOX (JB). SEAL BASE FLASHING PENETRATION PER
ROOFING MANUFACTURER'S DIRECTION TO MEET
WARRANTY REQUIREMENTS. PROVIDE SOLID WOOD
BLOCKING BEHIND DEVICE TO ACCOMMODATE
INSTALLATION. CONDUIT SHALL BE ROUTED IN STUD
SPACE OF PARAPET. DO NOT SURFACE MOUNT CONDUIT.
- WALKWAY PADS - TYP
- ▨ ROOFING SYSTEM CRICKET
- RS OS (RS) ROOF SUMP AND
(OS) OVERFLOW ROOF SUMP



MECHANICAL SYMBOL LEGEND

GRAPHIC SYMBOLS	PIPE & FITTING SYMBOLS	VALVE SYMBOLS	DUCTWORK SYMBOLS	DUCTWORK SYMBOLS																																																											
<p>DRAWING TITLE</p> <p>TOP TITLE</p> <p>BOTTOM TITLE</p> <p>SHEET 1</p> <p>SCALE: 1/8" = 1'-0"</p> <p>SCALE OF FLOOR PLAN, SECTION OR DETAIL</p> <p>AREA OF ENLARGED PLAN OR DETAIL</p> <p>DETAIL NO. AND SHEET NO.</p> <p>DETAIL NUMBER</p> <p>SHEET NO. ON WHICH ENLARGED DETAIL IS DRAWN</p> <p>M3.01</p> <p>SECTION OF CUTTING PLANE</p> <p>SHEET NO. ON WHICH THE SECTION IS DRAWN</p> <p>M5.01</p> <p>PIPING DESIGNATION</p> <p>2" CHWS</p> <p>OR</p> <p>2" CHWS</p> <p>SYSTEM SERVICE ABBREVIATION</p> <p>NOMINAL PIPE SIZE (IN INCHES)</p> <p>MULTI-LINE KEY</p> <p>HORIZONTAL RUN ON PLAN READ TOP TO BOTTOM</p> <p>VERTICAL RUN ON PLAN READ LEFT TO RIGHT</p> <p>2" HWS 2" CWR 4" CWS</p> <p>3" PCD(F)* 4" CHWS 4" CHWR 2" LPS</p> <p>BOP 12'-0" AFF LOWER PIPE RACK</p> <p>BOP 13'-6" AFF UPPER PIPE RACK</p> <p>4" CWS 4" CWR 2" HWS 2" HWR 2" LPS 2" LPS</p> <p>BOP 12'-6" AFF LOWER PIPE RACK</p> <p>BOP 13'-6" AFF UPPER PIPE RACK</p> <p>4" CWS 4" CWR 2" HWS 2" HWR 2" LPS 2" LPS</p> <p>3" PCD(F)* 4" CHWS 4" CHWR 2" LPS</p> <p>BOP 13'-6" AFF UPPER PIPE RACK</p> <p>*(F) INDICATES FUTURE PIPING ON RACK</p> <p>MISCELLANEOUS SYMBOLS</p> <p>xxx-1</p> <p>EQUIPMENT DESIGNATION</p> <p>SINGLE LINE PIPE/DUCTWORK BREAK</p> <p>DOUBLE LINE PIPE/ROUND DUCTWORK BREAK</p> <p>RECTANGULAR DUCT/STANDARD BREAK</p> <p>KEYED NOTE</p> <p>REVISION DELTA</p> <p>POINT OF DISCONNECTION</p> <p>POINT OF CONNECTION (NEW TO EXISTING)</p> <p>NEW ITEMS (PIPING/DUCTWORK/EQUIPMENT)</p> <p>EXISTING ITEMS TO REMAIN</p> <p>EXISTING ITEMS TO BE DEMOLISHED</p> <p>LIMIT OF EXISTING ITEMS TO BE REMOVED</p> <p>NEW CONNECTION TO EXISTING ITEM</p> <p>(N) NEW ITEM (NOTATION SHOWN AS NECESSARY FOR CLARIFICATION)</p> <p>(E) EXISTING ITEM TO REMAIN (NOTATION SHOWN AS NECESSARY FOR CLARIFICATION)</p> <p>(F) FUTURE ITEM (NOTATION SHOWN AS NECESSARY FOR CLARIFICATION)</p> <p>(R) EXISTING ITEM TO BE RELOCATED (NOTATION SHOWN AS NECESSARY FOR CLARIFICATION)</p> <p>(D) EXISTING ITEM TO BE DEMOLISHED (NOTATION SHOWN AS NECESSARY FOR CLARIFICATION)</p> <p>NOTE: WELDED FITTINGS ARE SHOWN FOR DOUBLE LINE PIPING. FITTINGS WITH OTHER END CONDITIONS ARE SIMILAR.</p>	<table border="1"> <thead> <tr> <th>DOUBLE LINE</th> <th>SINGLE LINE</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr><td></td><td></td><td>PIPE</td></tr> <tr><td></td><td></td><td>DIRECTION OF FLOW / SLOPE</td></tr> <tr><td></td><td></td><td>PIPING WITH INSULATION (WHEN SHOWN FOR CLARITY)</td></tr> <tr><td></td><td></td><td>WELDED JOINT</td></tr> <tr><td></td><td></td><td>SCREWED JOINT</td></tr> <tr><td></td><td></td><td>FLANGED JOINT</td></tr> <tr><td></td><td></td><td>UNION</td></tr> <tr><td></td><td></td><td>GROOVED END JOINT</td></tr> <tr><td></td><td></td><td>GENERIC FLEXIBLE COUPLING (REFER TO SPECIFICATIONS)</td></tr> <tr><td></td><td></td><td>GROOVED END ADAPTER FLANGE</td></tr> <tr><td></td><td></td><td>FLANGED COUPLING ADAPTER</td></tr> <tr><td></td><td></td><td>STUB END OR FLANGE ADAPTER W/ FLANGE RING</td></tr> <tr><td></td><td></td><td>BLIND FLANGE</td></tr> <tr><td></td><td></td><td>ELBOW, 45 DEGREE (LONG RADIUS UCN)</td></tr> <tr><td></td><td></td><td>ELBOW, 90 DEGREE (LONG RADIUS UCN)</td></tr> <tr><td></td><td></td><td>ELBOW, 90 DEGREE - CHANGE IN DIRECTION TOWARD VIEWER</td></tr> <tr><td></td><td></td><td>ELBOW, 90 DEGREE - CHANGE IN DIRECTION AWAY FROM VIEWER</td></tr> <tr><td></td><td></td><td>TEE FITTING</td></tr> <tr><td></td><td></td><td>TEE FITTING, BRANCH TOWARD VIEWER</td></tr> <tr><td></td></tr></tbody></table>	DOUBLE LINE	SINGLE LINE	DESCRIPTION			PIPE			DIRECTION OF FLOW / SLOPE			PIPING WITH INSULATION (WHEN SHOWN FOR CLARITY)			WELDED JOINT			SCREWED JOINT			FLANGED JOINT			UNION			GROOVED END JOINT			GENERIC FLEXIBLE COUPLING (REFER TO SPECIFICATIONS)			GROOVED END ADAPTER FLANGE			FLANGED COUPLING ADAPTER			STUB END OR FLANGE ADAPTER W/ FLANGE RING			BLIND FLANGE			ELBOW, 45 DEGREE (LONG RADIUS UCN)			ELBOW, 90 DEGREE (LONG RADIUS UCN)			ELBOW, 90 DEGREE - CHANGE IN DIRECTION TOWARD VIEWER			ELBOW, 90 DEGREE - CHANGE IN DIRECTION AWAY FROM VIEWER			TEE FITTING			TEE FITTING, BRANCH TOWARD VIEWER		TEE FITTING, BRANCH AWAY FROM VIEWER
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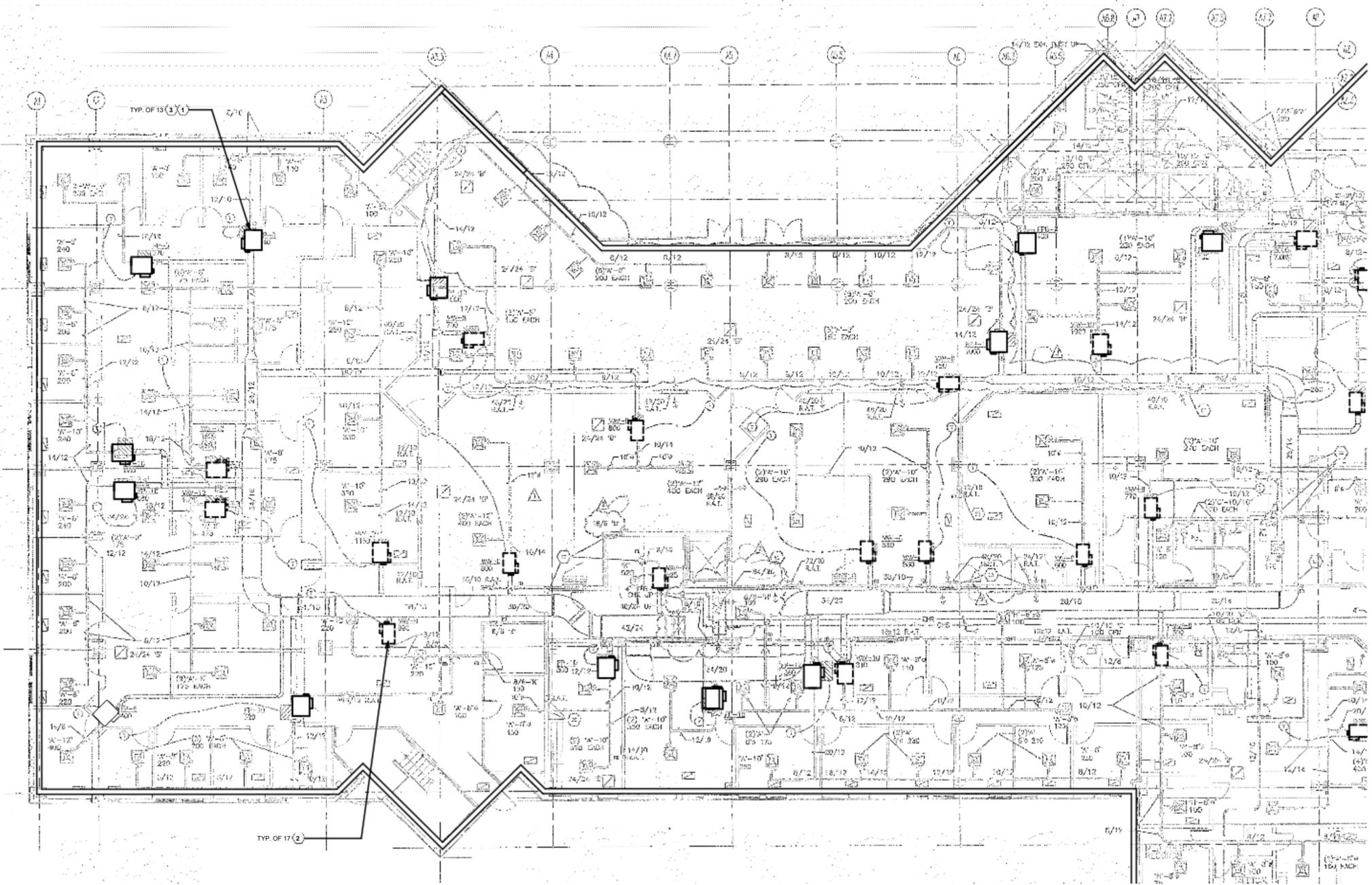
 | DOUBLE LINE | SINGLE LINE | DESCRIPTION | |-------------|-------------|-------------------------| | | | GATE VALVE | | | | BUTTERFLY VALVE | | | | BALL VALVE | | | | DIAPHRAGM VALVE | | | | GLOBE VALVE | | | | PLUG VALVE | | | | CHECK VALVE | | | | PRESSURE REDUCING VALVE | | | | BALANCING VALVE | | | | PRESSURE RELIEF VALVE | | | | AUTOMATIC AIR VENT | | | | MANUAL AIR VENT | **CONTROL VALVES** | DOUBLE LINE | SINGLE LINE | DESCRIPTION | |-------------|-------------|---| | | | TWO-WAY, TWO POSITION CONTROL VALVE | | | | TWO-WAY, TWO POSITION CONTROL VALVE W/ SOLENOID | | | | TWO-WAY, MODULATING CONTROL VALVE | | | | THREE-WAY, TWO POSITION CONTROL VALVE | | | | THREE-WAY, MODULATING CONTROL VALVE | **CONTROL SYMBOLS** **WALL MOUNTED DEVICES** - TEMPERATURE SENSOR/THERMOSTAT - HUMIDITY SENSOR/HUMIDISTAT - MOTION SENSOR - OVERRIDE SWITCH - CARBON DIOXIDE SENSOR - CARBON MONOXIDE SENSOR - VARIABLE FREQUENCY DRIVE **EQUIPMENT SYMBOLS** - ROOFTOP EXHAUST FAN (ROOF PLAN VIEW) - ROOFTOP EXHAUST FAN (ROOF PLAN VIEW) - INLINE EXHAUST FAN (EF), AIR HANDLING UNIT (AHU), CONDENSING UNIT (CU) - WALL LOUVER WITH POSITIVE OR NEGATIVE AIRFLOW - DOOR UNDERCUT (SPECIFY CFM IF REQUIRED) - DOOR LOUVER (SPECIFY CFM IF REQUIRED) | | DOUBLE LINE | SINGLE LINE | DESCRIPTION | |-------------|-------------|---| | | | RECTANGULAR OR SQUARE DUCT, DIMENSIONS ARE IN INCHES, MIN. INSIDE CLEAR, A = WIDTH, B = HEIGHT | | | | ROUND DUCT DIMENSIONS ARE IN INCHES, MIN. INSIDE CLEAR, A = DIAMETER | | | | FLAT OVAL DUCT DIMENSIONS ARE IN INCHES, MIN. INSIDE CLEAR, A = WIDTH, B = HEIGHT | | | | DUCTWORK RISE (R) OR DROP (D) RELATIVE TO DIRECTION OF AIRFLOW | | | | DIRECTION OF AIR FLOW | | | | SUPPLY AIR OR POSITIVE PRESSURE DUCTWORK, SECTION TOWARDS/AWAY VIEWER | | | | SUPPLY AIR OR POSITIVE PRESSURE DUCTWORK, AIRFLOW AWAY FROM VIEWER | | | | RETURN AIR OR NEGATIVE PRESSURE DUCTWORK, AIRFLOW TOWARDS VIEWER | | | | RETURN AIR OR NEGATIVE PRESSURE DUCTWORK, AIRFLOW AWAY FROM VIEWER | | | | EXHAUST AIR DUCTWORK, AIRFLOW TOWARDS VIEWER | | | | EXHAUST AIR DUCTWORK, AIRFLOW AWAY FROM VIEWER | | | | RIGID ROUND DUCTWORK, AIRFLOW TOWARDS VIEWER | | | | RIGID ROUND DUCTWORK, AIRFLOW AWAY FROM VIEWER | | | | TRANSITION - ECCENTRIC REDUCER | | | | TRANSITION - CONCENTRIC REDUCER | | | | TRANSITION - SQUARE TO ROUND | | | | 90° ELBOW WITH TURNING VANES (REQUIRED ON SUPPLY DUCTWORK) | | | | 90° ELBOW WITHOUT TURNING VANES (RETURN OR EXHAUST DUCTWORK ONLY) | | | | 45° ELBOW WITH TURNING VANES (REQUIRED ON SUPPLY DUCTWORK) | | | | 45° ELBOW WITHOUT TURNING VANES (RETURN OR EXHAUST DUCTWORK ONLY) | | | | RADIUS 90° ELBOW (R = 1.5W) | | | | RADIUS 45° ELBOW (R = 1.5W) | | | | SPIN-IN FITTING WITH FLEXIBLE DUCTWORK, DIMENSIONS ARE IN INCHES, MIN. INSIDE CLEAR, A = DIAMETER | | | | BRANCH TAKE-OFF WITH MVD | | | | CONICAL TAKE-OFF WITH MVD | | | | MANUAL VOLUME DAMPER | | | | FIRE DAMPER | | | | FIRE/SMOKE DAMPER | | | | SMOKE DAMPER | | | | BACKDRAFT DAMPER | | | | MOTORIZED DAMPER | | | | BAROMETRIC DAMPER | | | | SMOKE DETECTOR | **AIR DISTRIBUTION** REFER TO SCHEDULE FOR ADDITIONAL INFORMATION - SUPPLY AIR DIFFUSER - RETURN AIR OR TRANSFER AIR GRILLE - EXHAUST AIR GRILLE - ROUND SUPPLY AIR DIFFUSER - LINEAR SLOT DIFFUSER - CEILING RADIATION DAMPER - SIDEWALL REGISTER - DUCT MOUNTED GRILLE - AIR DISTRIBUTION CALLOUT |

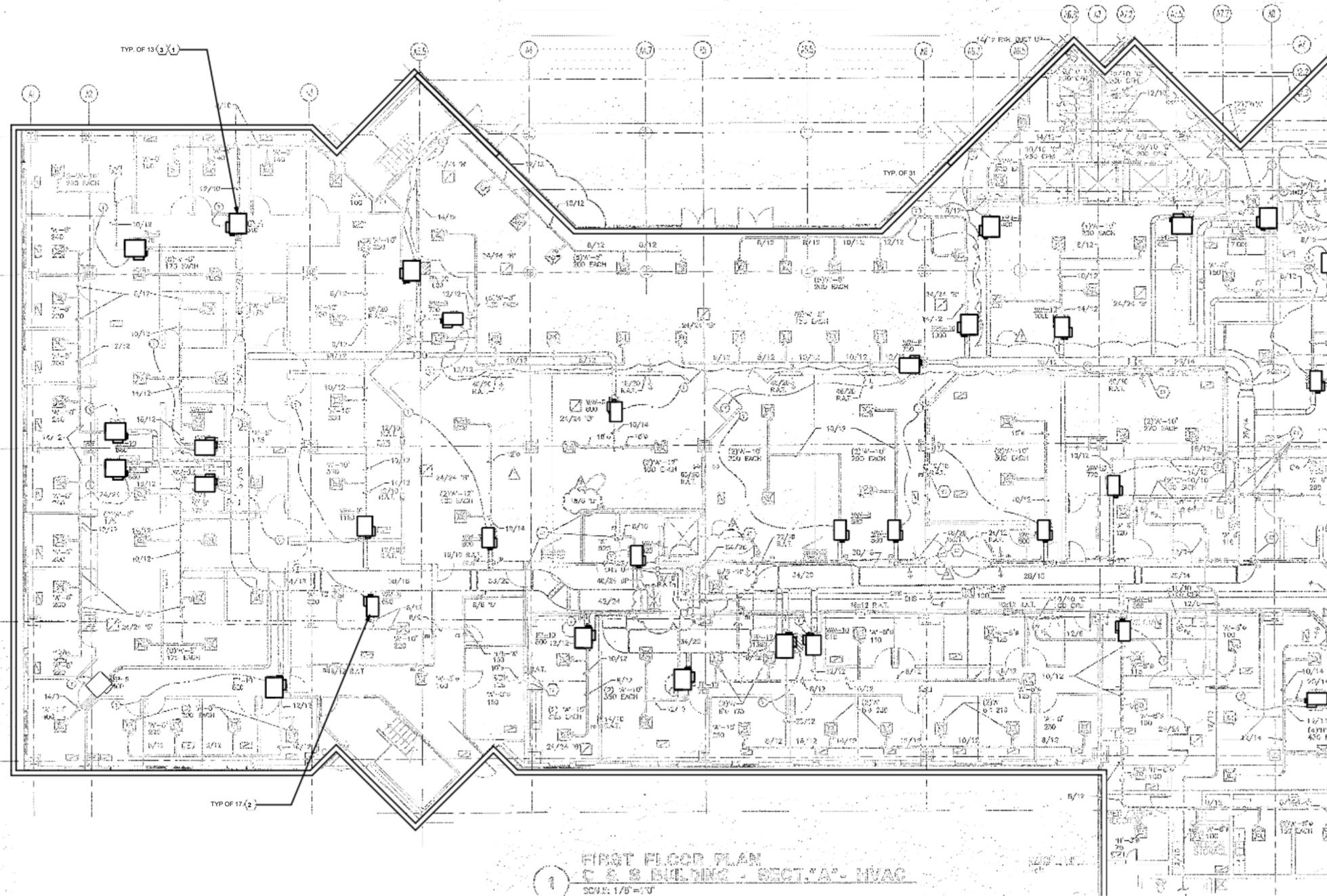
ABBREVIATIONS

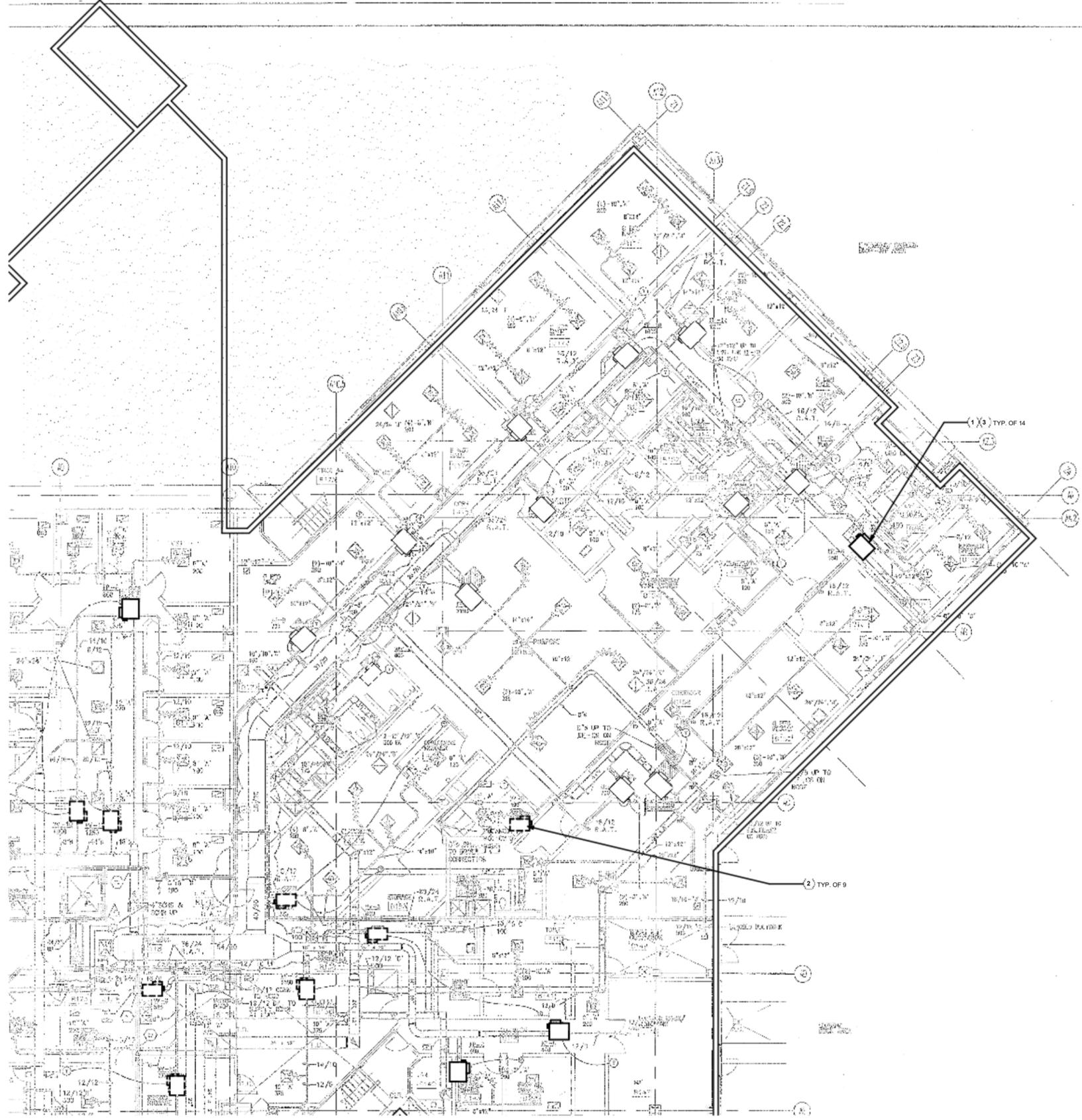
A (0.5)	COMPRESSED AIR (WORKING PRESS.)	FCU	FAN COIL UNIT	POS	POSITIVE
AVV	AUTOMATIC AIR VENT	FD	FLOOR DRAIN	PR	PUMPED RETURN
ABV	ABOVE	F	FAHRENHEIT (DEGREES)	PG	PRESSURE GAUGE
AC	ALTERNATING CURRENT	FLA	FULL LOAD AMPS	PH	PHASE
ACU	AIR CONDITIONING	FLG	FLANGE	PHC	PREHEAT COIL
AD	ACCESS DOOR, AREA DRAIN	FMS	FACILITY MANAGEMENT SYSTEM	PRV	PRESSURE REDUCING VALVE
AF	ABOVE FINISHED FLOOR	FOB	FLAT ON BOTTOM	PPM	PARTS PER MILLION
AHJ	AIR HANDLING UNIT	FOT	FLAT ON TOP	PLUMB	PLUMBING
AI	ANALOG INPUT	FPS	FAN POWERED BOX	PLMB	PRESSURE
ALT	ALTITUDE	FPI	FINS PER INCH	PS	PRESSURE SWITCH
AMB	AMBIENT	FFM	FEET PER MINUTE	PSF	POUNDS PER SQUARE FOOT
AMP	AMPERE	FFS	FEET PER SECOND	PSI	POUNDS PER SQUARE INCH
AO	ANALOG OUTPUT	FRP	FIBERGLASS REINFORCED PLASTIC	PSK	POUNDS PER SQUARE INCH GAUGE
AP	ACCESS PANEL	FT	FOOT, FEET	PTAC	PACKAGED TERMINAL AC
APD	AIR PRESSURE DROP	FT LB	FOOT-POUND	Q	TOTAL, TOTAL HEAT
APPROX	APPROXIMATE	GA	GAUGE, GAGE	QT	QUART
AS	AIR SEPARATOR	GAL	GALLON	QTY	QUANTITY
ASD	ABOVE SUSPENDED CEILING	GALV	GALVANIZED	R	RELIEF, THERMAL RESISTANCE
AHJ	AUTHORITY HAVING JURISDICTION	GEN	GENERATOR	RA	RETURN AIR
AVG	AVERAGE	GPD	GALLONS PER DAY	RAU	ROOM AIR CONDITIONER
AWG	AMERICAN WIRE GAUGE	GPH	GALLONS PER HOUR	REC	RECTANGULAR
		GPM	GALLONS PER MINUTE	REC-I	REFRIGERATION
B&S	BELL & SPIGOT	GSW	GROUND SOURCE WATER (GEOTHERMAL)	REFR	REFRIGERANT
BB	BACK TO BACK	GTV	GATE VALVE	RET	RETURN
BAL	BALANCE			RED	REDUCER
BBR	BASE BOARD RADIATOR	HC	HEATING COIL	REV	REVOLUTIONS
BFC	BELOW FINISHED CEILING	HD	HEAD	REF	REFERENCE
BFG	BELOW FINISHED GRADE	HS	HEAT GAIN	RH	RELATIVE HUMIDITY
BFV	BUTTERFLY VALVE	HGT	HEIGHT	RH-C	REHEAT COIL
BFBP	BOILER FEED BOOSTER PUMP	HP	HEAT PUMP, HORSEPOWER	RH-K	REFRIGERANT HOT GAS
BFW	BOILER FEED WATER	HPC	HIGH PRESSURE CONDENSATE	RHV	REHEAT VALVE
BLDG	BUILDING	HPS	HIGH PRESSURE STEAM (>100 PSI)	HL	REFRIGERANT LIQUID
BHP	BRAKE HORSEPOWER	HR	HOUR	HR-M	REVOLUTIONS PER MINUTE
BLR	BOILER	HS	HUMIDITY SENSOR	RPS	REVOLUTIONS PER SECOND
BLW	BELOW	HSTAT	HUMIDISTAT	RSU	REFRIGERANT SUCTION
BO	BLOWOFF	HVAC	HEATING, VENTILATION AND AC	RTU	ROOF TOP UNIT
BOD	BOTTOM OF DUCT	HW	HEATING WATER	RV	RELIEF VALVE
BOP	BOTTOM OF PIPE	HWB	HEATING WATER BOILER	S	SECOND
BOS	BOTTOM OF STEEL	HWC	HEATING WATER COIL	SA	SUPPLY AIR
BTU	BRITISH THERMAL UNIT	HWCP	HEATING WATER CIRCULATING PUMP	SAT	SATURATION
BTUH	BRITISH THERMAL UNIT PER HOUR	HWP	HEATING WATER PUMP	SC	SHADING COEFFICIENT
BY	BALL VALVE	HWR	HEATING WATER RETURN	SE	SEASONAL EER
BYB	BYPASS	HWS	HEATING WATER SUPPLY	SE-M	SQUARE FEET
		HWT	HEATING WATER TANK	SF	SPECIFIC GRAVITY, STEAM GAUGE
°C	CELSIUS (DEGREES)	HZ	HERTZ (FREQUENCY)	SH	SENSIBLE HEAT
°C	COOLING COIL	IO	INPUT/OUTPUT	SHG	SENSIBLE HEAT GAIN
CAP	CAPACITY	ID	INSIDE DIAMETER	SHGC	SOLAR HEAT GAIN COEFFICIENT
CD	CONDENSATE DRAIN	IE	INVERT ELEVATION	SHK	SENSIBLE HEAT RATIO
CF	CHEMICAL FEED	IN WC	INCHES WATER COLUMN	SJLV	SOLENOID VALVE
CFM	CUBIC FEET PER MINUTE	INV	INVERT	SOV	SHUT OFF VALVE
CFM	CUBIC FEET PER SECOND	IOM	INSTALLATION, OPERATION, AND MAINTENANCE	SP	STATIC PRESSURE, SUMP PUMP SPECIFICATION
CH	CHILLED WATER	IP	IRON PIPE	SPLY	SUPPLY
CHWP	CHILLED WATER PUMP	IPS	IRON PIPE SIZE, INCHES PER SECOND	SPS	STATIC PRESSURE SENSOR
CHWPP	CHILLED WATER PRIMARY PUMP	IFT	IRON PIPE THREADED	SQ	SQUARE
CHWR	CHILLED WATER RETURN	IR	INFRARED	SSP	STAINLESS STEEL PIPE
CHWS	CHILLED WATER SUPPLY	IW	INDIRECT WASTE	SST	STAINLESS STEEL
CHWSP	CHILLED WATER SECONDARY PUMP	IRW	INDIRECT WASTE	STD	STANDARD
CI	CAST IRON	K	KELVIN, THERMAL CONDUCTIVITY	STM	STEAM
CP	CAST IRON PIPE	KIP	THOUSAND POUNDS	STR	STRAINER
CKT	CIRCUIT	KIP FT	THOUSAND FOOT-POUNDS	STWP	STEAM WORKING PRESSURE
CKV	CHECK VALVE	KW	KILOWATT	SUCT	SUCTION
CL	CENTER LINE (L)	KWh	KILOWATT HOUR	SUP	SUPPLY
CONN	CONNECTION	LAT	LEAVING AIR TEMPERATURE	SV	SAFETY VALVE
CPD	CONDENSATE PUMP DISCHARGE	LB	POUNDS	T	TEMPERATURE SENSOR
CRAC	COMPUTER ROOM A/C UNIT	LB-T	LEAVING DRY BULB TEMPERATURE	T&P	TEMPERATURE AND PRESSURE
CRP	CONDENSATE RETURN PUMP	LF	LINEAR FEET	TCV	TEMPERATURE CONTROL VALVE
CT	COOLING TOWER	LG	LENGTH	TD	TEMPERATURE DIFFERENCE
CJ	CONDENSING UNIT	LH	LATENT HEAT	TEMP	TEMPERATURE
CJ FT	CUBIC FEET	LI	LATENT HEAT GAIN	TOP	TOP OF PIPE
CJ IN	CUBIC INCH	LP	LOW PRESSURE	TRANS	TRANSFER
CLH	CABINET UNIT HEATER	LPC	LOW PRESSURE CONDENSATE	TSTAT	THERMOSTAT
Cv	COEFFICIENT - VALVE FLOW	LPS	LOW PRESSURE STEAM (<15 PSI)	U	HEAT TRANSFER COEFFICIENT
CW	COLD WATER (POTABLE)	LRA	LOCKED ROTOR AMPS	UG	UNDERGROUND
CWP	CONDENSER WATER PUMP	LT	LEAVING TEMPERATURE	UH	UNIT HEATER
CWR	CONDENSER WATER RETURN	LTHW	LOW TEMPERATURE HOT WATER	UJON	UNLESS OTHERWISE NOTED
CWS	CONDENSER WATER SUPPLY	LWT	LEAVING WET BULB TEMPERATURE	V	VOLTS
D	DRAIN	LWT	LEAVING WATER TEMPERATURE	VAC	VOLTS ALTERNATING CURRENT
DB	DRY BULB	MA	MILLIAMPERES	VAR	VARIABLE
DBT	DRY BULB TEMPERATURE	MAX	MAXIMUM	VAV	VARIABLE AIR VOLUME
dB	DECIBEL	MCA	MINIMUM CIRCUIT AMPACITY	VDC	VOLTS DIRECT CURRENT
DC	DIRECT CURRENT	MCC	MOTOR CONTROL CENTER	VEL	VELOCITY
DDC	DIRECT DIGITAL CONTROL	MN	MINIMUM	VENT	VENT, VENTILATION
DEG	DEGREES (CELSIUS OR FAHRENHEIT)	MOCP	MAXIMUM OVERCURRENT PROTECTION	VERT	VERTICAL
DENS	DENSITY	MOV	MOTOR OPERATED VALVE	VFD	VARIABLE FREQUENCY DRIVE
DEWPT	DEW POINT TEMPERATURE	MP	MEDIUM PRESSURE	VP	VELOCITY PRESSURE
DIA	DIAMETER	MPC	MEDIUM PRESSURE CONDENSATE	VRF	VARIABLE REFRIGERANT FLOW
DI	DUCTILE IRON PIPE	MPS	MEDIUM PRESSURE STEAM (16-99 PSI)	VSD	VARIABLE SPEED DRIVE
DP	DUCTILE IRON PIPE	MPT	MALE PIPE THREAD	W	WATT
DOV	DRAIN OFF VALVE	MU	MAKE-UP WATER	WB	WET BULB
DPS	DIFFERENTIAL PRESSURE SENSOR	MVD	MANUAL VOLUME DAMPER	WBT	WET BULB TEMPERATURE
DPT	DIFFERENTIAL PRESSURE TRANSMITTER	NA	NOT APPLICABLE	WC	WATER COLUMN
DS	DISCONNECT SWITCH	NC	NOISE CRITERIA, NORMALLY CLOSED	WG	WATER GAGE
DW	DRAIN, WASTE & VENT	NO	NORMALLY OPEN, NUMBER	WH	WATER HEATER
EA	EXHAUST AIR	NPS	NOMINAL PIPE SIZE	WL	WATER LINE
EP	ELECTRIC PNEUMATIC	NR	NOISE REDUCTION	WLD	WELDED
EAT	ENTERING AIR TEMPERATURE	NRC	NOISE REDUCTION COEFFICIENT	WM	WATER METER
ECON	ECONOMIZER	NTS	NOT TO SCALE	WNF	WELD NECK FLANGE
ECU	EVAPORATIVE COOLING UNIT	OA	OUTSIDE AIR	WP	WATER PUMP
EDBT	ENTERING DRY BULB TEMPERATURE	OAF	OUTSIDE AIR FAN	WPD	WATER PRESSURE DROP
EDH	ELECTRIC DUCT HEATER	OAI	OUTSIDE AIR INTAKE	WPS	WORKING PRESSURE DROP
ER	ENERGY EFFICIENCY RATIO	OBD	OPPOSED BLADE DAMPER	WSP	WORKING STEAM PRESSURE
EF	EXHAUST FAN	OD	OUTSIDE DIAMETER	WT	WEIGHT
EFF	EFFICIENCY	OZ	OUNCE	YD	YARD, YARD DRAIN
EL	ELEVATION	P	PUMP	YR	YEAR
ENT	ENTERING	PE	PNEUMATIC ELECTRIC	Z	ZONE
EOV	ELECTRONICALLY OPERATED VALVE	%	PERCENT		
ESP	EXTERNAL STATIC PRESSURE	PC	PUMPED CONDENSATE		
ET	EXPANSION TANK	PCC	PRE-COOL COIL		
EUH	ELECTRIC UNIT HEATER	PD	PRESSURE DROP		
EVA	EVAPORATOR				
EWB	ENTERING WET BULB TEMPERATURE				
EWT	ENTERING WATER TEMPERATURE				
EXCH	EXCHANGER				
EXH	EXHAUST				
EXP	EXPANSION				

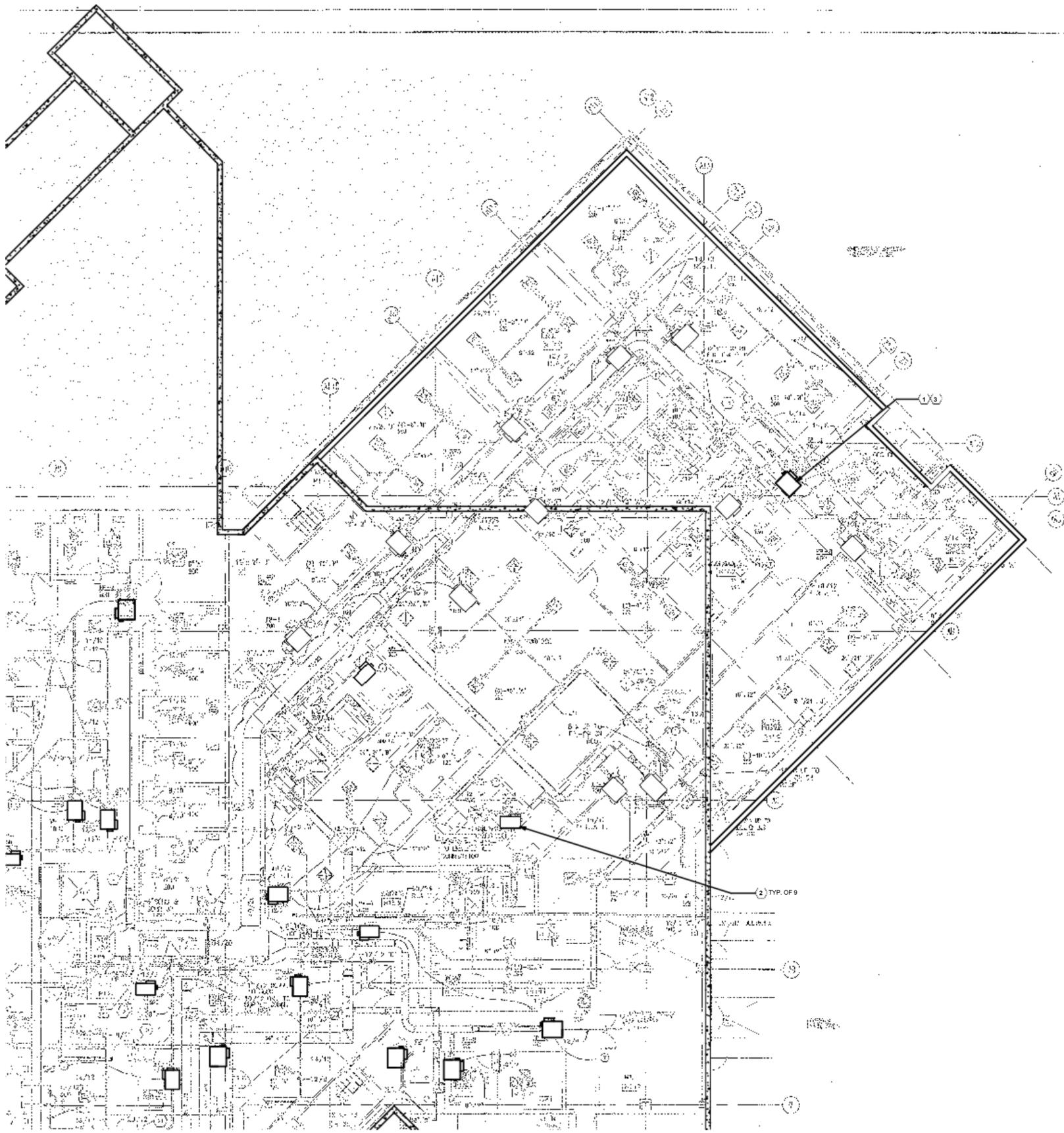
MECHANICAL GENERAL NOTES

- ISOLATION VALVES SHALL BE PROVIDED IN ALL BRANCH PIPING AND AT EQUIPMENT CONNECTIONS.
- PIPING CONNECTIONS TO ALL EQUIPMENT SHALL BE FABRICATED WITH THE ISOLATION VALVES, FLANGES AND/OR UNIONS POSITIONED TO ALLOW REMOVAL AND SERVICE OF THE COMPONENT PARTS.
- INSTALL MANUAL AIR VENTS AT THE HIGH POINTS OF THE PIPING SYSTEMS.
- ROUTE PIPING IN AN ORDERLY MANNER AND MAINTAIN PROPER GRADES. INSTALL TO CONSERVE HEADROOM AND TO CREATE MINIMUM INTERFERENCE WITH USE OF SPACE. ROUTE ALL PIPING PARALLEL TO BUILDING LINES UNLESS GROUP PIPING AT COMMON BOP ELEVATIONS WHENEVER PRACTICAL. PIPES LOCATED IN CONCEALED SPACES SHALL BE ROUTED CLOSE TO BUILDING STRUCTURE UNLESS OTHERWISE NOTED.
- INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE OR EQUIPMENT CONNECTED.
- INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.
- INSTALL VALVES AND EQUIPMENT IN ACCESSIBLE LOCATIONS. INSTALL ACCESS DOORS IN PARTITIONS OR CEILINGS WHERE VALVES AND EQUIPMENT WOULD OTHERWISE BE INACCESSIBLE.
- WHEN SOCKET WELD OR SOLDER END VALVES ARE INSTALLED, SPECIAL CARE SHALL BE TAKEN TO AVOID OVERHEATING AND DAMAGING THE VALVE BODY, TRIM OR PACKING. DAMAGED VALVES SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.
- IDENTIFY EACH PIPE WITH LABELING AS REQUIRED BY SPECIFICATIONS.
- SLEEVE ALL PIPING THAT PENETRATES FIRE RATED WALLS, FLOORS AND PARTITIONS. PENETRATIONS SHALL BE SEALED WITH A U.L. LISTED ASSEMBLY TO PROVIDE A RATING EQUAL TO OR GREATER THAN THAT OF THE PENETRATED WALL, FLOOR OR PARTITION.
- SLEEVE ALL PIPING THAT PENETRATES EXTERIOR BUILDING WALLS AND GRADE BEAMS. SEAL PENETRATIONS WATER TIGHT.
- COORDINATE WITH OTHER TRADES BEFORE FABRICATION OR INSTALLATION OF ANY SYSTEMS.
- EXISTING DUCTWORK, PIPING AND EQUIPMENT SHOWN ON THESE DRAWINGS INDICATES THE GENERAL LOCATION AND ROUTING. THE ACTUAL LOCATION SHALL BE DETERMINED BY THE CONTRACTOR WHO SHALL COORDINATE ALL WORK WITH ALL TRADES NECESSARY TO INSTALL NEW DUCTWORK, PIPING OR EQUIPMENT AS SHOWN ON THE DRAWING.
- THESE DRAWINGS DO NOT NECESSARILY SHOW ALL OFFSETS OR ELEVATION DIFFERENCES WHICH MAY BE NECESSARY FOR THE COMPLETE INSTALLATION. THESE SHALL BE PROVIDED AS REQUIRED TO PROVIDE A COMPLETE AND FUNCTIONAL SYSTEM AT NO ADDITIONAL COST TO THE CONTRACTOR.
- ALL NEW DUCTWORK SHALL BE EXTERNALLY INSULATED AS SPECIFIED.
- WHERE REMOVAL OF EXISTING DUCTWORK OR PORTIONS OF ANY AIR SYSTEM IS NECESSARY, THE DUCT SHALL BE PATCHED AND SEALED AIR TIGHT USING PATCH OF SAME MATERIAL AND EQUAL OR GREATER THICKNESS AS EXISTING. PATCHES SHALL BE ATTACHED WITH SHEET METAL SCREWS OR OTHER MEANS OF POSITIVE ATTACHMENT (WELDING, BONDING, ETC.) AS SPECIFIED FOR THE PARTICULAR DUCT SYSTEM. NEW INSULATION SHALL BE EQUAL TO OR BETTER THAN EXISTING AND SHALL BE PATCHED AND SEALED TO MATCH EXISTING INSULATION AND MAINTAIN VAPOR BARRIER.
- COORDINATE ALL REMODEL WORK WITH NEW CONSTRUCTION AND OTHER TRADES.
- THE CONTRACTOR SHALL ADJUST AND BALANCE ALL MECHANICAL SYSTEMS TO DESIGN SETTINGS AS SHOWN AND SHALL REBALANCE TO RESTORE SETTINGS OF SYSTEMS TEMPORARILY ALTERED FOR THE PURPOSES OF COMPLETING THE WORK OF THIS PROJECT.
- NOTIFY AND COORDINATE WITH THE OWNER AT LEAST SEVEN DAYS PRIOR TO SHUTDOWN OF ANY BUILDING SERVICES OR EQUIPMENT. SHUTDOWN TIME SHALL BE KEPT TO A MINIMUM.
- ANY ITEMS DAMAGED DURING DEMOLITION SHALL BE REPLACED WITH NEW MATERIALS TO MATCH EXISTING.
- CONTRACTOR SHALL PROVIDE TEMPORARY DUCTWORK, ELECTRICAL SERVICE, PIPING OR OTHER BUILDING SERVICES AS REQUIRED TO KEEP OTHER AREAS IN OPERATION DURING REMODELING. NOTIFY OWNER PRIOR TO SHUT-DOWN FOR ANY TEMPORARY SERVICE REQUIREMENTS. ALL TEMPORARY WORK SHALL BE COMPLETELY REMOVED ONLY AFTER NEW SERVICES ARE COMPLETELY INSTALLED AND FUNCTIONAL.
- REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR LOCATIONS OF CEILING-MOUNTED HVAC DEVICES AND EQUIPMENT.
- DUCT ROUTING CHANGES MADE BY THE CONTRACTOR FOR THE PURPOSE OF ACCOMMODATING FIELD CONDITIONS SHALL INCLUDE FIRE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS IN RATED PARTITIONS AS SHOWN IN ORIGINAL ROUTING ARRANGEMENTS.
- FURNISH AND INSTALL ACCESS DOORS (AD) IN THE DUCTWORK IMMEDIATELY ADJACENT TO EACH FIRE DAMPER AND EACH FIRE/SMOKE DAMPER. PARTITIONS SHALL BE PROVIDED WITH ACCESS DOORS TO PROVIDE SERVICE AND ACCESS TO DAMPER ACCESS DOORS.
- PROVIDE FIRE AND COMBINATION FIRE/SMOKE DAMPERS WHERE REQUIRED BY CODE. FIRE, SMOKE, AND COMBINATION FIRE/SMOKE DAMPERS SHALL BE U.L. LISTED, SHALL BEAR THE U.L. LABEL AND SHALL COMPLY WITH NFPA BULLETIN NO. 90A. FULLY-OPEN DAMPERS SHALL NOT HAVE ANY PROJECTIONS INTO THE AIRSTREAM.
- ABANDONED DUCT SHALL BE REMOVED WHERE INDICATED ON THE DRAWINGS. DUCT REMAINING IN PLACE SHALL BE CAPPED, SEALED AIR TIGHT AT POINT(S) OF DEMOLITION, AND INSULATED TO MATCH EXISTING.
- NEW HOLES THROUGH EXISTING FLOORS SHALL BE CORE DRILLED. ALL CORES SHALL BE X-RAYED PRIOR TO CORING.
- ALL DUCT SIZES SHOWN HEREIN REPRESENT INSIDE CLEAR DIMENSIONS. EXTERNAL SHEET METAL DIMENSIONS OF DUCTWORK THAT IS SPECIFIED TO BE INTERNALLY LINED SHALL BE ADJUSTED BY THE CONTRACTOR TO ALLOW FOR THICKNESS OF LINING.
- THE OWNER SHALL HAVE THE OPTION TO DESIGNATE ANY MATERIALS REMOVED OR DEMOLISHED DURING THIS WORK AS "RECYCLABLE" AND SHALL HAVE FINAL DISPOSITION OVER THE DISPOSAL OF THESE MATERIALS. ALL MATERIALS REMOVED/DEMOLISHED BY THE CONTRACTOR FOR THIS JOB AND NOT RETAINED BY THE OWNER FOR RECYCLING OR OTHER PURPOSES SHALL BE DISPOSED OFF-SITE BY THE CONTRACTOR.
- THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL OF ANY EQUIPMENT DESIGNATED FOR REMOVAL. THE OWNER SHALL PROVIDE A LIST OF ITEMS THEY REQUIRE TO BE SALVAGED PRIOR TO THE START OF DEMOLITION. THE CONTRACTOR SHALL REMOVE THESE ITEMS USING REASONABLE CARE TO MINIMIZE DAMAGE.
- ANY AND ALL WATER CONNECTIONS MADE FOR THE PURPOSE OF CLEANING TOOLS OR THE WORK AREA OR FOR ANY OTHER CONSTRUCTION-RELATED PURPOSES SHALL BE MADE ONLY TO DOMESTIC WATER HOSE BIBBS OR TO CONTRACTOR-SUPPLIED WATER SOURCES. APPROVED BACKFLOW PREVENTION DEVICES SHALL BE USED AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION. CONNECTIONS SHALL NOT BE MADE TO FIRE WATER, CHILLED WATER, CONDENSER WATER, HEATING HOT WATER, DOMESTIC HOT WATER OR ANY OTHER TREATED WATER SOURCE UNLESS REQUIRED AS PART OF WORK ON THESE SYSTEMS.
- EXCEPT WHERE REQUIRED AT EQUIPMENT NOZZLES, FLANGES SHALL BE RAISED FACE WELD-NECK.
- INSTALL DIELECTRIC FITTINGS AT ALL FERROUS PIPE CONNECTIONS TO NON-FERROUS METALLIC PIPE OR EQUIPMENT.
- BULLHEAD TEES SHALL NOT BE USED TO JOIN CONVERGING (RETURN) FLOWS, REGARDLESS OF ARRANGEMENT SHOWN ON PLANS.
- PROVIDE ESCUTCHEON PLATES WHERE PIPES EXPOSED TO VIEW PENETRATE FINISHED WALLS, FLOORS AND CEILINGS. SPLIT-RING ESCUTCHEON PLATES SHALL NOT BE USED UNLESS OTHERWISE NOTED.
- PROVIDE CAPPED DRAIN VALVES AT LOW POINTS OF PIPING SYSTEMS AND AT EQUIPMENT CONNECTIONS. PROVIDE HOSE BIBB CONNECTIONS WITH CAPS AT DRAIN VALVES WHICH DO NOT DISCHARGE DIRECTLY OVER OR ARE NOT PIPED DIRECTLY TO AN APPROPRIATE DRAIN.
- PIPING, DUCTWORK OR EQUIPMENT CONNECTIONS OPENED BY DEMOLITION OR RENOVATION SHALL BE TEMPORARILY SEALED TO KEEP OUT FOREIGN MATTER UNTIL SUCH TIME AS RECONNECTIONS ARE MADE.



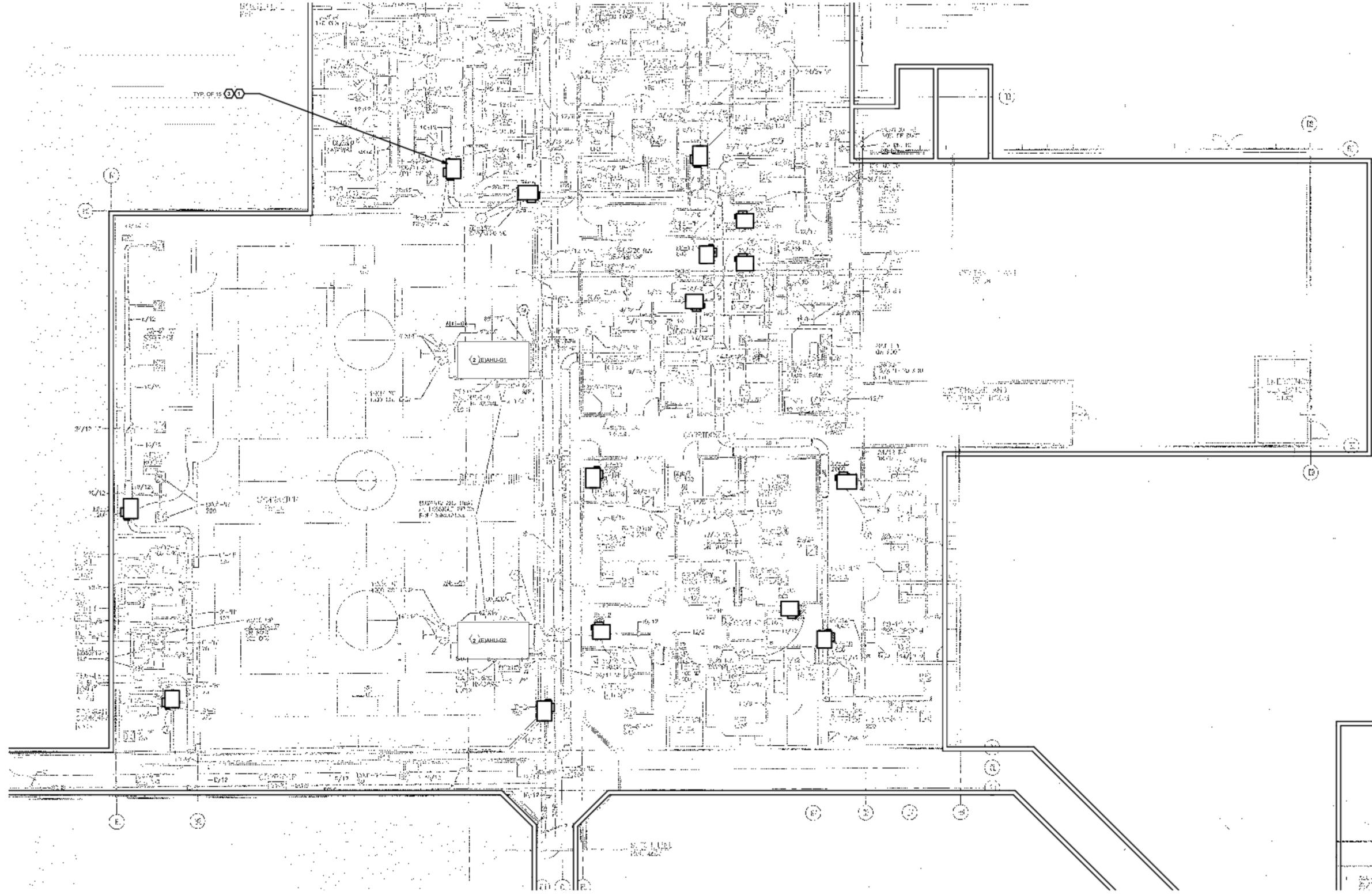






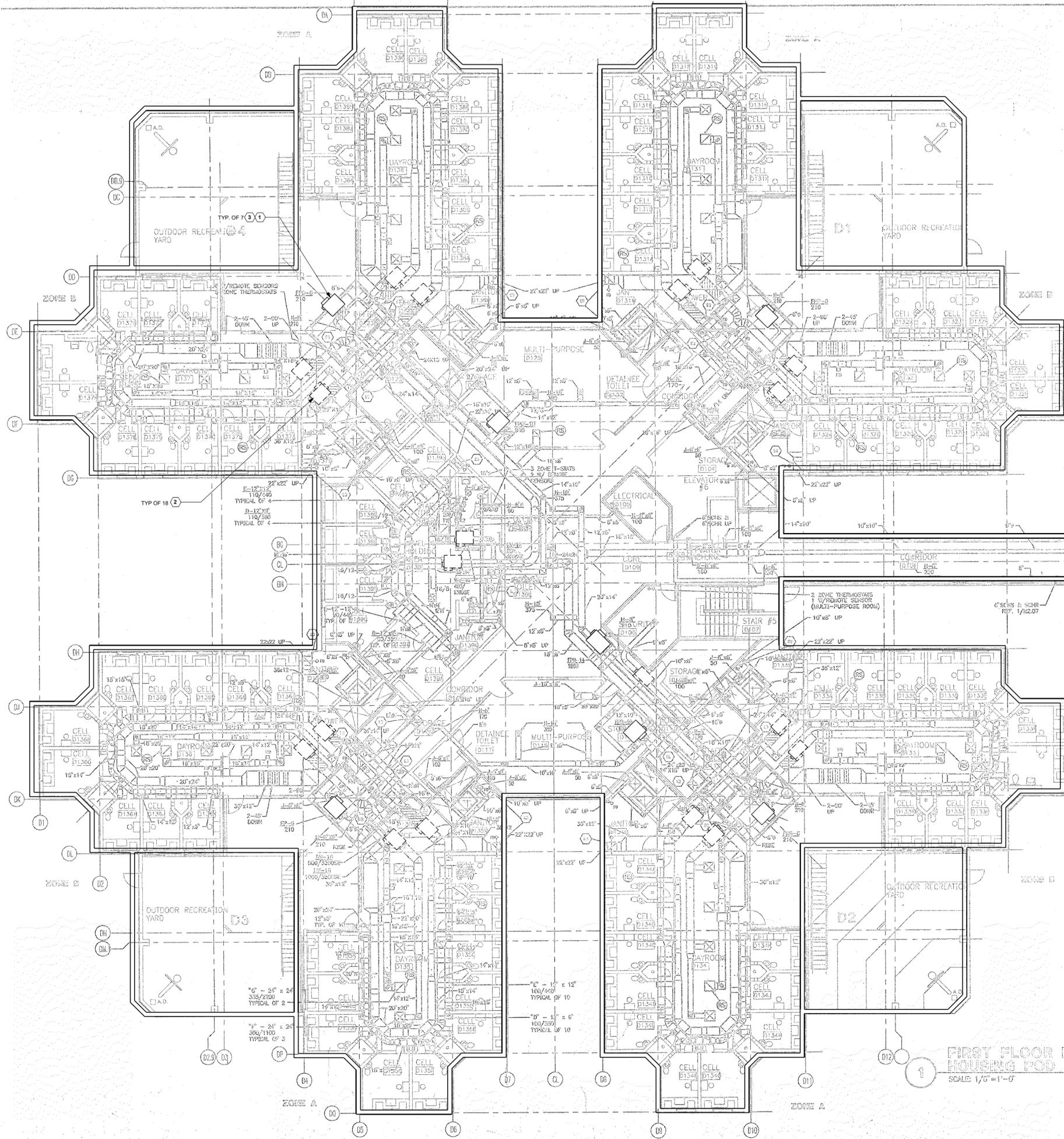
2 TYP. OF 9

ALPH. 1



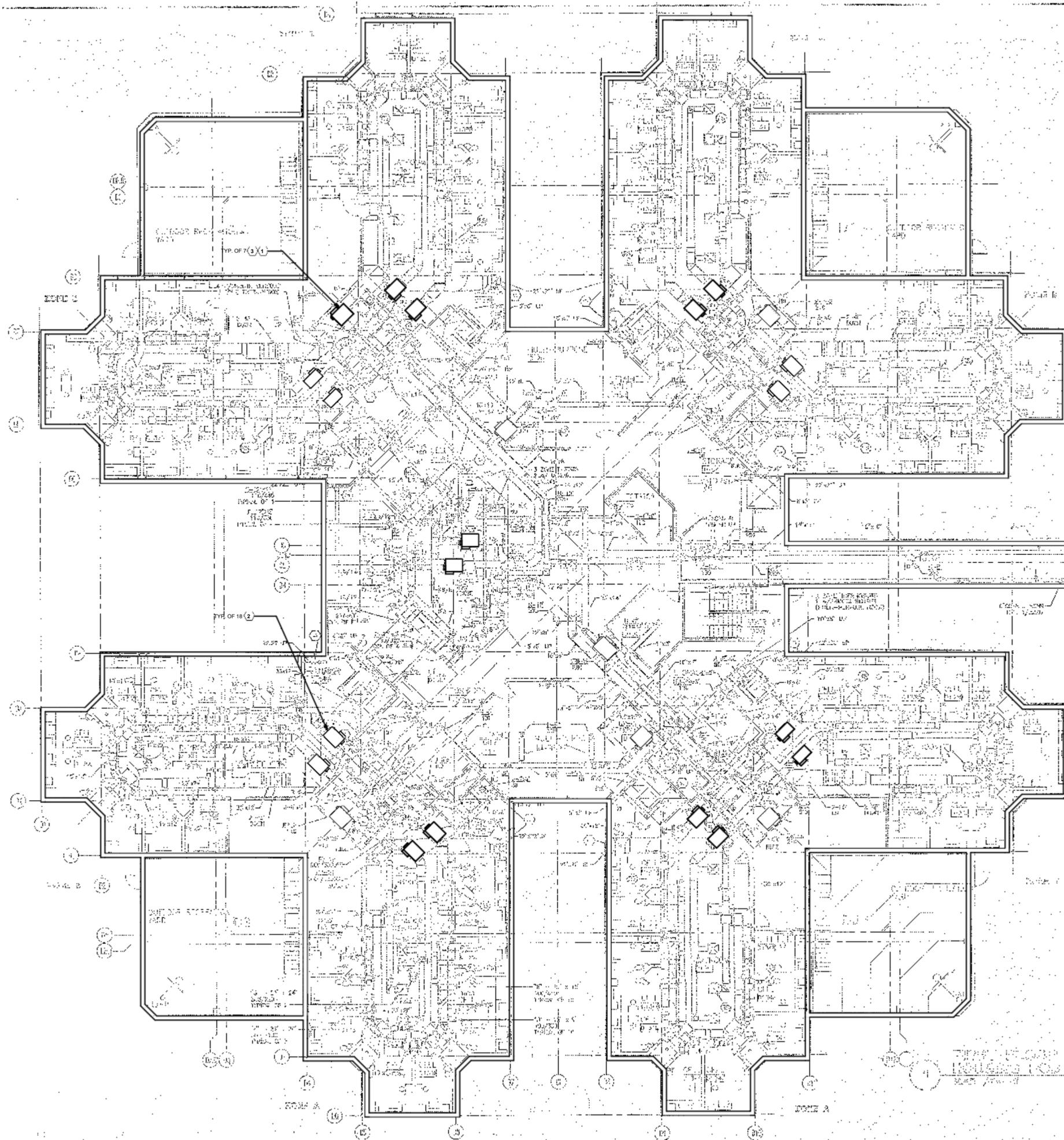
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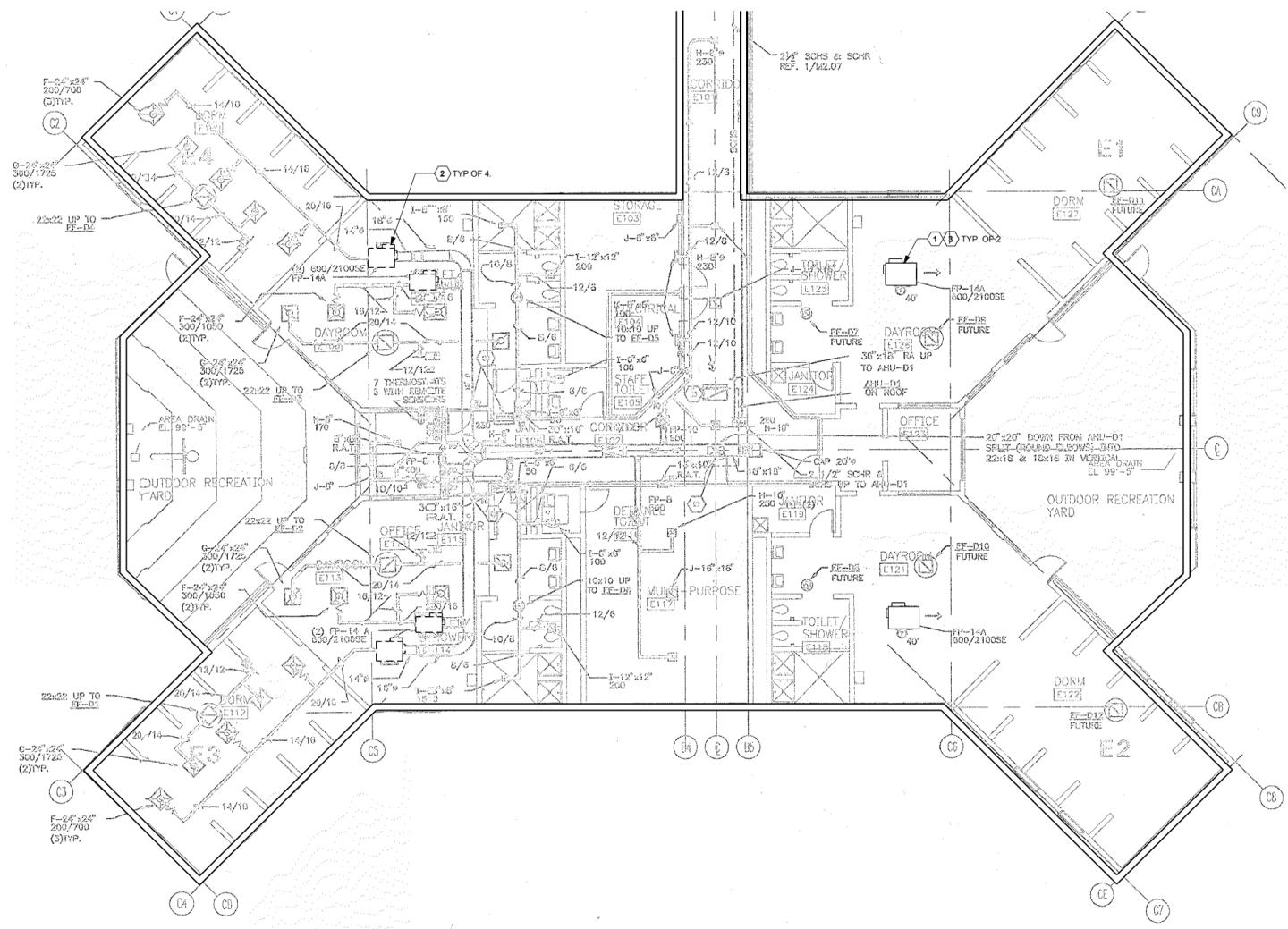


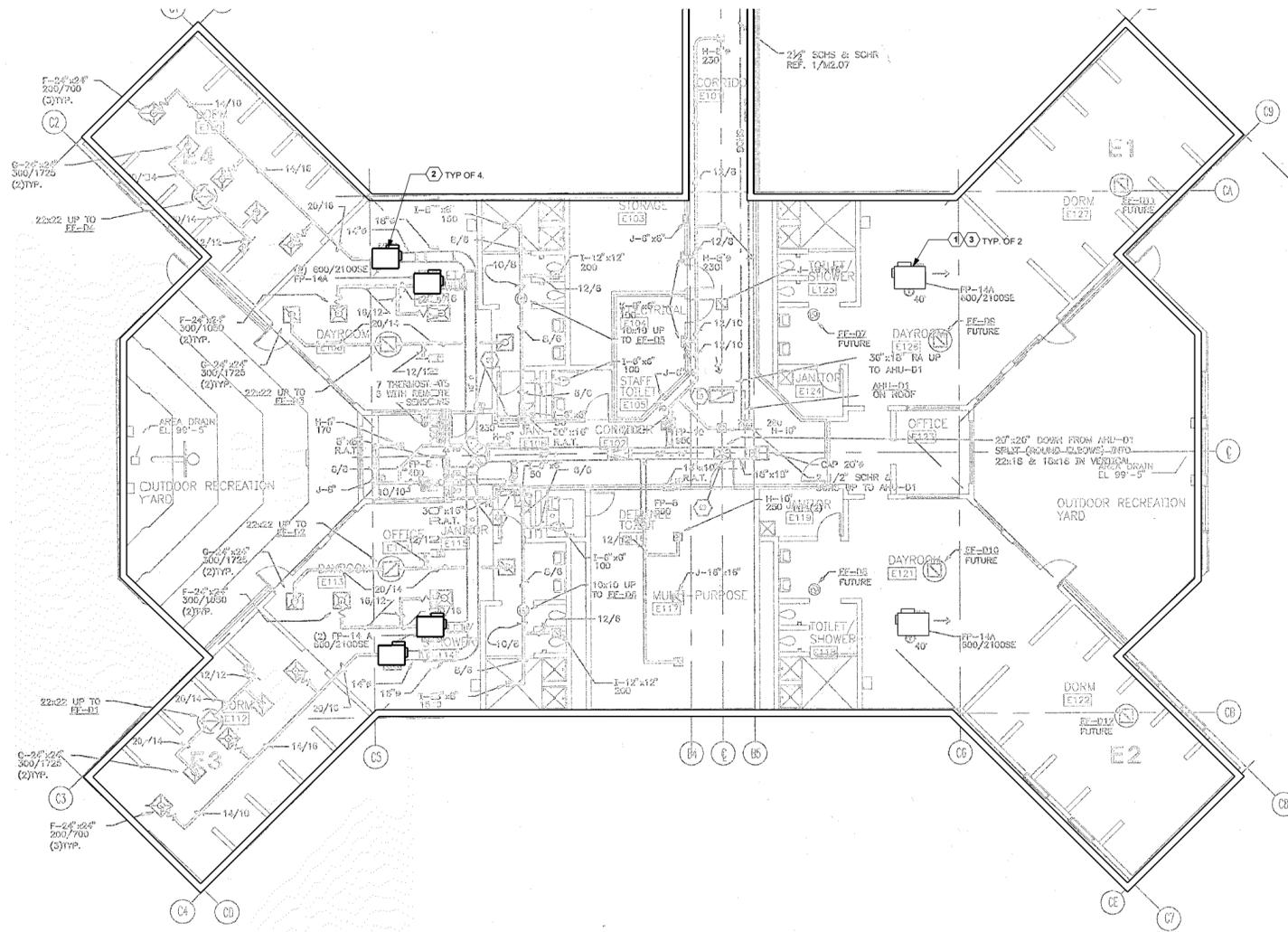


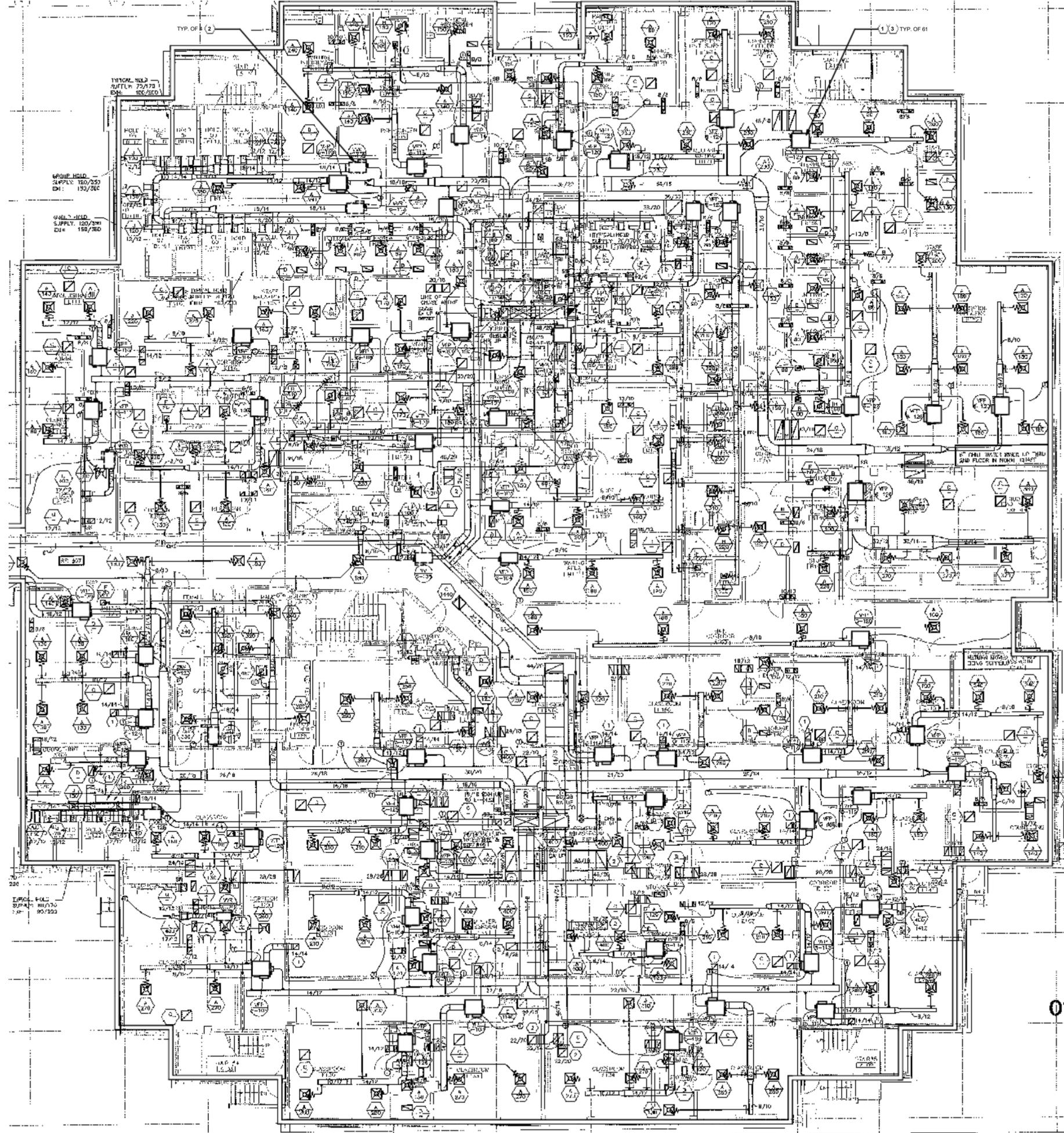
FIRST FLOOR OF HOUSING POD
SCALE 1/8"=1'-0"











TYP. OF 2

TYP. OF 61

TYPICAL HEAD
SUPPLY: 75/173
DN: 100/360

GROUP HEAD
SUPPLY: 100/250
DN: 150/360

GROUP HEAD
SUPPLY: 100/300
DN: 150/360

8" CHASE W/STAIR DOWN TO
2ND FLOOR IN ROOM 1214C

RETURN DUCT
GROUP OVER
STAIRS

TYPICAL HEAD
SUPPLY: 100/300
DN: 150/360

HEAD 44
12.3A1

CLASSROOM
12.3A1

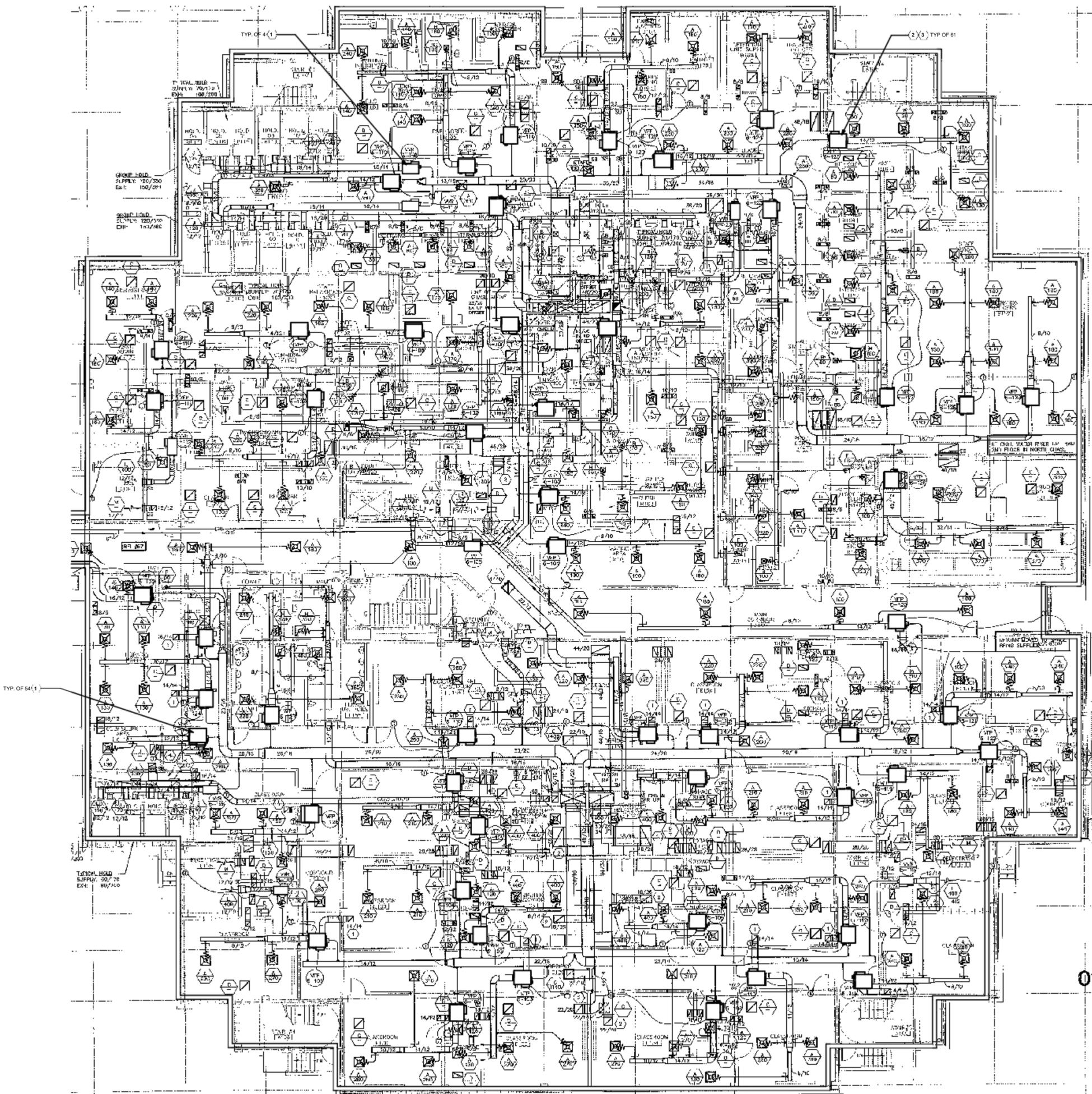
CLASSROOM
12.3A1

CLASSROOM
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CLASSROOM
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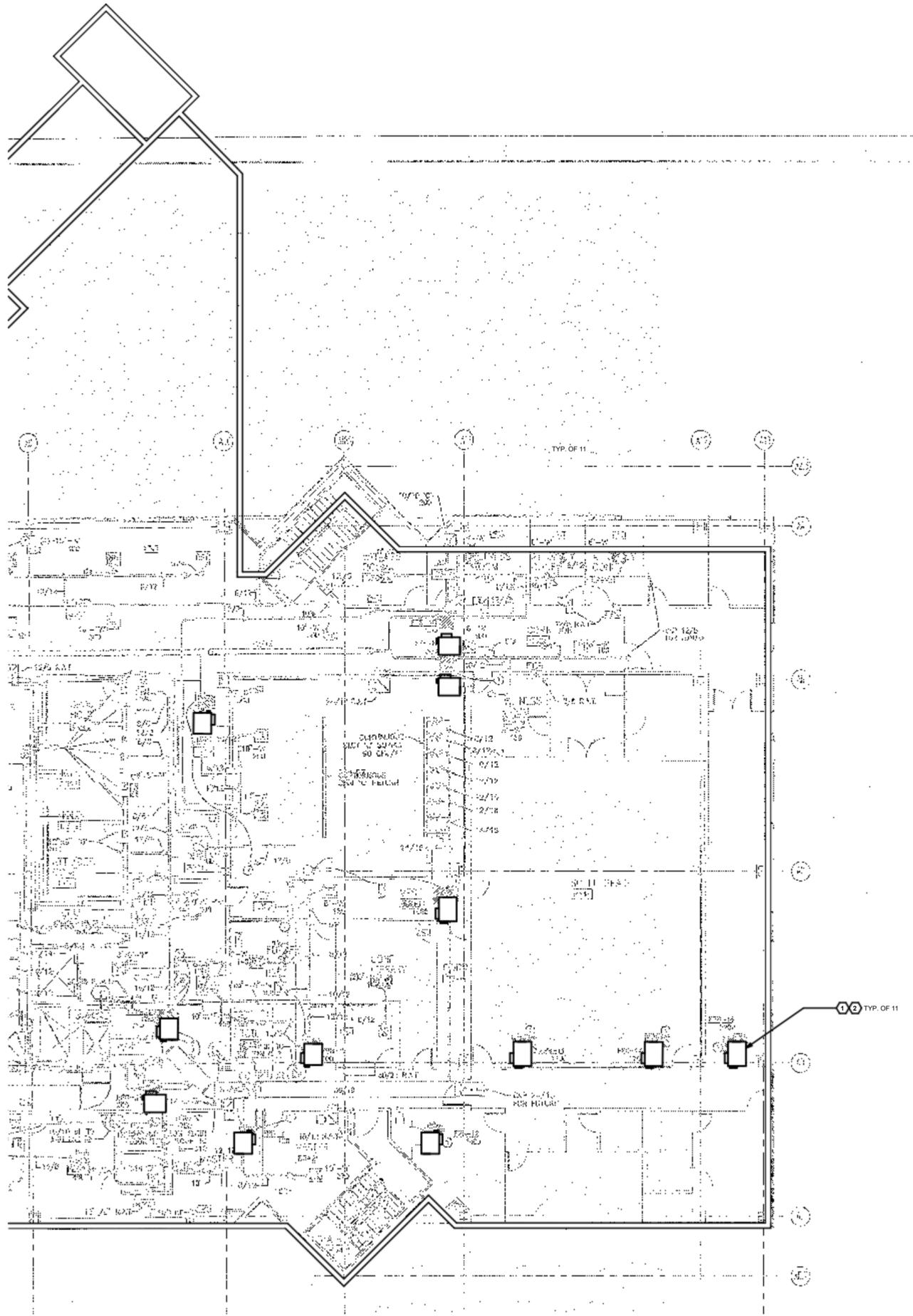
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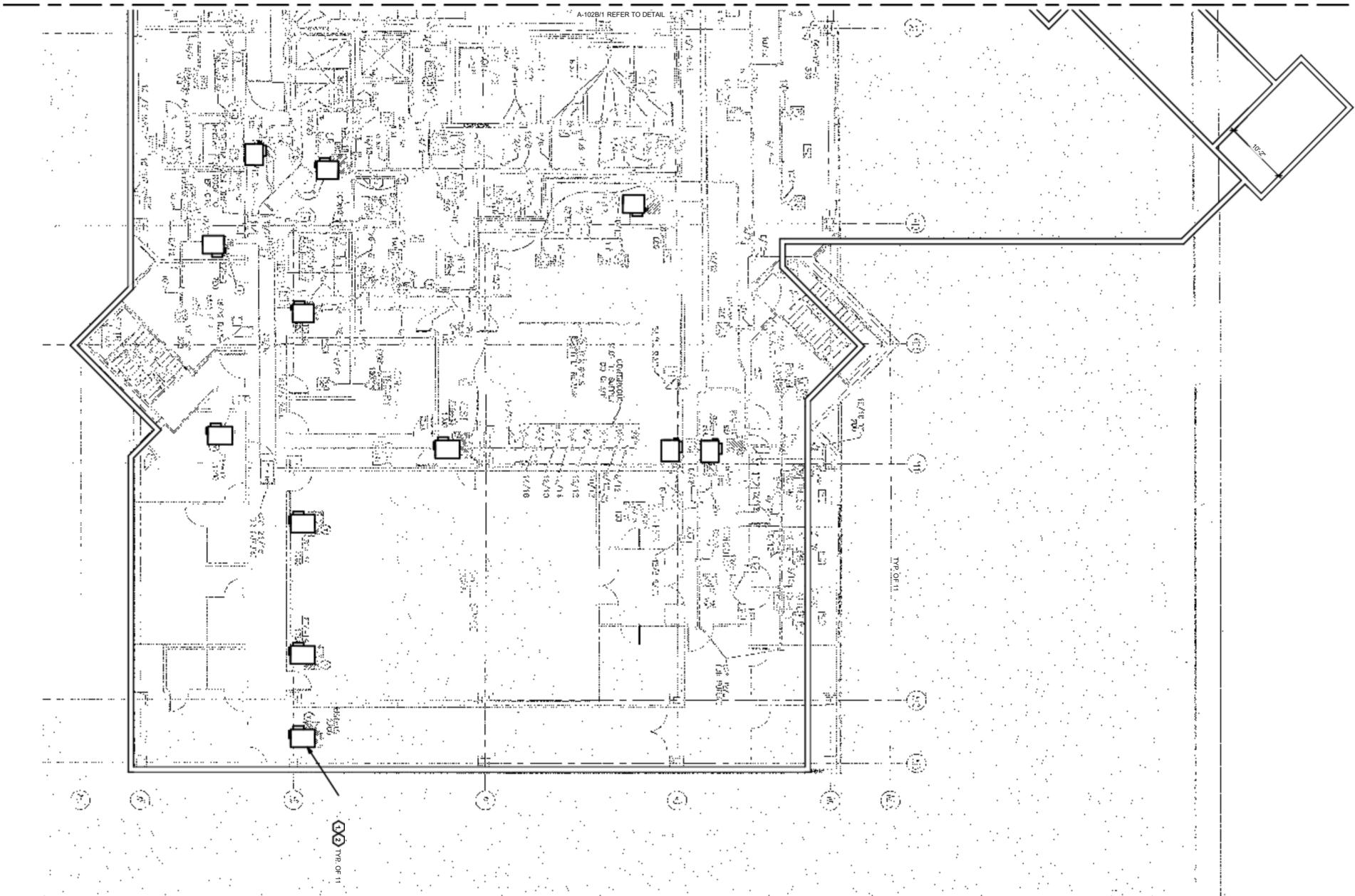
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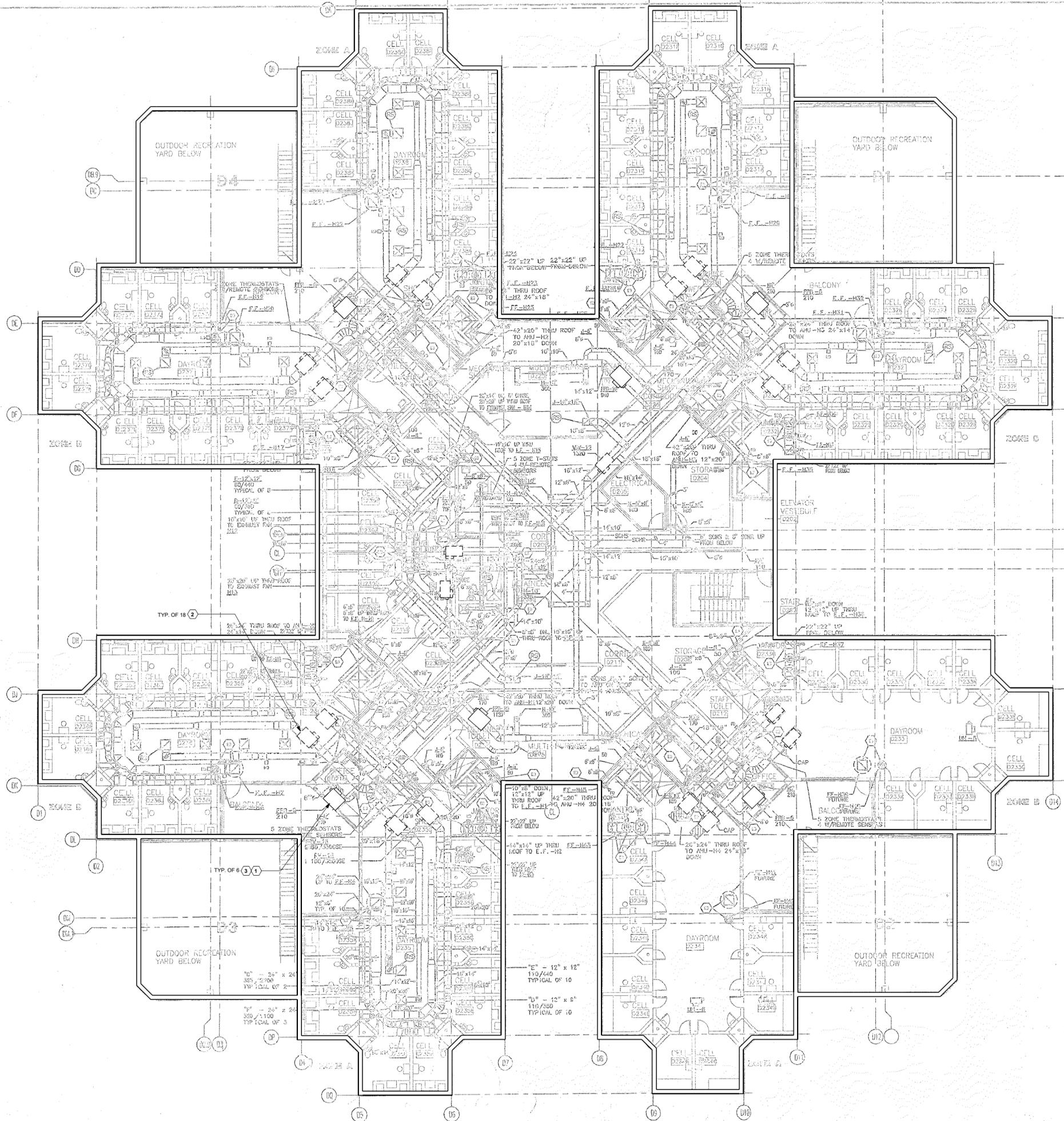


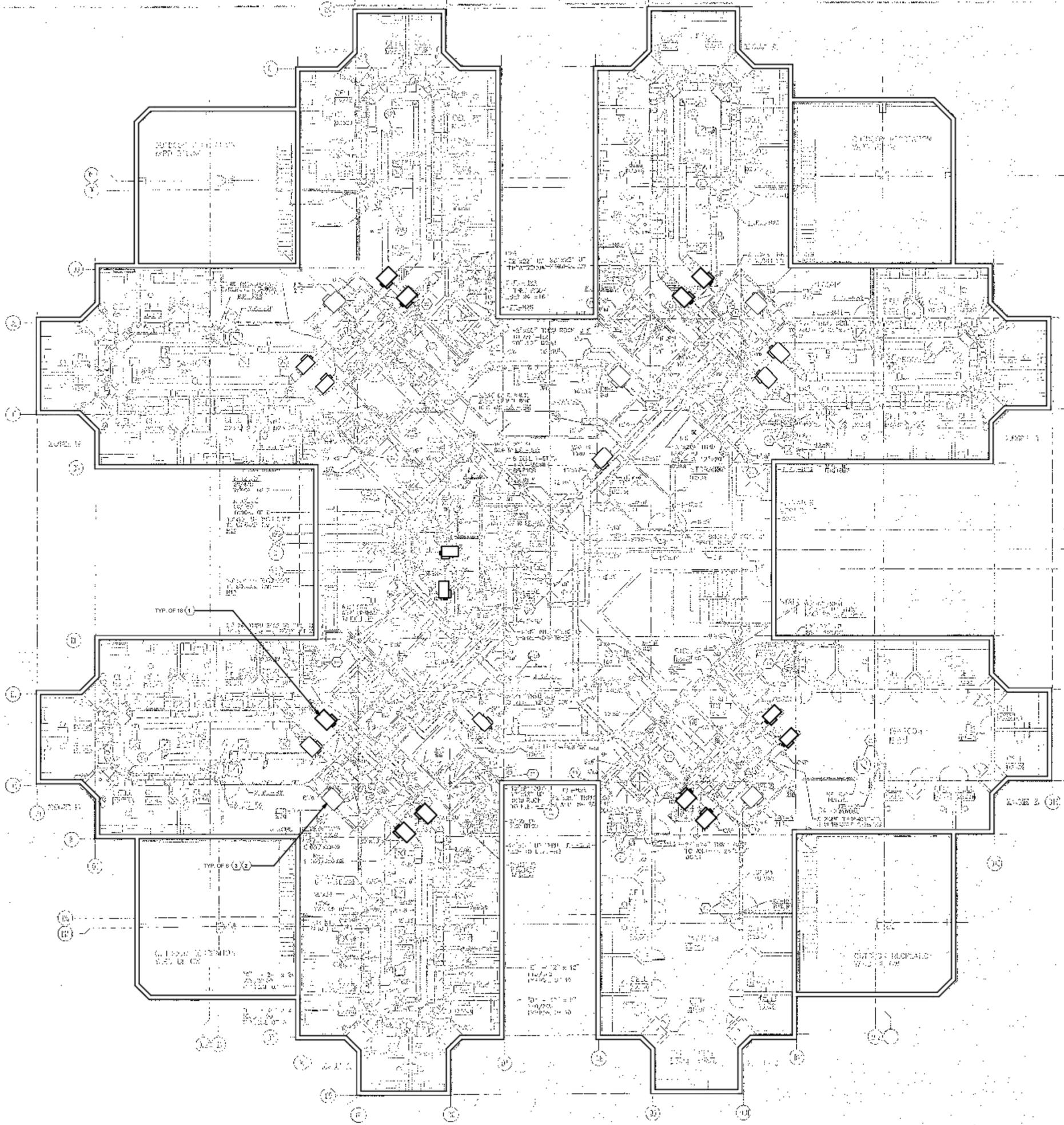


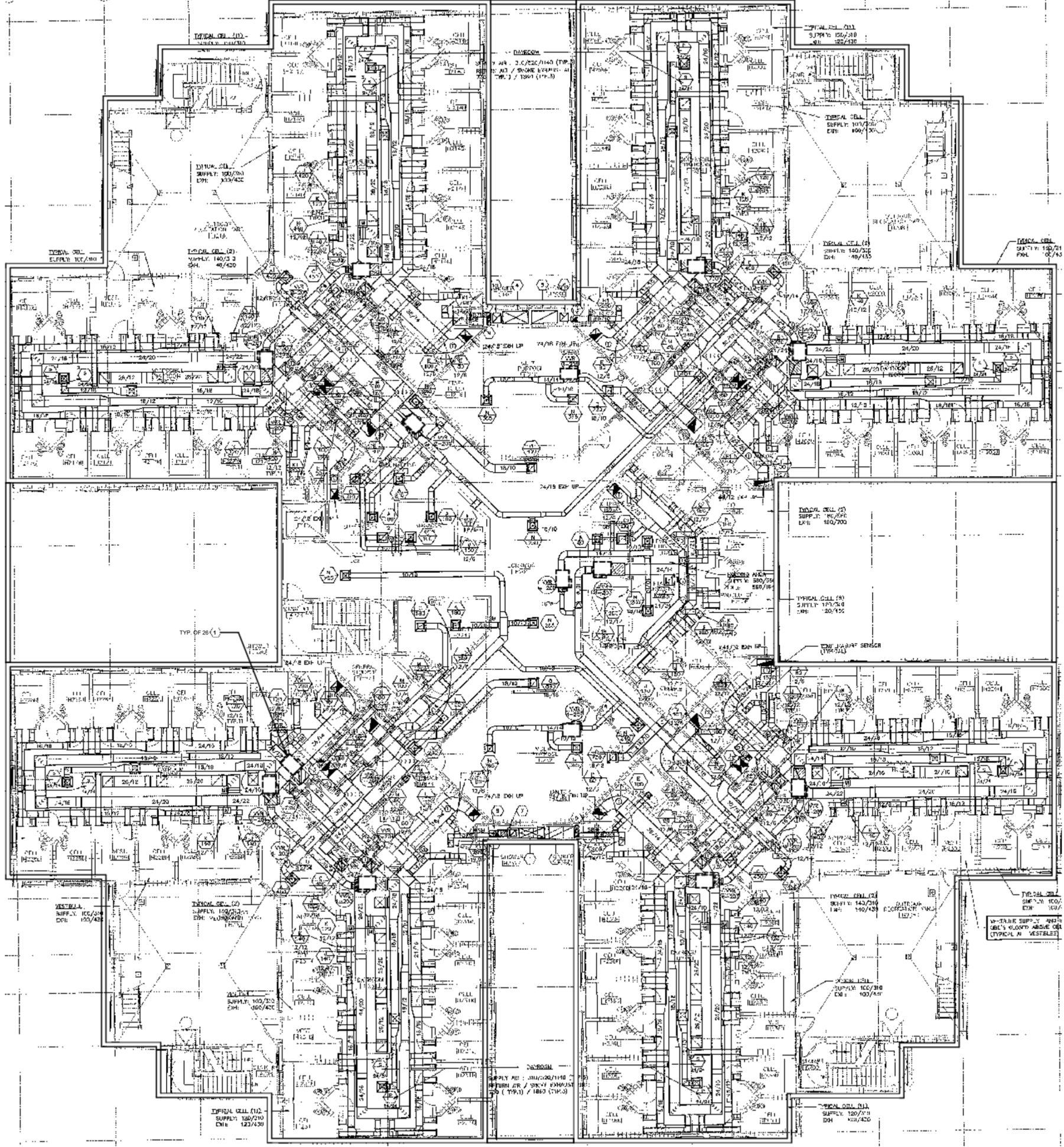
REFER TO DETAIL 11A-102A

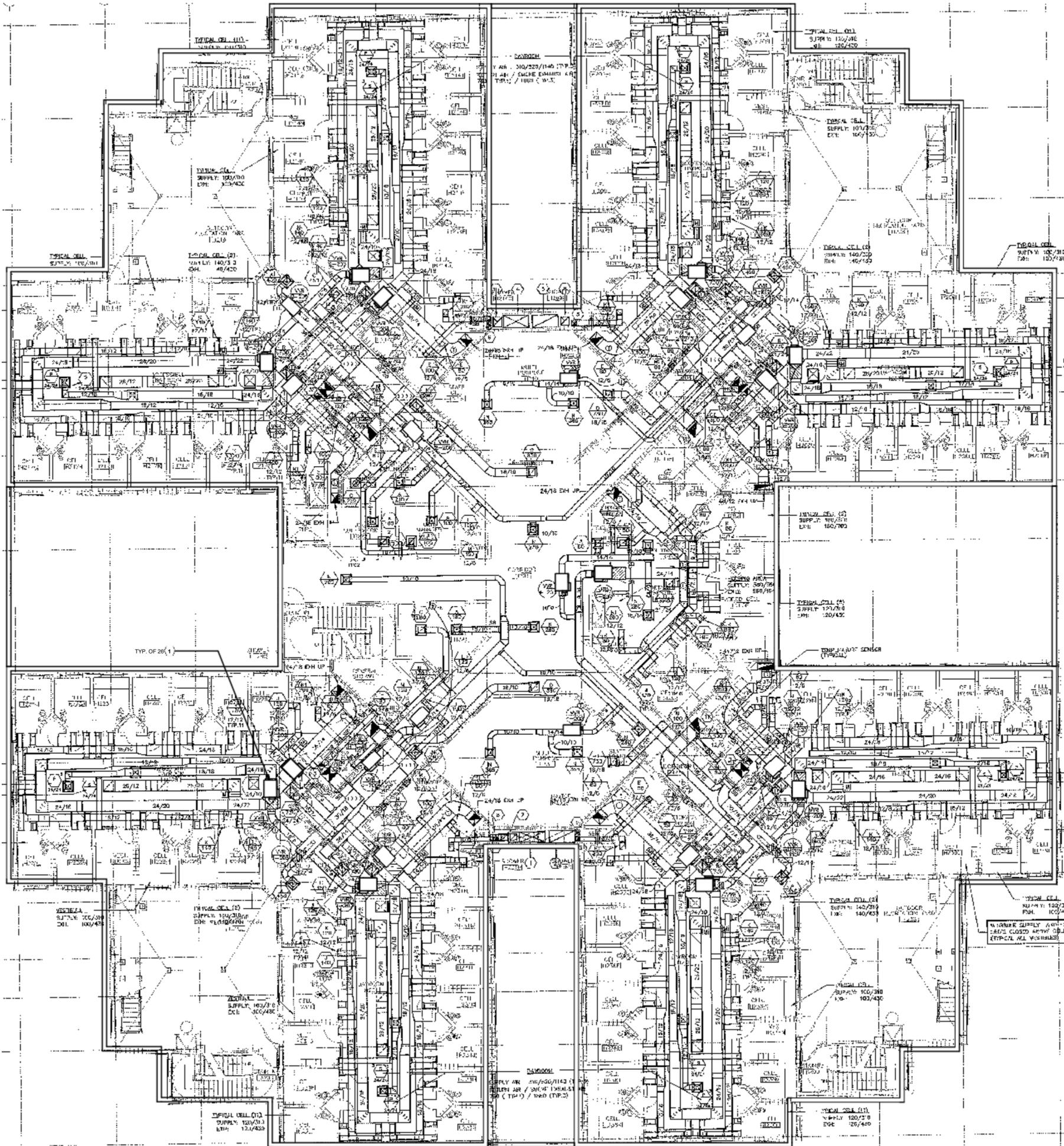
A-102B/1 REFER TO DETAIL

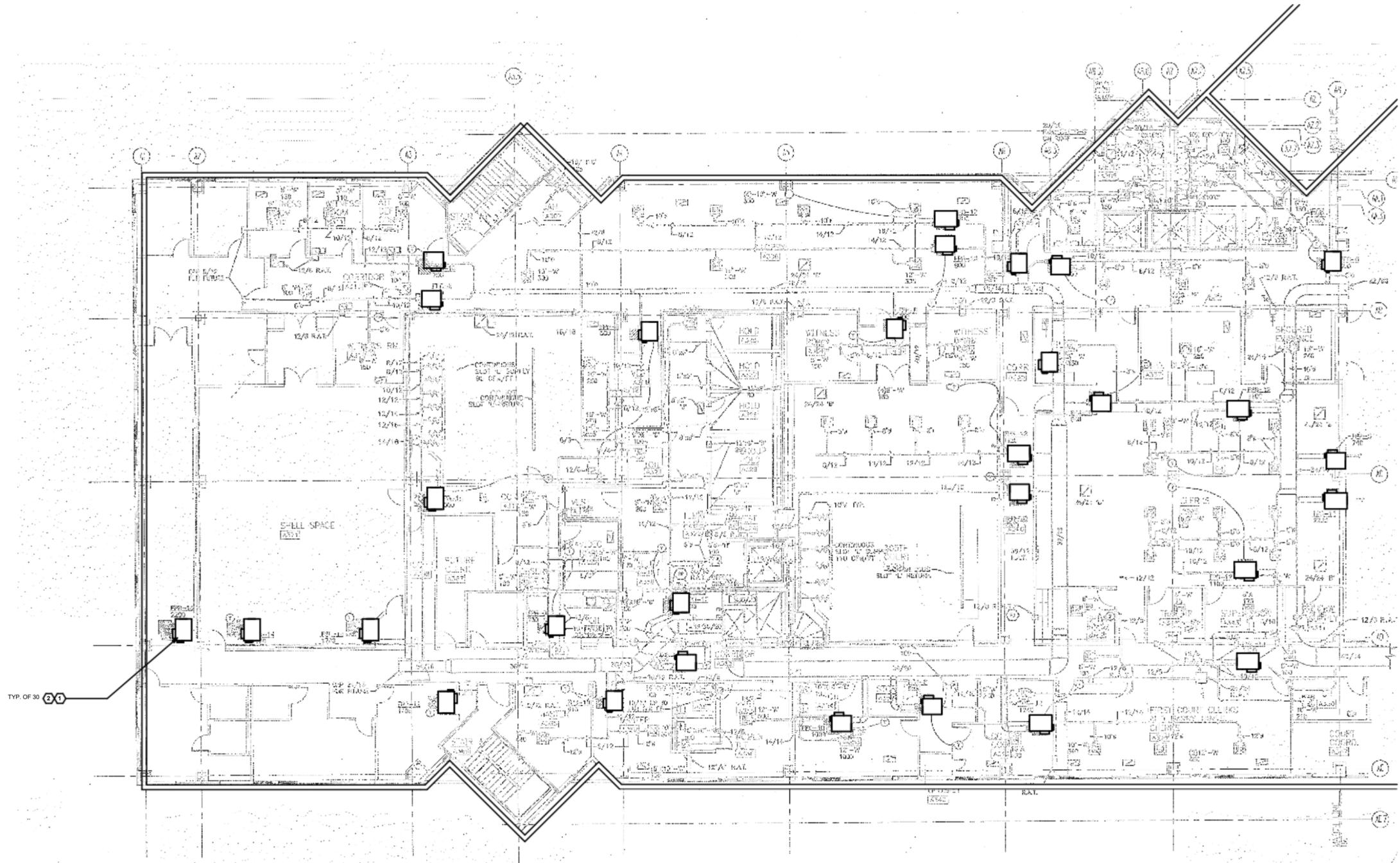


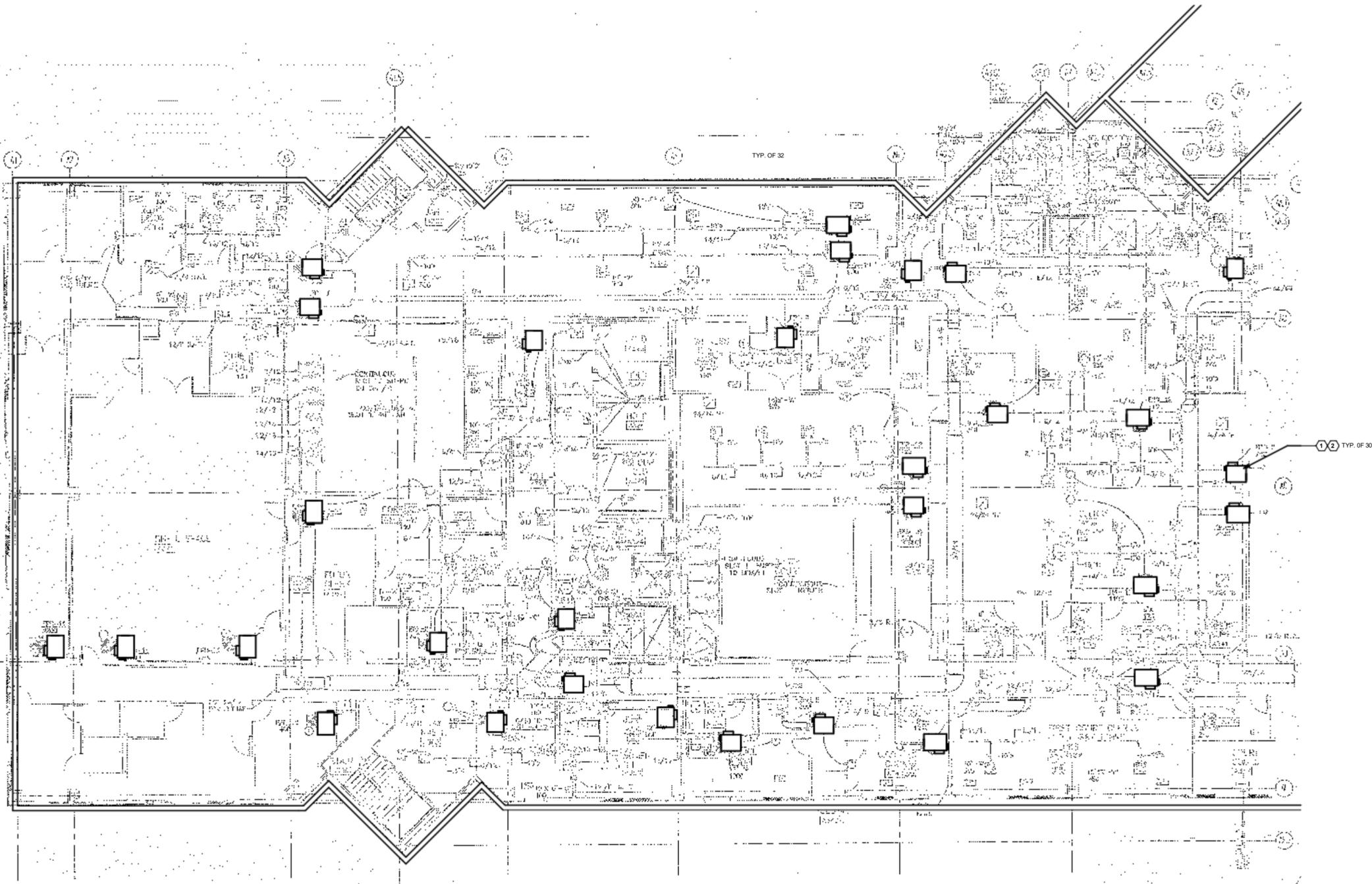


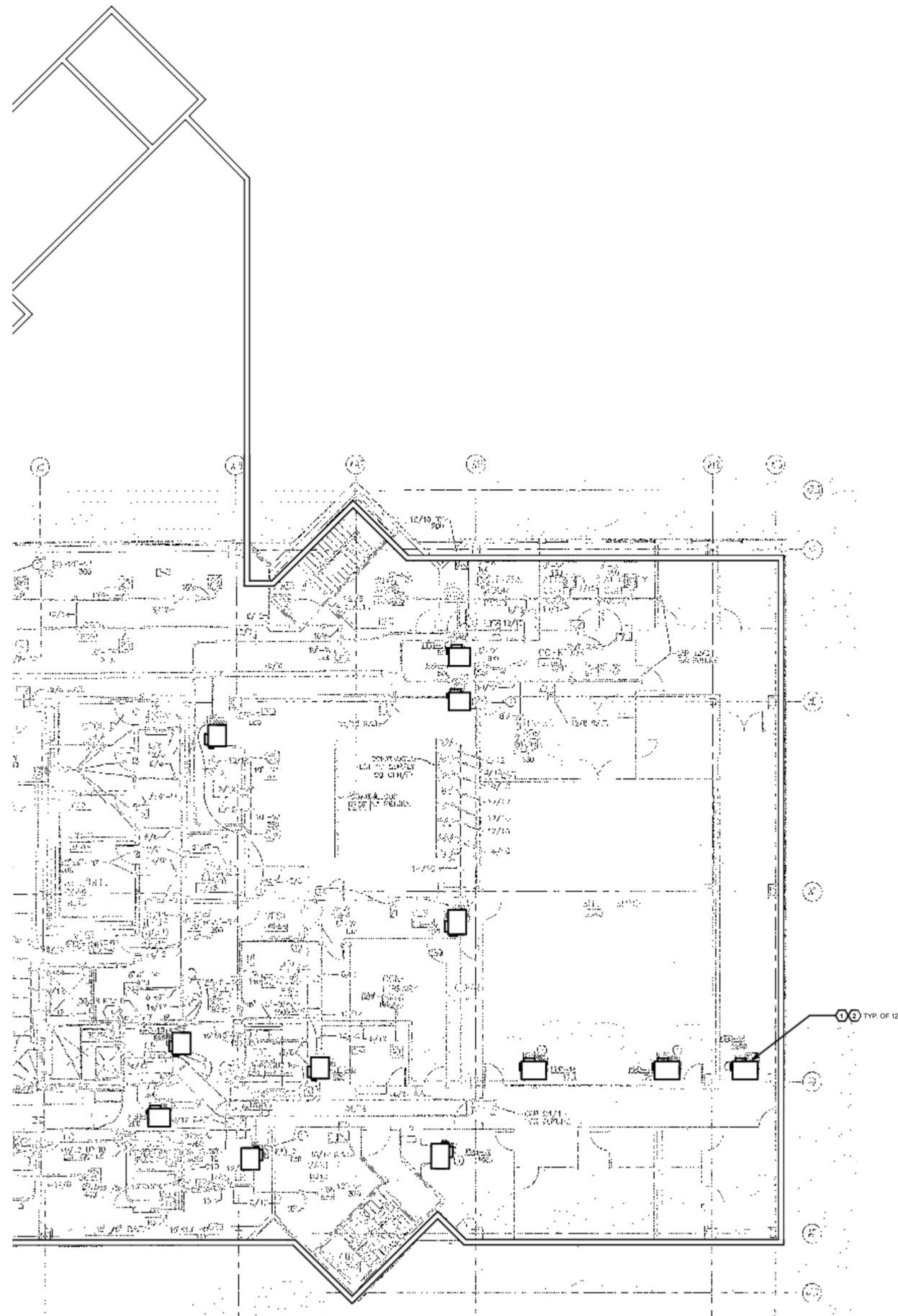






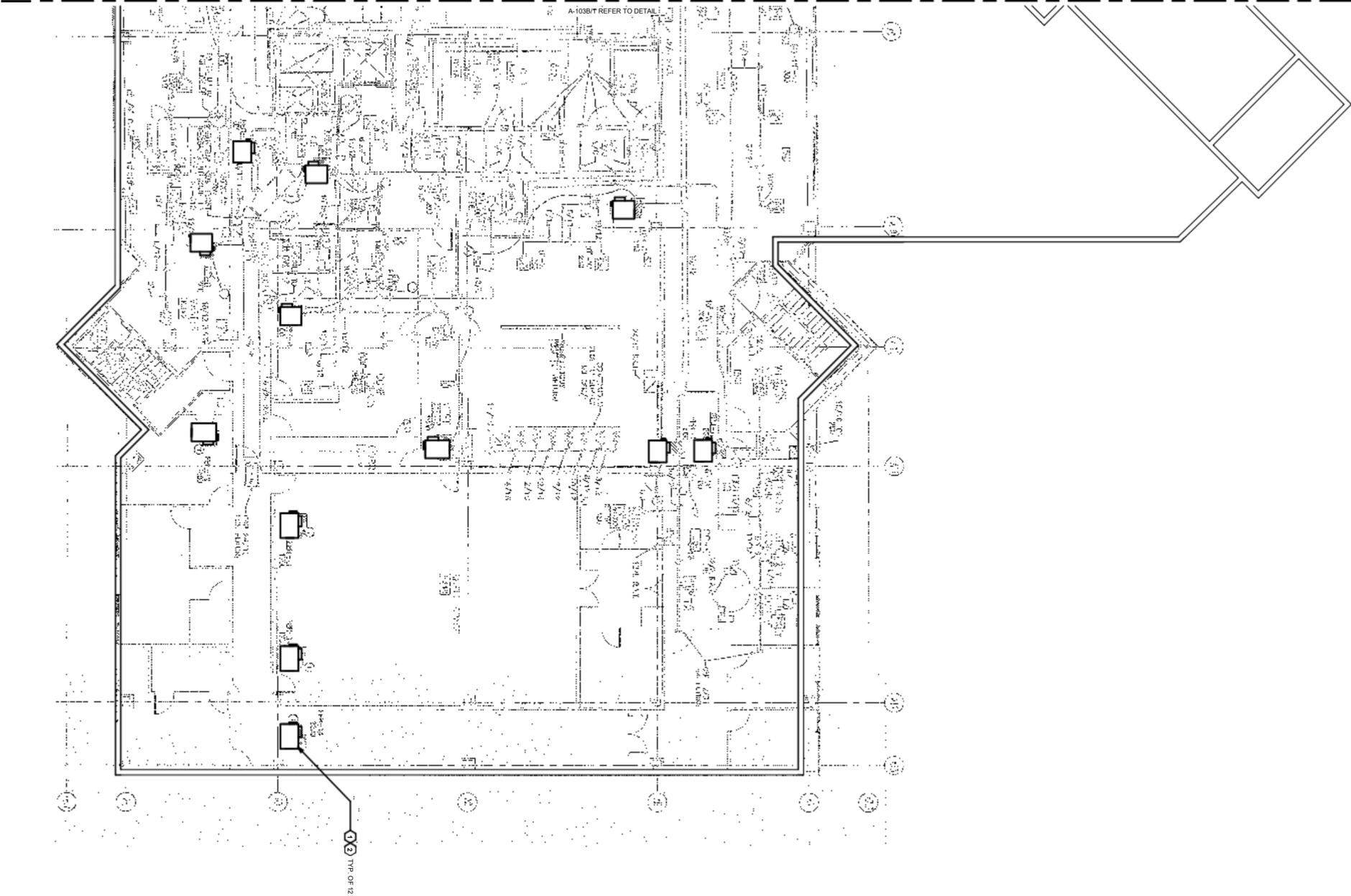






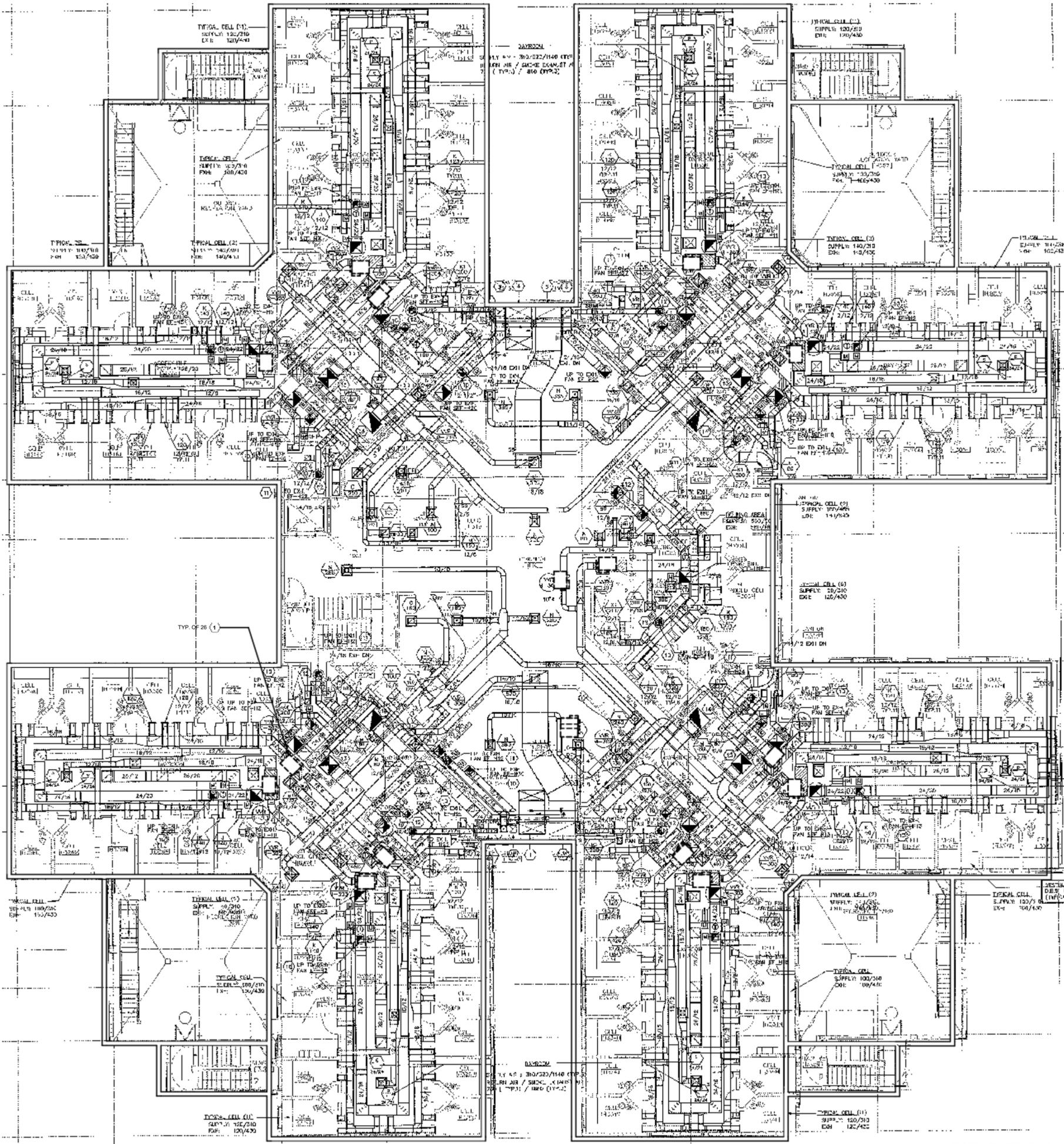
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A-103B/T REFER TO DETAIL



12/5/2025





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(E)EF-C1

(E)EF-C3

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(E)BUILT-UP_AHU1

(E)BUILT-UP_AHU2

(E)EF-C4 2

(E)EF-C5 2

(E)EF-C6 2

(E)EF-C7 2

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(E)SEF-I2 3

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(E)VF-3

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(E)SEF-H44 (E)EF-H43

(E)EF-D5 3

(E)EF-D6 2

(E)EF-D7 2

(E)SEF-D11 3
(E)SEF-D9 3

(E)EF-H7 4

(E)EF-H11 4

(E)SEF-H7 3

(E)EF-H26 2

(E)SEF-H11 3

(E)SEF-H8 3

(E)EF-H27 2

(E)EF-H5 4

(E)SEF-H5 3

(E)EF-H8 4

(E)SEF-H12 3

(E)SEF-H9 4

(E)EF-H10 3

(E)SEF-H6 4

(E)EF-H20 5

(N)X-2 3

(E)EF-H27 4

(N)X-3 1

(E)SEF-H10 3

(E)EF-H10 4

(E)EF-H6 3

(E)SEF-H20 3

(E)EF-H22 3

(E)SEF-H17 4

(E)EF-H17 4

(E)SEF-H18 3

(E)EF-H18 4

(E)SEF-H4 3 4
(E)SEF-H5 4 4

3 (E)SEF-H1
4 (E)SEF-H2

(E)SEF-D3

(E)AHU-D1

2 (E)EF-H21
4 (E)SEF-H2

(N)X-5
5

(E)EF-H24 2
(E)SEF-H14 3

(E)EF-H2 1 5
(E)SEF-H2 3 (N)X-1

(E)SEF-H19 1
3 4

5 1
(N)X-4 4

(E)SEF-H14 4

4 (E)SEF-H1

(E)SEF-H1

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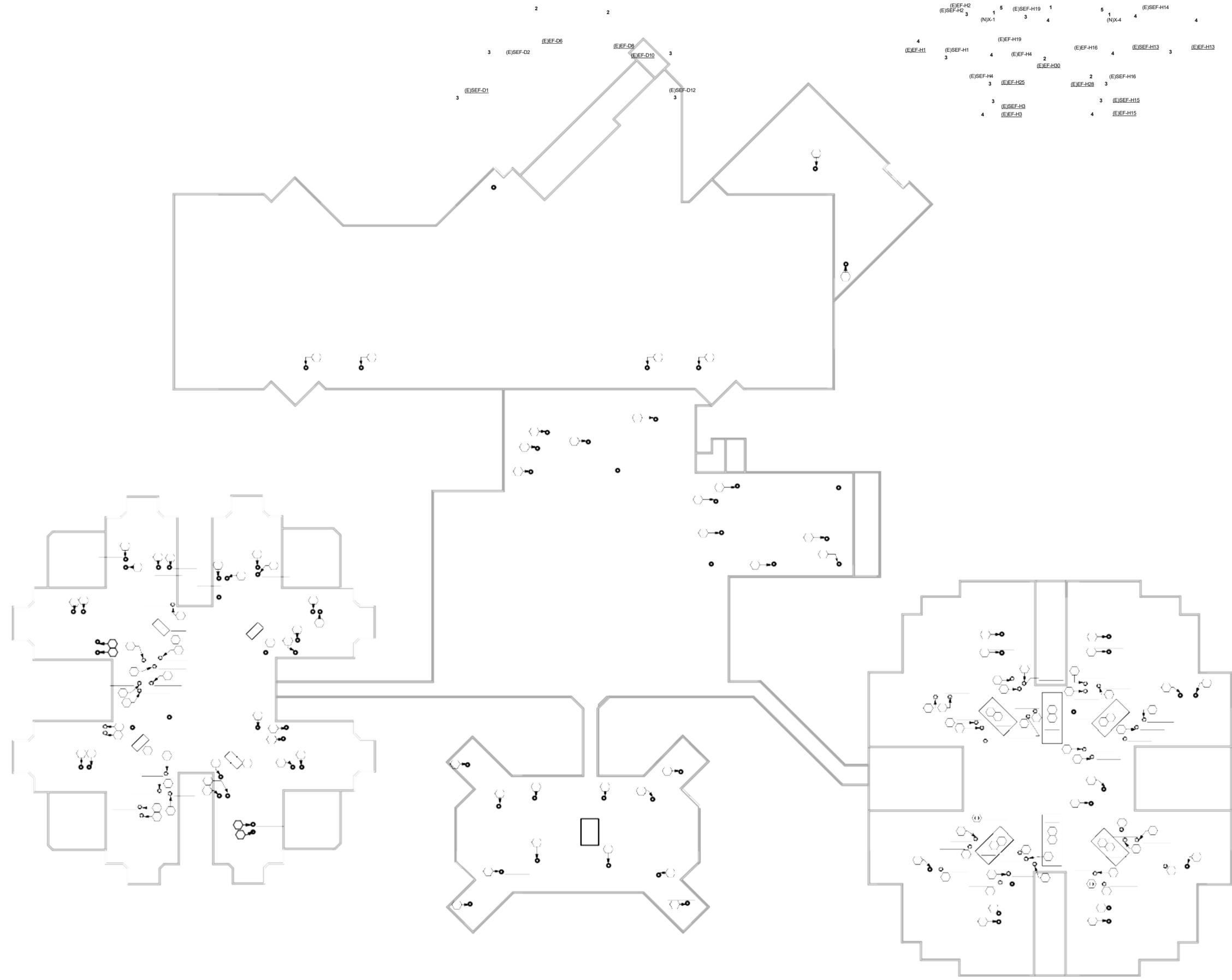
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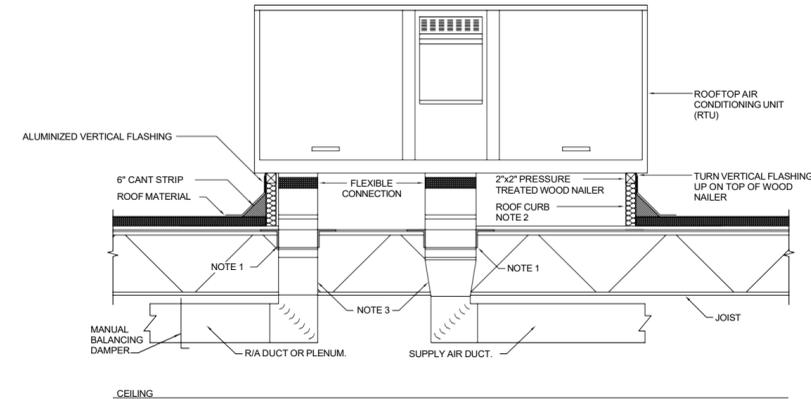
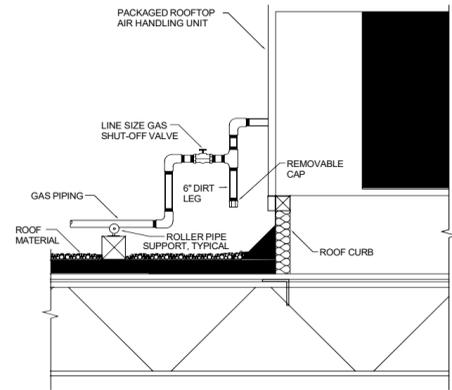
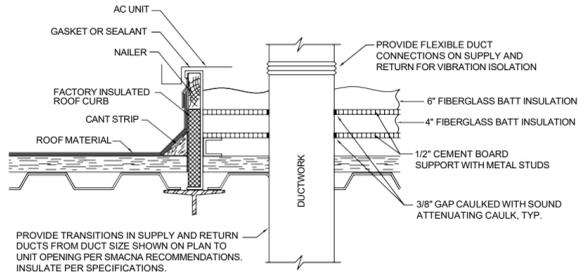
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3 (E)SEF-H3
(E)EF-H3

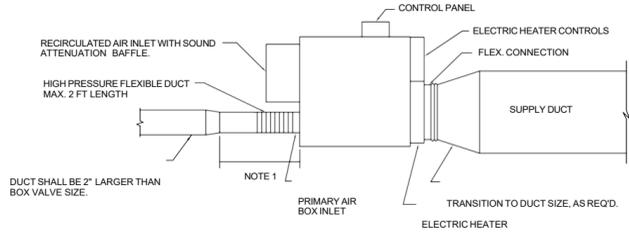
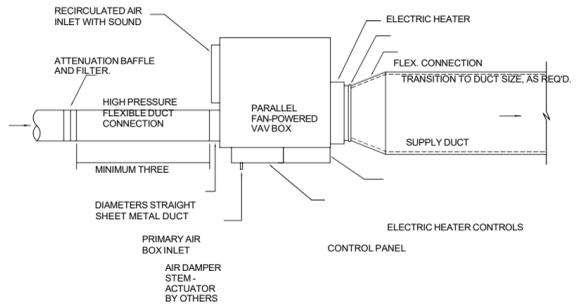
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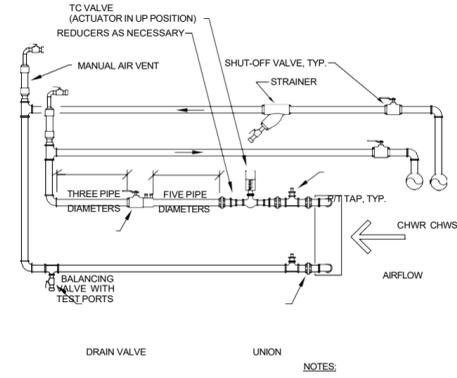


CEILING

- NOTES:
- REFER TO STRUCTURAL DRAWINGS FOR SUPPORT REQUIREMENTS.
 - ALL RTU'S SHALL BE "PLUMB" AND SET LEVEL ON ROOF IN BOTH DIRECTIONS. THE VERTICAL DIMENSION OF THE CURB WALLS SHALL BE TAPERED AS REQUIRED TO COMPENSATE FOR THE ROOF SLOPE AND ALLOW THE RTU TO SET LEVEL. REFER TO THE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR ROOF SLOPE INFORMATION. CURBS TO BE FACTORY INSULATED WITH MIN 6" RIGID INSULATION, MIN 14" HIGH.
 - PROVIDE TRANSITION AND/OR OFFSET AS INDICATED OR REQUIRED.
 - THIS DETAIL IS TYPICAL FOR ALL RTU INSTALLATIONS.



- NOTES:
- DUCT CONNECTION TO BE SAME SIZE AS INLET, WITH A MINIMUM STRAIGHT SECTION OF 40 OR AS RECOMMENDED BY MANUFACTURER.

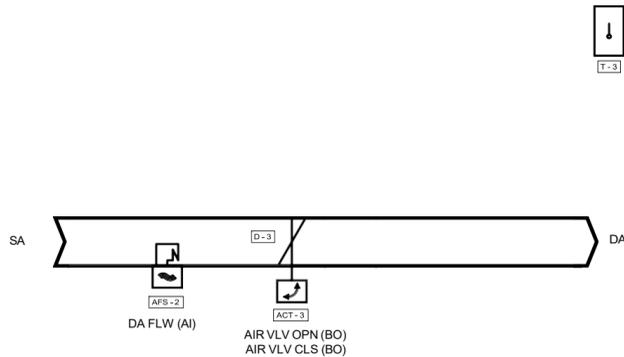


- DESIGNER'S NOTES:
- SHUT-OFF VALVES: THROUGH 2-1/2" BALL VALVE
 - BALANCING VALVES: THROUGH 2-1/2" CHARACTERIZED BALL VALVE WITH P/T TAPS AND MEMORY STOP
 - MANUAL AIR VENT: BALL VALVE WITH HOSE END AND CAP
 - DRAIN VALVE: BALL VALVE WITH HOSE END AND CAP
- NOTES:
- PROVIDE ALL DRAIN VALVES AND AIR VENTS WITH HOSE END AND CAP WITH CHAIN

HYDRONIC AIR HANDLING UNIT SCHEDULE																													
MARK AHU-	ARRANGMENT	SUPPLY FAN							ELECTRIC PRE-HEATING				NET COOLING PERFORMANCE DATA										POWER CONN.				MANUFACTURER MAKE AND MODEL	REMARKS	
		SUPPLY CFM		O/A CFM		EXT. S.P.	QTY	HP	EAT	LAT	KW	NO. STAGES	CAPACITY (MBH)			O.D. D.B.	E.A.T.		L.A.T. D.B.	WATER				V	PH	MCA			MOCP
		DES	MIN	DES	MIN								TOTAL	SENS.	LAT.		D.B.	W.B.		D.B.	E.W.T.	L.W.T.	GPM						
X1	DOWNFLOW	14100	4230			3	1	20	17.0	40	102.5	6	905.2	489.99	315.21	105	85	72	54	43	56	124	15.68	460	3	34.4		TRANE	ALL
X2	DOWNFLOW	13400	1270			3	1	20	17.0	40	97.4	6	797.27	473.32	323.95	105	86	72	54	43	53	159	8.87	460	3	34.4		TRANE	ALL
X3	DOWNFLOW	12700	2810			3	1	15	17.0	40	92.4	6	775.09	455.6	319.29	105	86	72	54	43	53	154	9.14	460	3	25.9		TRANE	ALL
X4	DOWNFLOW	16100	4830			3	1	25	17.0	44	137.5	6	1089.48	618.08	471.4	105	89	74	54	43	60	128	12.12	460	3	43.15		TRANE	ALL
X5	DOWNFLOW	19368	5815			3	1	15	17.0	31.45	88.5	6	1044.48	652.79	391.69	105	84	70	53	44	54	208	19.37	460	3	50.65		TRANE	ALL
X6	DOWNFLOW	19368	5815			3	2	15	17.0	26.78	59.9	6	816.03	576.14	239.89	105	80	66	53	44	54	163	12.16	460	3	50.65		TRANE	ALL
X7	DOWNFLOW	15050	4515			3	1	20	54.0	67.68	65.1	6	759.37	486.93	272.44	105	82	69	53	44	54	151	9.81	460	3	34.4		TRANE	ALL
H1	DOWNFLOW	18000	5400			2	2	15	17.0	34.56	100.0	6	952.13	615.98	336.15	105	83	69	52	44	54	190	14	460	3	50.65		TRANE	ALL
H2	DOWNFLOW	18001	5405			2	2	15	17.0	34.56	100.0	6	952.13	615.98	336.15	105	83	69	52	44	54	190	14	460	3	50.65		TRANE	1,2,3,4,5,6,7,8,9,10,11,12
H3	DOWNFLOW	18002	5405			2	2	15	17.0	34.56	100.0	6	952.13	615.98	336.15	105	83	69	52	44	54	190	14	460	3	50.65		TRANE	1,2,3,4,5,6,7,8,9,10,11,12
H4	DOWNFLOW	18003	5405			2	2	15	17.0	34.56	100.0	6	952.13	615.98	336.15	105	83	69	52	44	54	190	14	460	3	50.65		TRANE	ALL

- EXTERNAL STATIC PRESSURE ("WG") INCLUDES DUCTWORK, BALANCING DAMPERS AND AIR DEVICES ONLY.
- UNITS SHALL PERFORM TO LISTED CAPACITIES. UNIT PERFORMANCE MUST SATISFY BOTH SENSIBLE AND LATENT CAPACITY REQUIREMENTS.
- DESIGN BASIS IS TRANE. CONTRACTOR IS RESPONSIBLE FOR VARIATIONS IN FIT AND ELECTRICAL SERVICE.
- PROVIDE WITH TERMINAL STRIP FOR CONTROL SYSTEM INTERFACE - COORDINATE WITH CONTROLS CONTRACTOR.
- PROVIDE WITH 2" MERV-A 8 FILTERS.
- PROVIDE SUPPLY FAN WITH VARIABLE FREQUENCY DRIVE AND SHAFT GROUNDING
- PROVIDE WITH ENTHALPY ECONOMIZER AND BAROMETRIC RELIEF. PROVIDE ECONOMIZER WITH IECC COMPLIANT FAULT DETECTION AND DIAGNOSTICS CAPABILITY.
- PROVIDE WITH RETURN AIR SMOKE DETECTOR INTERLOCKED TO SUPPLY FAN
- PROVIDE WITH INTEGRAL DISCONNECT AND UNPOWERED GFCI RECEPTACLE
- PROVIDE WITH STAINLESS STEEL OR CORROSION RESISTANT CONDENSATE DRAIN PAN
- PROVIDE WITH INTEGRAL DISCONNECT AND UNPOWERED GFCI RECEPTACLE
- PROVIDE WITH STAINLESS STEEL OR CORROSION RESISTANT CONDENSATE DRAIN PAN
- PROVIDE WITH UL 555 DAMPERS LISTED FOR USE IN A SMOKE CONTROL SYSTEM
- PROVIDE UL 864 LISTED BMS CONTROLLER





Sequence of Operation: COOLING ONLY VAV TERMINAL UNIT

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied, and Unoccupied commands. The BAS may also send a Heat/Cool Setpoint (or, if shutdown commands, space temperature and/or space temperature setpoint). If communication is lost with the BAS, the controller shall operate using its local setpoints.

Occupied:

Normal operating mode for occupied spaces or daytime operation. When the unit is in the occupied mode the VAV shall maintain the space temperature at the active occupied cooling setpoint. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV. Applicable ventilation and airflow setpoints will be enforced. The occupied mode will be the default mode of the VAV.

Unoccupied:

Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller shall maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardware or communicated setpoint. When the space temperature exceeds the active unoccupied setpoint the VAV shall modulate fully closed.

Occupied Bypass:

Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.

Heat/Cool Mode:

The Heat/Cool mode shall be set by a communicated value or automatically by the VAV. In standalone or auto mode the VAV shall compare the primary air temperature with the configured auto changeover setpoint to determine if the air is "hot" or "cold". Heating mode implies the primary air temperature is hot. Cooling mode implies the primary air temperature is cold.

Cooling Mode:

When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs will be controlled based on the unit configuration and the requested cooling capacity.

Based on the VAV controller occupancy mode, the active cooling setpoint will be one of the following:

Setpoint	Default Value
Occupied Cooling Setpoint	74.0 deg. F
Unoccupied Cooling Setpoint	85.0 deg. F
Occupied Standby Cooling Setpoint	78.0 deg. F
Occupied Min Cooling Airflow Setpoint	See VAV Schedule
Occupied Max Cooling Airflow Setpoint	See VAV Schedule

Heat/Cool Setpoint:

The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.

Demand Control Ventilation:

When the unit is in unoccupied mode, the ventilation airflow setpoint will be zero. When the unit is in occupied mode, the ventilation airflow setpoint shall be equal the design outdoor airflow and reset based on occupancy.

OCCUPANCY SENSOR: When the unit is in occupied mode, and the occupancy sensor indicates that the space is currently unoccupied, the ventilation airflow setpoint shall be the "occupied standby" outdoor airflow (see VAV schedule).

The current ventilation airflow setpoint shall be communicated to the BAS for control of the system outdoor-air intake.

Space Sensor Failure:

If there is a fault with the operation of the zone sensor an alarm shall be annunciated at the BAS. Space sensor failure shall cause the VAV to drive the damper to minimum air flow if the VAV is in the occupied mode, or drive it closed if the VAV is in the unoccupied mode.

Guide Specification: COOLING ONLY VAV TERMINAL UNIT

1.1 VARIABLE AIR VOLUME TERMINAL UNIT CONTROLLERS

A. General Description

1. Variable Air Volume (VAV) controllers shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are typically not user programmable, but are configurable for operation of VAV terminal units.

2. Variable Air Volume (VAV) controllers are controllers that operate equipment that control the space temperature of single zone.

B. The VAV controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the VAV controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. The VAV controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the following: Occupied/Heat/Cool, Unoccupied/Heat/Cool, Morning Warm-up, Pre-cool, Occupied Bypass).

2. The VAV controller will provide equipment status parameters to the BAS through BACnet communication.

3. The VAV controller will operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. Stand-Alone Operation: Each VAV Terminal Unit shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.

E. The VAV controller shall communicate to the building automation system via one of the following protocols: BACnet™ MS/TP, BACnet™ Zigbee or BACnet™ IP as defined in ANSI/ASHRAE® Standard 135-2020.

1. BACnet™ MS/TP

a. To allow maximum communications speed and co-existence with other controllers, the controller shall support at a minimum the following BACnet MS/TP manager baud rates: 9600, 19200, 38400, 76800.

2. BACnet™ IP

a. BACnet IP controllers provide BACnet communications over Internet Protocol via Local Area Networks (LAN), an open standard building automation communication protocol that enables connections to other building automation systems and controllers

3. BACnet™ Zigbee

a. VAV controller wireless communication interface shall self-form and self-heal to maintain operation in the event of network communication failure.

b. IEEE 802.15.4 radios to minimize risk of interference, reliability, and range.

c. Operating range shall be a minimum of 200 feet; open range shall be 2,500 ft. (762 m) with less than 2% packet error rate.

d. To protect against harmful interference, certifications shall include Energy Management Equipment FCC CFR47, Section 15.247 & subpart E, Digital Modulation Transmission with no SAR (FCC ID: TPF-251701)

F. Each VAV terminal unit shall use a space zone sensor(s) to measure the space condition it is serving.

G. Software

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

H. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.

2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.

3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

I. Input/Output:

1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).

2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to 10V, 0 to 20mA, and 200 to 20Kohm.

3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.

4. For flexibility in selection and replacement devices, the controller shall have binary output which are able to drive at least 12VA each.

5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

J. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.

2. All binary output shall have LED's indicating the output state.

3. All wiring connectors shall removable without the use of a tool.

4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link and through the controller's zone sensor.

5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.

6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.

7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.

a. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.

8. For ease of troubleshooting, the Controller shall support BACnet data trend logging.

a. Trends shall be capable of being collected at a minimum sample rate of once every second.

b. Shall be capable of trending all BACnet points used by controller

c. Trends shall be capable of being scheduled or triggered

K. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

L. Controller shall meet the following Agency Compliance:

1. UL916 PAZX, Open Energy Management Equipment

2. UL94-SV, Flammability

3. FCC Part 15, Subpart B, Class B Limit

4. ASINZS CISPR 32:2016

5. VCCI-CSPR 32:2016

6. CAN ICES-003(B)/NMB-003(B)

7. To ensure integration to the building automation system the controller must be BTL (BACnet Testing Lab) listed. The following BACnet profiles are in order of most functionality (B-BC) to least functionality (B-ASC).

a. BACnet Building Controller (B-BC)

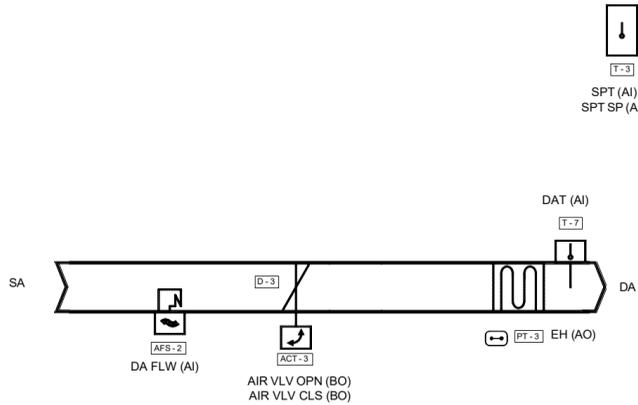
b. BACnet Advance Applications Controller (B-AAC)

c. BACnet Application Specific Controller (B-ASC)

Points List: COOLING ONLY VAV TERMINAL UNIT

System Point Description	POINTS											ALARMS		
	GRAPHIC	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	BINARY HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	SOFTWARE POINT (SET)	HARDWARE INTERLOCK (HOW)	WIRELESS (WLS)	NETWORK (NET)	HIGH ANALOG LIMIT	LOW ANALOG LIMIT	LAN TO DIAGNOSTIC	SENSOR FAIL	COMMUNICATION FAIL
AIR VALVE DRIVE OPEN COMMAND	X				X									
AIR VLV OPN														
AIR VALVE DRIVE CLOSE COMMAND	X				X									
AIR VLV CLS														
SPACE OCCUPANCY INPUT	X	X												
SPACE OCCUPANCY LOCAL SPT	X	X												
SPACE TEMPERATURE LOCAL SPT	X	X												
SPACE TEMPERATURE SETPOINT LOCAL SPT	X	X												
SUPPLY AIRFLOW	X	X							X	X				
DA FLW														
BAS COMMUNICATION STATE							X							X
BAS COM														
MAXIMUM COOLING AIRFLOW SETPOINT					X									
MINIMUM COOLING AIRFLOW SETPOINT					X									
MIN CLG FLW SP														
OCCUPIED BYPASS TIMER	X					X								
OCC TMR														
OCCUPIED COOLING SETPOINT	X													
OCC CLG SP														
UNOCCUPIED COOLING SETPOINT	X				X									
UNOCC CLG SP														





SPT (AI)
SPT SP (AI)

A. General Description
terminal units.

Sequence of Operation: REHEAT VAV TERMINAL UNIT

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied, and Unoccupied commands. The BAS may also send a Heat/Cool mode, priority shutdown commands, space temperature and/or space temperature setpoint. If communication is lost with the BAS, the controller shall operate using its local setpoints.

Occupied:

The occupancy mode will be communicated or hardwired to the controller via a binary input. When the unit is in the occupied mode the VAV will maintain the space temperature at the active occupied heating or cooling setpoint. Applicable ventilation and airflow setpoints will be enforced. The occupied mode will be the default mode of the VAV. Applicable ventilation and airflow setpoints will be enforced. The occupied mode will be the default mode of the VAV.

Occupied Standby:

The occupancy mode will be communicated or hardwired to the controller via a binary input, even though the BAS has scheduled the space as occupied. In the occupied standby mode, the active cooling and heating setpoints shall be relaxed (see cooling and heating mode) and both the ventilation airflow and minimum airflow setpoints shall be lowered (see VAV schedule).

Unoccupied:

Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller will maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardwired or communicated setpoint. When the space temperature drops below its Unoccupied Heating Setpoint, the controller will modulate the air damper and the hot water valve until the zone temperature rises back to 2.0 deg. F above the Unoccupied Heating Setpoint. When the space temperature exceeds the active unoccupied setpoint the hot water valve will the air damper and hot water valve will modulate fully closed.

Occupied Bypass:

Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.

Heat/Cool Mode:

The Heat/Cool mode shall be set by a communicated value or automatically by the VAV. In standalone or auto mode the VAV shall compare the primary air temperature with the configured auto changeover setpoint to determine if the air is "hot" or "cold". Heating mode implies the primary air temperature is hot. Cooling mode implies the primary air temperature is cold.

Cooling Mode:

When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs will be controlled based on the unit configuration and the requested cooling capacity.

Based on the VAV controller occupancy mode, the active cooling setpoint will be one of the following:

Setpoint	Default Value
Occupied Cooling Setpoint	74.0 deg. F
Unoccupied Cooling Setpoint	85.0 deg. F
Occupied Standby Cooling Setpoint	70.0 deg. F
Occupied Min Cooling Airflow Setpoint	See VAV Schedule
Occupied Max Cooling Airflow Setpoint	See VAV Schedule

Heat/Cool Setpoint:

The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.

Reheat Control Mode:

Reheat will only be allowed when the supply air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat will be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV will operate at its minimum heating airflow setpoint and energize the heat as follows:

Setpoint	Default Value
Occupied Heating Setpoint	71.0 deg. F
Unoccupied Heating Setpoint	60.0 deg. F
Occupied Standby Heating Setpoint	67.0 deg. F
Occupied Min Heating Airflow Setpoint	See VAV Schedule
Occupied Max Heating Airflow Setpoint	See VAV Schedule

Heating Mode:

When the unit is in heating mode, the VAV controller will maintain the space temperature at the active heating setpoint by modulating the VAV damper (between the active heating minimum and maximum airflow setpoints). Based on the VAV controller occupancy mode, the active heating setpoint will be one of the following:

Setpoint	Default Value
Occupied Heating Setpoint	71.0 deg. F
Unoccupied Heating Setpoint	60.0 deg. F
Occupied Standby Heating Setpoint	67.0 deg. F
Occupied Min Heating Airflow Setpoint	See VAV Schedule
Occupied Max Heating Airflow Setpoint	See VAV Schedule

Local Reheat Control:

Reheat will only be allowed when the primary air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:

Electric Silicon Controlled Rectifier Reheat (SCR):

If the space temperature is at the heating setpoint, the electric heater shall modulate as required to maintain space temperature at the active heating setpoint while the VAV operates at its minimum heating airflow setpoint. If the discharge air temperature reaches the design heating discharge air temperature setpoint (adj.), the VAV shall modulate airflow between the minimum heating airflow setpoint and the maximum heating airflow setpoint as required to maintain space temperature at the active heating setpoint, while the electric heater modulates to maintain discharge air temperature at the design heating discharge air temperature setpoint. If the airflow reaches the maximum heating airflow setpoint, the VAV shall modulate the electric heater as required to maintain space temperature at the active heating setpoint, while the VAV operates at its maximum heating airflow setpoint.

Demand Control Ventilation:

When the unit is in unoccupied mode, the ventilation airflow setpoint will be zero. When the unit is in occupied mode, the ventilation airflow setpoint shall be equal the design outdoor airflow and reset based on occupancy.

OCCUPANCY SENSOR: When the unit is in occupied mode, and the occupancy sensor indicates that the space is currently unoccupied, the ventilation airflow setpoint shall be the "occupied standby" outdoor airflow (see VAV schedule).

The current ventilation airflow setpoint shall be communicated to the BAS for control of the system outdoor-air intake.

Space Sensor Failure:

If there is a fault with the operation of the zone sensor an alarm shall be annunciated at the BAS. Space sensor failure shall cause the VAV to drive the damper to minimum air flow if the VAV is in the occupied mode, or drive it closed if the VAV is in the unoccupied mode.

Guide Specification: REHEAT VAV TERMINAL UNIT

1.1 VARIABLE AIR VOLUME TERMINAL UNIT CONTROLLERS

1. Variable Air Volume (VAV) controllers shall be microprocessor-based DDC controllers which, through hardware or firmware design, control specified equipment. They are typically not user programmable, but are configurable for operation of VAV

2. Variable Air Volume (VAV) controllers are controllers that operate equipment that control the space temperature of single zone.

B. The VAV controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the VAV controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

1. The VAV controller will receive operation mode commands from the BAS network controller. The BAS commands shall include but not be limited to the following: Occupied/Heat/Cool, Unoccupied/Heat/Cool, Morning Warm-up, Pre-cool, Occupied Bypass).

2. The VAV controller will provide equipment status parameters to the BAS through BACnet communication.

3. The VAV controller will operate as a stand-alone controller in the event of communication failure with the BAS.

4. In case of communications failure stand-alone operation shall use default values or last known values for remote sensors read over the network such as outdoor air temperature.

D. Stand-Alone Operation: Each VAV Terminal Unit shall be controlled by a single controller and provide stand-alone control in the event that a BAS is not present.

E. The VAV controller shall communicate to the building automation system via one of the following protocols: BACnet™ MS/TP, BACnet™ Zigbee or BACnet™ IP as defined in ANSIS/ASHRAE® Standard 135-2020.

1. BACnet™ MS/TP
a. To allow maximum communications speed and co-existence with other controllers, the controller shall support at a minimum the following BACnet MS/TP manager baud rates: 9600, 19200, 38400, 76800.

2. BACnet™ IP
a. BACnet IP controllers provide BACnet communications over Internet Protocol via Local Area Networks (LAN), an open standard building automation communication protocol that enables connections to other building automation systems and controllers

3. BACnet™ Zigbee
a. VAV controller wireless communication interface shall self-form and self-heal to maintain operation in the event of network communication failure.

b. IEEE 802.15.4 radios to minimize risk of interference, reliability, and range.

c. Operating range shall be a minimum of 200 feet; open range shall be 2,500 ft. (762 m) with less than 2% packet error rate.

d. To protect against harmful interference, certifications shall include Energy Management Equipment FCC CFR47, Section 15.247 & subpart E, Digital Modulation Transmission with no SAR (FCC ID: TPF-251701)

F. Each VAV terminal unit shall use a space zone sensor(s) to measure the space condition it is serving.

G. Software

1. To meet the sequence of operation for each zone control, the controller shall use programs developed and tested by the controller manufacturer that are either factory loaded or downloaded with service tool to the controller.

2. For controlling ancillary devices and for flexibility to change the sequence of operation in the future, the controller shall be capable running custom programs written in a graphical programming language.

H. Environment: Controller hardware shall be suitable for the anticipated ambient conditions.

1. Storage: -55° to 203° F (-48° to 95° C) and 5 to 95% Rh, non-condensing.

2. Operating: -40° to 158° F (-40 to 70° C) and 5 to 95% Rh, non-condensing.

3. Controllers used indoors shall be mounted in a NEMA 1 enclosure at a minimum.

4. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° to 158° F [-40° to 70° C].

I. Input/Output:

1. For flexibility in selection and replacement of valves, the controllers shall be capable of supporting all of the following valve control types 0-10VDC, 0-5VDC, 4-20mA, 24VAC floating point, 24VAC - 2 position (Normally Open or Normally Closed).

2. For flexibility in selection and replacement of sensors, the controllers shall be capable of reading sensor input ranges of 0 to 10V, 0 to 20mA, and 200 to 20Kohm.

3. For flexibility in selection and replacement of binary devices, the controller shall support dry and wetted (24VAC) binary inputs.

4. For flexibility in selection and replacement devices, the controller shall have binary output which are able to drive at least 12VA each.

5. For flexibility in selection and replacement of motors, the controller shall be capable of outputting 24VAC (binary output), DC voltage (0 to 10VDC minimum range) and PWM (in the 80 to 100 Hz range).

J. Serviceability – The controller shall provide the following in order to improve serviceability of the controller.

1. Diagnostic LEDs shall indicate correct operation or failures/faults for all of the following: power, sensors, BACnet communications, and I/O communications bus.

2. All binary output shall have LED's indicating the output state.

3. All wiring connectors shall be removable without the use of a tool.

4. Software service tool connection through all of the following methods: direct cable connection to the controller, connection through another controller on BACnet link and through the controller's zone sensor.

5. For safety purposes, the controller shall be capable of being powered by a portable computer for the purposes of configuration, programming, and testing programs so that this work can be accomplished with the power off to the equipment.

6. Capabilities to temporarily override of BACnet point values with built-in time expiration in the controller.

7. BACnet MAC Address shall be set using decimal (0-9) based rotary switches.

8. Configuration change shall not be made in a programming environment, but rather by a configuration page utilizing dropdown list, check boxes, and numeric boxes.

9. For ease of troubleshooting, the Controller shall support BACnet data trend logging.

a. Trends shall be capable of being collected at a minimum sample rate of once every second.

b. Shall be capable of trending all BACnet points used by controller

K. Software Retention: All Zone Controller operating parameters, setpoints, BIOS, and sequence of operation code must be stored in non-volatile memory in order to maintain such information for months without power.

L. Controller shall meet the following Agency Compliance:

- UL916 PAZX, Open Energy Management Equipment
- UL94-V, Flammability
- FCC Part 15, Subpart B, Class B Limit
- AS/NZS CISPR 32:2016
- VCCI-CSPR 32:2016
- CAN ICES-003(B)/NMB-003(B)

7. To ensure integration to the building automation system the controller must be BTL (BACnet Testing Lab) listed. The following BACnet profiles are in order of most functionality (B-BC) to least functionality (B-ASC).

- BACnet Building Controller (B-BC)
- BACnet Advance Applications Controller (B-AAC)
- BACnet Application Specific Controller (B-ASC)

Points List: REHEAT VAV TERMINAL UNIT

System Point Description	POINTS	ALARMS
AIR VALVE DRIVE OPEN COMMAND AIR VLV OPN	X	
AIR VALVE DRIVE CLOSE COMMAND AIR VLV CLS	X	X
DISCHARGE AIR TEMPERATURE DAT	X	X
LOCAL HEAT ELECTRIC SCR OUTPUT EH	X	X
SPACE OCCUPANCY INPUT SP OCC	X	X
SPACE TEMPERATURE LOCAL SPT	X	X
SPACE TEMPERATURE SETPOINT LOCAL SPT SP	X	X
SUPPLY AIRFLOW DA FLW	X	X
BAS COMMUNICATION STATE BAS COM		X
DESIGN HEAT DISCHARGE AIR TEMP SETPOINT DSNG HT DAT SP		X
MAXIMUM COOLING AIRFLOW SETPOINT MAX CLG FLW SP		X
MINIMUM COOLING AIRFLOW SETPOINT MIN CLG FLW SP		X
MAXIMUM HEATING AIRFLOW SETPOINT MAX HTG FLW SP		X
MINIMUM HEATING AIRFLOW SETPOINT MIN HTG FLW SP		X
OCCUPIED BYPASS TIMER OCC TMR	X	X
OCCUPIED COOLING SETPOINT OCC CLG SP	X	X
OCCUPIED HEATING SETPOINT OCC HTG SP	X	X
UNOCCUPIED COOLING SETPOINT UNOCC CLG SP	X	X
UNOCCUPIED HEATING SETPOINT UNOCC HTG SP	X	X



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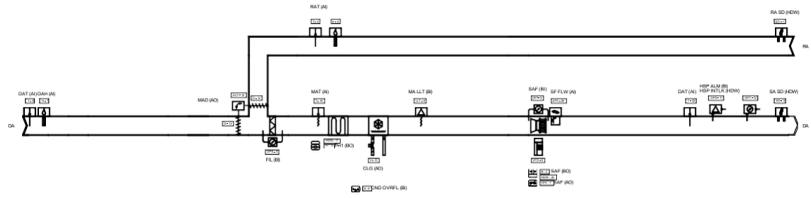
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6. CAN ICES-003(B)/NMB-003(B)

7. To ensure integration to the building automation system the controller must be BTL (BACnet Testing Lab) listed. The following BACnet profiles are in order of most functionality (B-BC) to least functionality (B-ASC).

- a. BACnet Building Controller (B-BC)
- b. BACnet Advance Applications Controller (B-AAC)
- c. BACnet Application Specific Controller (B-ASC)

Flow Diagram: AHU



Sequence of Operation: AHU

Building Automation System Interface:

The Building Automation System (BAS) shall send the controller Occupied Bypass, Pre-Cool, Occupied/Unoccupied and Heat/Cool modes. The BAS shall also send the discharge air temperature setpoint and the duct static pressure setpoint. If a BAS is not present, or communication is lost with the BAS the controller shall operate using default modes and setpoints.

Occupied:

During occupied periods, the supply fan shall run continuously and the mixed air dampers shall open to maintain minimum ventilation requirements.

The chilled water valve shall control to maintain the active discharge air temperature setpoint. If economizing is enabled, the outdoor air or mixed air dampers shall modulate to maintain the discharge air temperature setpoint and the relief air damper shall track the mixed air dampers. The discharge air temperature setpoint shall be dynamically reset based on the deviation of actual space temperature from the active space temperature setpoint. If the discharge air temperature sensor fails, the chilled water valve shall close and an alarm shall annunciate at the BAS.

Unoccupied:

When the space temperature is above the unoccupied cooling setpoint of 85.0 deg. F (adj.) the supply fan shall start, the outside air damper shall open if economizing is enabled and remain closed if economizing is disabled and the chilled water valve shall open. When the space temperature falls below the unoccupied cooling setpoint of 85.0 deg. F (adj.) minus the unoccupied differential of 4.0 deg. F (adj.) the supply fan shall stop, the chilled water valve shall close and the outside air damper shall close.

Optimal Start:

The BAS shall monitor the scheduled occupied time, occupied space setpoints and space temperature to calculate when the optimal start occurs.

Optimal Stop:

The BAS shall monitor the scheduled unoccupied time, occupied setpoints and space temperature to calculate when the optimal stop occurs. When the optimal stop mode is active the unit controller shall maintain the space temperature to the space temperature offset setpoint. Outside air damper shall remain enabled to provide minimum ventilation.

Occupied Bypass:

The BAS shall monitor the status of the ON and CANCEL buttons of the space temperature sensor. When an occupied bypass request is received from a space sensor, the unit shall transition from its current occupancy mode to occupied bypass mode and the unit shall maintain the space temperature to the occupied setpoints (adj.).

Heat/Cool Mode:

When the space temperature rises above the occupied cooling setpoint the mode shall transition to cooling. When the space temperature falls below the occupied heating setpoint the mode shall transition to heating. When the space temperature is above the occupied cooling setpoint or below the occupied heating setpoint the mode shall remain in its last state. If the space temperature sensor fails the mode shall remain in its last state and an alarm shall annunciate at the BAS. If the local and communicated setpoints fail the controller shall disable the supply fan and an alarm shall annunciate at the BAS.

Morning Warm-Up Mode:

During optimal start, if the average space temperature is below the occupied heating setpoint a morning warm-up mode shall be activated. When morning warm-up is initiated the unit shall enable the heating and fan(s). The outside air damper shall remain closed. When the space temperature reaches the occupied heating setpoint (adj.), the unit shall transition to the occupied mode.

Daytime Warm-Up Control:

During Occupied periods, when the space temperature is below the Daytime Warm-up Initiate setpoint, a daytime warm-up sequence shall be activated. The outside air damper shall modulate to maintain minimum ventilation requirements, and the heating shall enable to maintain the discharge air temperature heating setpoint. Daytime Warm-up shall terminate when the average space temperature reaches the Occupied heating setpoint.

Pre-Cool Mode:

During optimal start, if the average space temperature is above the occupied cooling setpoint, pre-cool mode shall be activated. When pre-cool is initiated the unit shall enable the fan and cooling or economizer. The outside air damper shall remain closed, unless economizing. When the space temperature reaches occupied cooling setpoint (adj.), the unit shall transition to the occupied mode.

Economizer Mode:

ENABLE: Outside air (OA) enthalpy shall be compared with Return air (RA) enthalpy point. The economizer shall enable when OA enthalpy is less than RA enthalpy - 2.0 BTU/LB. The economizer shall disable when OA enthalpy is greater than RA enthalpy.

OPERATION: When economizing is enabled and the unit is operating in the cooling mode, the economizer damper shall be modulated between its minimum position and 100% to maintain the space temperature setpoint. The economizer damper shall modulate toward minimum position in the event the mixed air temperature falls below the low temperature limit setting.

Discharge Air Temperature Reset Control:

The discharge air temperature setpoint shall be reset to the optimal setpoint communicated by the BAS. The Space Temperature BAS and the Space Temperature Setpoint BAS shall be communicated to the unit controller by the BAS. The discharge air temperature setpoint shall be reset based upon the deviation of the Space Temperature BAS from the Space Temperature Setpoint BAS. Also, the BAS shall override this reset function whenever outdoor dew point is higher than 60.0 deg. F (adj.) or indoor humidity (measured at the source of control) is higher than 60% RH (adj.). If the discharge air temperature drops below the minimum limit, a low temperature alarm shall annunciate, and the unit shall shut down. If the discharge air temperature rises above the maximum limit, a high temperature alarm shall annunciate.

Supply Fan:

The supply fan shall be off in the unoccupied mode. The supply fan shall be on if the control is heating or cooling in the unoccupied mode. When the controller is in the occupied mode, the supply fan shall operate continuously and its speed shall be modulated to maintain the duct static pressure setpoint. The duct static pressure setpoint shall be sent by the BAS and is reset between the minimum and maximum static pressure limits to maintain the critical zone VAV air damper in a position between 65% and 75% open.

A manual reset of the high static pressure cut-off switch shall be required to restart the fan.

Building Pressure Control (Relief Air):

After the fan startup delay expires, building static pressure shall be controlled by modulating the Outside Air Damper. As building pressure increases over the building pressure setpoint (adj.), the damper shall modulate closed. If the building pressure falls below the setpoint, the damper shall modulate open.

Preheat Control:

When the fan is off, the electric preheat shall be disabled.

When the fan is on, the preheat shall control to maintain a leaving preheat temperature of 45.0 deg. F (adj.). If the preheat temperature sensor fails, the electric preheat shall be disabled. An alarm shall annunciate at the BAS if the leaving preheat temperature sensor, the mixed air temperature sensor or the outside air temperature sensor are failed.

Mixed Air Low Limit:

The initial damper opening rate shall be limited to 2% per minute (adj.) until the damper has reached its minimum ventilation position. The outside air damper shall modulate to a position less than the minimum damper position if the mixed air temperature drops below 50.0 deg. F (adj.). If the mixed air temperature sensor fails an alarm shall annunciate at the BAS and the outside air damper shall return to the minimum position.

Freeze Protection:

A hardwired, low limit temperature switch shall be electrically interlocked with the variable speed drive. If the low limit temperature switch is tripped 38.0 deg. F (adj.), the fan shall be commanded off and the outside air damper shall close. All valves shall be commanded open to 100% (adjust per climate). The electric heating shall be disabled. An alarm shall annunciate at the BAS and manual reset of the low limit temperature switch shall be required to restart the fan.

Condensate Overflow Monitoring:

If the condensate level reaches the trip point, a condensate overflow diagnostic shall annunciate at the BAS. To prevent the condensate drain pan from overflowing and causing water damage to the building the fan shall be disabled and the chilled water valve shall close.

Filter Status:

A differential pressure switch shall monitor the differential pressure across the filter(s) when the fan is running. If the switch closes during normal operation a dirty filter alarm shall annunciate at the BAS.

Smoke Detector Shutdown:

The unit shall shut down in response to a signal from the smoke detector indicating the presence of smoke. The smoke detector shall be interlocked to the unit through the dry contacts of the smoke detector. A manual reset of the smoke detector shall

Guide Specification: AHU

1.1 ADVANCED APPLICATION CONTROLLERS

A. Advance Application Controllers shall be used to control all equipment or applications of medium and high complexity, including but not limited to Air Handlers, Boiler Plants and Chiller Plants.

B. The Advanced Application Controller shall be capable of operating as a stand-alone controller or as a member of a Building Automation System (BAS).

C. When the Advanced Application Controller is operating as a member of a Building Automation System (BAS), the application controller shall operate as follows:

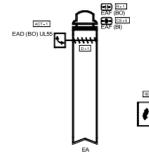
be required to restart the unit.

Points List: AHU

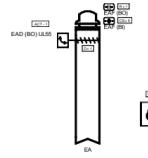
System Point Description	RESTART	ANALOG HARDWARE INPUT (AI)	BINARY HARDWARE INPUT (BI)	ANALOG HARDWARE OUTPUT (AO)	BINARY HARDWARE OUTPUT (BO)	HARDWARE INTERLOCK (HW)	WIRELESS (WLS)	NETWORK (NET)	DIAGNOSTIC	LATCH	LOW ANALOG LIMIT	BINARY	SENSOR FAIL	COMMUNICATION FAIL
CONDENSATE OVERFLOW DETECTION LOCAL CND OVRF			X										X	
COOLING COIL LEAVING TEMPERATURE CC LAT	X	X											X	X
COOLING OUTPUT COMMAND CCG	X	X												
DISCHARGE AIR TEMPERATURE DAT	X	X											X	X
FILTER STATUS FL	X	X											X	
HEAT ENABLE HT ENA	X	X												
HIGH STATIC ALARM HSP ALM	X	X											X	X
HIGH STATIC ALARM INTERLOCK HSP INTLK						X								
MIXED AIR DAMPER COMMAND MAD	X	X												
MIXED AIR LOW TEMPERATURE C/OUT ALARM MA LLT			X											X
MIXED AIR TEMPERATURE LOCAL MAT	X	X											X	X
OUTDOOR AIR RELATIVE HUMIDITY LOCAL OAH	X	X												
OUTDOOR AIR TEMPERATURE LOCAL OAT	X	X												
PREHEAT LEAVING COIL TEMPERATURE LOCAL PH LAT	X	X												X
PREHEAT OUTPUT 1 PH1	X	X												
RELIEF AIR FAN SPEED OUTPUT COMMAND RLF	X	X												
RETURN AIR TEMPERATURE LOCAL RAT	X	X												
RETURN SMOKE DETECTOR INPUT RA SD							X							
SPACE HUMIDITY LOCAL SPH	X	X												X
SUPPLY FAN AIR FLOW LOCAL SF FLW	X	X												
SUPPLY FAN SPEED COMMAND SFC	X	X												
SUPPLY FAN START STOP COMMAND SFS	X	X												
SUPPLY FAN STATUS SFF	X	X												
SUPPLY SMOKE DETECTOR INPUT SA SD							X							
BAS COMMUNICATION STATE BAS COM							X							X
DISCHARGE AIR COOLING SETPOINT DA CL SP				X										
DISCHARGE AIR HEATING SETPOINT DA HT SP				X										
MAINTENANCE REQUIRED MNT REQ										X				
MIXED AIR TEMPERATURE LOW LIMIT SETPOINT MA LLT STPT				X										
OCCUPIED COOLING SETPOINT OCC CLG STPT	X	X												
OCCUPIED HEATING SETPOINT OCC HTG STPT	X	X												
SUPPLY FAN FAILURE SF FAIL	X	X										X		
UNOCCUPIED COOLING SETPOINT UNOCC CLG STPT	X	X												
UNOCCUPIED HEATING SETPOINT UNOCC HTG STPT	X	X												



Flow Diagram: FAN



Flow Diagram: SMOKE EXHAUST FAN

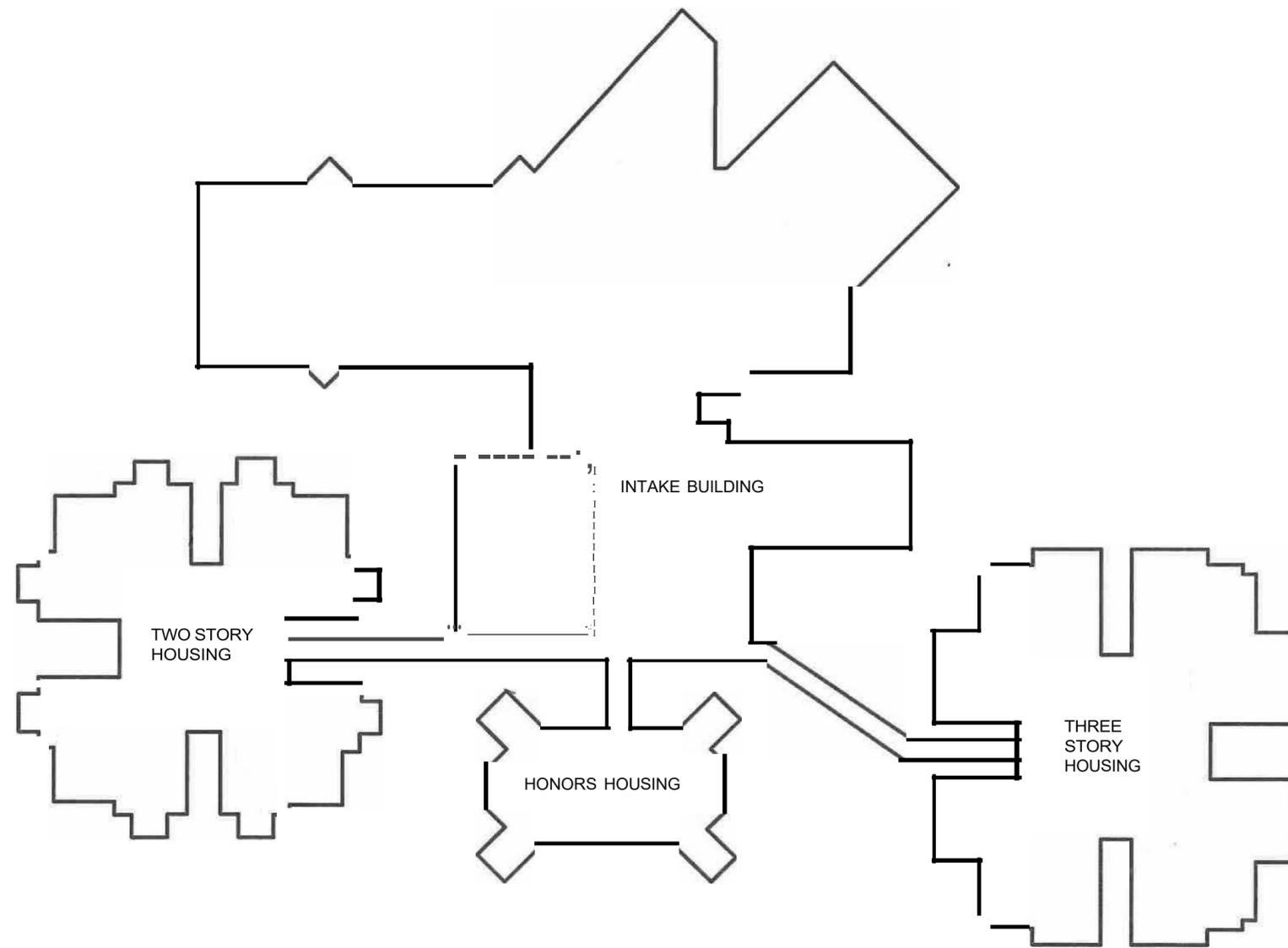


Points List: FAN

System Point Description	POINTS	ALARMS
	GRAPHIC	
	ANALOG HARDWARE INPUT (AI)	
	BINARY HARDWARE INPUT (BI)	
	ANALOG HARDWARE OUTPUT (AO)	
	BINARY HARDWARE OUTPUT (BO)	
	SOFTWARE POINT (SFT)	
	HARDWARE INTERLOCK (HDW)	
	WIRELESS (WLS)	
	NETWORK (NET)	
	HIGH ANALOG LIMIT	
	LOW ANALOG LIMIT	
	BINARY	
	LATCH DIAGNOSTIC	
	SENSOR FAIL	
	COMMUNICATION FAIL	
SMOKE DETECTOR	X	
EXHAUST AIR DAMPER COMMAND EAD		X
EXHAUST FAN STATUS EAF	X	X
EXHAUST FAN START STOP COMMAND EAF	X	X
BAS COMMUNICATION STATE BAS COM		X

SEE M11.12, AND M11.13 FOR SMOKE CONTROL SEQUENCE

SMOKE CONTROL SEQUENCES



- 5) The dorm area plenum return air damper closes..
- 6) Dayroom area smoke exhaust fan remains disabled with motorized damper closed.

- 5) Dayroom smoke exhaust damper remains closed.
- 6) The ducted return air circulation damper shall close.
- 7) The normal single exhaust fan is disabled with damper closed.





THREE-STORY HOUSING		APPLIED SEQUENCE TYPE
AIR HANDLING SYSTEM	AHU-1	
LEVEL ONE - ZONE "A"		
NORMAL EXHAUST FAN	EF-H19	F
NORMAL EXHAUST FAN	EF-H30	
SMOKE EXHAUST FAN	SEF-H19	
NORMAL EXHAUST FAN	EF-H25	
LEVEL ONE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H21	F
LEVEL TWO - ZONE "A"		
NORMAL EXHAUST FAN	EF-3	E
SMOKE EXHAUST FAN	SEF-3	
NORMAL EXHAUST FAN	EF-4	E
SMOKE EXHAUST FAN	SEF-4	
LEVEL TWO - ZONE "B"		
NORMAL EXHAUST FAN	EF-H1	E
SMOKE EXHAUST FAN	SEF-H1	
NORMAL EXHAUST FAN	EF-H2	E
SMOKE EXHAUST FAN	SEF-H2	
LEVEL THREE - ZONE "A"		
NORMAL EXHAUST FAN	EF-3	E
SMOKE EXHAUST FAN	SEF-3	
NORMAL EXHAUST FAN	EF-4	E
SMOKE EXHAUST FAN	SEF-4	
LEVEL THREE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H1	E
SMOKE EXHAUST FAN	SEF-H1	
NORMAL EXHAUST FAN	EF-H2	E
SMOKE EXHAUST FAN	SEF-H2	

THREE-STORY HOUSING		APPLIED SEQUENCE TYPE
AIR HANDLING SYSTEM	AHU-2	
LEVEL ONE - ZONE "A"		
NORMAL EXHAUST FAN	EF-H26	F
SMOKE EXHAUST FAN	EF-H20	
NORMAL EXHAUST FAN	EF-H20	
LEVEL ONE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H22	F
LEVEL TWO - ZONE "A"		
NORMAL EXHAUST FAN	EF-H7	E
SMOKE EXHAUST FAN	SEF-H7	
NORMAL EXHAUST FAN	EF-H8	E
SMOKE EXHAUST FAN	SEF-H8	
LEVEL TWO - ZONE "B"		
NORMAL EXHAUST FAN	EF-H5	E
SMOKE EXHAUST FAN	SEF-H5	
NORMAL EXHAUST FAN	EF-H6	E
SMOKE EXHAUST FAN	SEF-H6	
LEVEL THREE - ZONE "A"		
NORMAL EXHAUST FAN	EF-7	E
SMOKE EXHAUST FAN	SEF-7	
NORMAL EXHAUST FAN	EF-8	E
SMOKE EXHAUST FAN	SEF-8	
LEVEL THREE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H5	E
SMOKE EXHAUST FAN	SEF-H5	
NORMAL EXHAUST FAN	EF-H6	E
SMOKE EXHAUST FAN	SEF-H6	

THREE-STORY HOUSING		APPLIED SEQUENCE TYPE
AIR HANDLING SYSTEM	AHU-3	
LEVEL ONE - ZONE "A"		
NORMAL EXHAUST FAN	EF-H27	F
NORMAL EXHAUST FAN	EF-H29	
LEVEL ONE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H23	F
SMOKE EXHAUST FAN	SEF-H17	
NORMAL EXHAUST FAN	EF-H17	
LEVEL TWO - ZONE "A"		
NORMAL EXHAUST FAN	EF-H11	E
SMOKE EXHAUST FAN	SEF-H11	
NORMAL EXHAUST FAN	EF-H12	E
SMOKE EXHAUST FAN	SEF-H12	
LEVEL TWO - ZONE "B"		
NORMAL EXHAUST FAN	EF-H9	E
SMOKE EXHAUST FAN	SEF-H9	
NORMAL EXHAUST FAN	EF-H10	E
SMOKE EXHAUST FAN	SEF-H10	
LEVEL THREE - ZONE "A"		
NORMAL EXHAUST FAN	EF-11	E
SMOKE EXHAUST FAN	SEF-11	
NORMAL EXHAUST FAN	EF-12	E
SMOKE EXHAUST FAN	SEF-12	
LEVEL THREE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H9	E
SMOKE EXHAUST FAN	SEF-H9	
NORMAL EXHAUST FAN	EF-H10	E
SMOKE EXHAUST FAN	SEF-H10	

THREE-STORY HOUSING		APPLIED SEQUENCE TYPE
AIR HANDLING SYSTEM	AHU-4	
LEVEL ONE - ZONE "A"		
NORMAL EXHAUST FAN	EF-H28	F
LEVEL ONE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H18	F
SMOKE EXHAUST FAN	SEF-H18	
NORMAL EXHAUST FAN	EF-H24	
LEVEL TWO - ZONE "A"		
NORMAL EXHAUST FAN	EF-H15	E
SMOKE EXHAUST FAN	SEF-H15	
NORMAL EXHAUST FAN	EF-H16	E
SMOKE EXHAUST FAN	SEF-H16	
LEVEL TWO - ZONE "B"		
NORMAL EXHAUST FAN	EF-H13	E
SMOKE EXHAUST FAN	SEF-H13	
NORMAL EXHAUST FAN	EF-H14	E
SMOKE EXHAUST FAN	SEF-H14	
LEVEL THREE - ZONE "A"		
NORMAL EXHAUST FAN	EF-H15	E
SMOKE EXHAUST FAN	SEF-H15	
NORMAL EXHAUST FAN	EF-H16	E
SMOKE EXHAUST FAN	SEF-H16	
LEVEL THREE - ZONE "B"		
NORMAL EXHAUST FAN	EF-H13	E
SMOKE EXHAUST FAN	SEF-H13	
NORMAL EXHAUST FAN	EF-H14	E
SMOKE EXHAUST FAN	SEF-H14	

SEQUENCE OF OPERATION

Sequence Type "E":

- a. This system is the same as described in Sequence Type "C" except the level one and level two mechanical equipment is dedicated to levels two and three.
- b. Normal Operation:
 1. Same as Sequence Type "C".
- c. Smoke Exhaust – Dayroom:
 1. Same as Sequence Type "C".
- d. Smoke Exhaust – Single Cells:
 1. Same as Sequence Type "C".

SEQUENCE OF OPERATION

Applied Control Sequence

1. Sequence Type "F":
 - a. This system consists of a general exhaust fan and a motorized damper dedicated to the first floor spaces, a smoke exhaust fan with a motorized damper dedicated to the first floor spaces, a miscellaneous exhaust isolation motorized damper, a fan terminal box, and a central station air handling unit.
 - b. Smoke Exhaust – First Floor Spaces:
 1. AHU outside air dampers full open, return air dampers fully closed
 2. All terminal box dampers served by AHU close except those serving adjacent first floor rooms.
 3. Smoke room terminal box open to smoke/maximum setpoint.
 4. Motorized damper for dedicated first floor room exhaust fan opens and exhaust fan starts.
 5. Dedicated first floor room plenum return air damper closes.



PROJECT MANUAL

FOR

HENRY WADE JJC AIR HANDLER REPLACEMENT

PROJECT NUMBER: 2024-DC048-002



DALLAS COUNTY FACILITIES MANAGEMENT

**HENRY WADE JUVENILE JUSTICE CENTER
2600 LONE STAR DRIVE
DALLAS, TEXAS 75212**

ISSUED FOR: ISSUE FOR CONSTRUCTION; DECEMBER 5, 2025

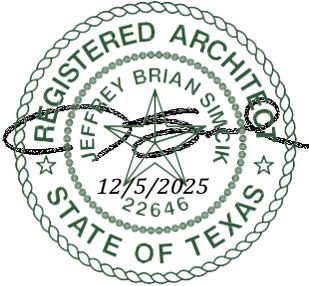
PREPARED BY:

HED

**SECTION 000107
SEALS PAGE**

ARCHITECTURAL

MEP



END OF SECTION 000107

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SECTION 000110 - TABLE OF CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS

Division 00 -- Procurement and Contracting Requirements

- 000101 - Project Title Page
- 000107 - Seals Page
- 000110 - Table of Contents
- 000115 - List of Drawing Sheets

SPECIFICATIONS

Division 01 -- General Requirements

- 011000 - Summary
- 012000 - Price and Payment Procedures
- 012500 - Substitution Procedures
- CSI 1.5C - Substitution Request Form (Sample) Pre-Bid
- CSI 13.1A - Substitution Request Form (Sample) Post-Bid
- 013000 - Administrative Requirements
- 013000.01 - Administrative Requirements, Appendix 01
- 013000.02 - Administrative Requirements, Appendix 02
- 013216 - Construction Progress Schedule
- 013553 - Security Procedures
- 014000 - Quality Requirements
- 014100 - Regulatory Requirements
- 014216 - Definitions
- 015000 - Temporary Facilities and Controls
- 015213 - Field Offices and Sheds
- 015500 - Vehicular Access and Parking
- 016000 - Product Requirements
- 016116 - Volatile Organic Compound (VOC) Content Restrictions
- 017000 - Execution and Closeout Requirements
- 017800 - Closeout Submittals
- 017900 - Demonstration and Training

Division 02 -- Existing Conditions

- 024100 - Demolition

- Division 03 -- Concrete (NOT USED)**
- Division 04 -- Masonry (NOT USED)**
- Division 05 -- Metals (NOT USED)**
- Division 06 -- Wood, Plastics, and Composites (NOT USED)**
- Division 07 -- Thermal and Moisture Protection (NOT USED)**
- Division 08 -- Openings (NOT USED)**
- Division 09 -- Finishes (NOT USED)**
- Division 10 -- Specialties (NOT USED)**
- Division 11 -- Equipment (NOT USED)**
- Division 12 -- Furnishings (NOT USED)**
- Division 13 -- Special Construction (NOT USED)**
- Division 14 -- Conveying Equipment (NOT USED)**
- Division 21 -- Fire Suppression (NOT USED)**
- Division 22 -- Plumbing (NOT USED)**
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- 230010 - General Requirements for HVAC Systems
- 230593 - Testing, Adjusting, and Balancing for HVAC
- 230800 - Commissioning of HVAC
- 230923 - Direct-Digital Control System for HVAC - Schneider Electric
- 232113 - Hydronic Piping
- 232114 - Hydronic Specialties
- 233100 - HVAC Ducts and Casings
- 233300 - Air Duct Accessories
- 233419 - Smoke Control Systems
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- 237413 - Packaged Outdoor Central-Station Air-Handling Units

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- 260526 - Grounding and Bonding for Electrical Systems
- 260529 - Hangers and Supports for Electrical Systems
- 260533.13 - Conduit for Electrical Systems
- 260533.16 - Boxes for Electrical Systems
- 260553 - Identification for Electrical Systems
- 262813 - Fuses
- 262816.16 - Enclosed Switches

Division 27 -- Communications (NOT USED)
Division 28 -- Electronic Safety and Security (NOT USED)
Division 31 -- Earthwork (NOT USED)
Division 32 -- Exterior Improvements (NOT USED)
Division 33 -- Utilities (NOT USED)
Division 34 -- Transportation (NOT USED)
Division 40 -- Process Integration (NOT USED)
Division 46 -- Water and Wastewater Equipment (NOT USED)
END OF SECTION 000110

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**SECTION 000115
LIST OF DRAWING SHEETS**

1.01 CONTRACT DRAWINGS

- A. The following Drawings, marked and dated as noted below, form a part of the Contract Documents:
1. Marked: Issued for: Issue for Construction
 2. Dated: December 5, 2025
 3. List: Refer to Drawing G-001 for complete list of drawings.

END OF SECTION 000115

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**SECTION 011000
SUMMARY**

PART 1 GENERAL

1.01 PROJECT

- A. Project Name: Henry Wade JJC Air Handler Replacement
- B. Owner's Name: Dallas County Facilities Management.
- C. Architect's Name: HED.

1.02 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 005200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on Drawings and specified in Section 024100.
- B. Scope of alterations new Work is indicated on Drawings.

1.04 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Owner intends to occupy the Project upon Substantial Completion.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
 - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Others.
 - 3. Work by Owner.
 - 4. Use of site and premises by the public.
- C. Provide access to and from site as required by law and by Owner:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- D. Time Restrictions:
 - 1. Limit conduct of the hours of 7:00 am and 4:00 pm weekdays. Weekend hours or evening hours may be considered..
- E. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 - 3. Prevent accidental disruption of utility services to other facilities.

1.06 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

**SECTION 012000
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Correlation of Contractor submittals based on changes.
- D. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
- F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. For each item, provide a column for listing each of the following:
 - 1. Item Number.
 - 2. Description of work.
 - 3. Scheduled Values.
 - 4. Previous Applications.
 - 5. Work in Place and Stored Materials under this Application.
 - 6. Authorized Change Orders.
 - 7. Total Completed and Stored to Date of Application.
 - 8. Percentage of Completion.
 - 9. Balance to Finish.
 - 10. Retainage.
- F. Execute certification by signature of authorized officer.
- G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
- H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

- I. Submit one electronic and three hard-copies of each Application for Payment.
- J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within ____ days.
- D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- E. Substantiation of Costs: Provide full information required for evaluation.
 - 1. On request, provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- F. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

- G. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- H. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 017000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012000

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**SECTION 012500
SUBSTITUTION PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittal procedures, coordination.
- B. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- C. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.
- B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. A Substitution Request for specified installer constitutes a representation that the submitter:

1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 1. Show compliance with requirements for substitutions and the following, as applicable.
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
 2. Note explicitly any non-compliant characteristics.
 3. Product Presentation: If requested by Architect, conduct a presentation at the Architect's office to prove appropriateness to the specified product.
- D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
 1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- E. Limit each request to a single proposed substitution item.
 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Submittal Time Restrictions:
 1. Owner will consider requests for substitutions only if submitted as "Voluntary Substitution" submitted with a bid.

2. Substitutions submitted by Bidders at the time of "Bid Submission" to the Construction Manager as "Voluntary Substitutions" will be considered during the Bidding review and negotiation process. If a substitution is accepted, an Addendum/Bulletin will be issued incorporating such substitution.
- B. Submittal Form (before award of contract) to support "Voluntary Substitution" included with bid:
 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
- C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
- D. Substitutions will not be considered under one or more of the following circumstances:
 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 2. Without a separate written request.
 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.
 1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.
-

- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION 012500



**SUBSTITUTION
REQUEST**
(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

 From: _____
 To: _____ Date: _____

 A/E Project Number: _____
 Re: _____ Contract For: _____

Specification Title: _____ Description: _____
 Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
 Manufacturer: _____ Address: _____ Phone: _____
 Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
-

Submitted by: _____
 Signed by: _____
 Firm: _____
 Address: _____

 Telephone: _____

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

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**SUBSTITUTION
REQUEST**
(After the Bidding/Negotiating Phase)

Project: _____ Substitution Request Number: _____

From: _____
To: _____ Date: _____

A/E Project Number: _____
Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____
Installer: _____ Address: _____ Phone: _____

History: New product 1-4 years old 5-10 years old More than 10 years old

Differences between proposed substitution and specified product: _____

Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$ _____).

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

**SUBSTITUTION
REQUEST**

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Phase — Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
 - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
-

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments:

A/E's REVIEW AND RECOMMENDATION

- Approve Substitution - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- Approve Substitution as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- Reject Substitution - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____ Date: _____

OWNER'S REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.
- Substitution rejected - Use specified materials.

Signed by: _____ Date: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E

**SECTION 013000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Contractor's daily reports.
- E. Coordination drawings.
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Requests for Information (RFI) procedures.
- I. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 016000 - Product Requirements: General product requirements.
- B. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

- A. AIA G716 - Request for Information; 2004.

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Information (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Delegated Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.
 - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
 - 11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 - 1. Owner.

2. Architect.
 3. Contractor.
- C. Agenda:
1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Submission of initial Submittal schedule.
 6. Designation of personnel representing the parties to Contract, Owner and Architect.
 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, inspection requests, post approval documents and Contract closeout procedures.
 8. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Special consultants.
 5. Contractor's superintendent.
 6. Major subcontractors.
- D. Agenda:
1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Maintenance of progress schedule.
 7. Corrective measures to regain projected schedules.
 8. Planned progress during succeeding work period.
 9. Maintenance of quality and work standards.
 10. Effect of proposed changes on progress schedule and coordination.
 11. Other business relating to work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 DAILY CONSTRUCTION REPORTS

- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

- B. In addition to transmitting electronically a copy to Owner and Architect, submit two printed copies at weekly intervals.
 - 1. Submit in format acceptable to Owner.
- C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 - 1. Date.
 - 2. High and low temperatures, and general weather conditions.
 - 3. List of subcontractors at Project site.
 - 4. List of separate contractors at Project site.
 - 5. Safety, environmental, or industrial relations incidents.
 - 6. Meetings and significant decisions.
 - 7. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
 - 8. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
 - 9. Change Orders received and implemented.
 - 10. Testing and/or inspections performed.
 - 11. Signature of Contractor's authorized representative.

3.04 COORDINATION DRAWINGS

- A. Provide information required by Project Coordinator for preparation of coordination drawings.
- B. Review drawings prior to submission to Architect.

3.05 REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
 - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 - 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
 - B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
 - C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 - 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 - 2. Prepare in a format and with content acceptable to Owner.
 - a. Use AIA G716 - Request for Information .
 - 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
 - D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
-

2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 016000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
 - a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within 5 working days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

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- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.06 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 1. Submit at the same time as the preliminary schedule.
 - a. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - b. Submit revised submittal schedule to reflect changes in current status and timing for submittals concurrently with the first complete submittal of Contractor's construction schedule.
 2. Coordinate with Contractor's construction schedule and schedule of values.
 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, role and name of subcontractor, and scheduled date of fabrication.
 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.07 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.08 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
-

1. Design data.
2. Sustainability design submittals and reports.
3. Certificates.
4. Test reports.
5. Inspection reports.
6. Manufacturer's instructions.
7. Manufacturer's field reports.
8. Qualification data.
9. Maintenance data.
10. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
 1. Project record documents.
 2. Operation and maintenance data.
 3. Warranties.
 4. Bonds.
 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format via e-mail; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
 1. Contractor shall retain one copy of file as an electronic Project record document file at the Project Site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

- A. General Requirements:
 1. Use a separate transmittal for each item.
 2. Submission of separate specification sections in one submittal is not allowed unless materials specified in separate sections are integral to the submittal.
 3. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
 4. Transmit using approved form.
 - a. Refer to Section 013300.03, "Administrative Requirements, Appendix 03", for a sample transmittal form that contains all information required. The sample transmittal form is available in Microsoft Word format for Contractor's use. Contractor's form may be used if all required information is provided.

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5. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 6. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 7. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 8. Deliver or transmit submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project. Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Transmittal must be electronically signed by the Contractor certifying submittal, to the best of the Contractor's knowledge, is in compliance with Contract Documents except as noted. Architect will return without review submittals received from sources other than Contractor.
 - a. Place a permanent label or title block on each submittal item for identification.
 - b. Refer to Appendix 013300.02, "Contractor's Submittal Label Information", for sample label. Sample is shown completely filled out for clarification. Size of label is optional but all information shown shall be included and shall be easily read.
 - c. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - d. Deliver hard copy or sample submittals to Architect at business address; Attention: Contract Administration.
 - e. Send submittals in electronic format via email to Architect.
 9. Schedule submittals to expedite the Project, and coordinate submission of related items. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - a. For each submittal and re-submittal for review, allow 10 working days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 working days.
 - 1) Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 calendar days.
 - d. Submittals received by 10:00 am will be marked as received on that day. Submittals received after 10:00 am will be marked as received on the next working day.
 10. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 11. Identify options requiring selection by Architect.
 12. Provide space on label or beside title block for Contractor review stamps. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Architect's project number and Owner's account/project number, if applicable.
 - c. Date.
 - d. Name and address of Architect.
-

- e. Name and address of Contractor.
 - f. Name and address of subcontractor.
 - g. Name and address of supplier.
 - h. Name of manufacturer.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Name of drawing preparer not initials.
 - l. Name of person and company preparing submittals.
 - m. Other necessary identification.
13. When revised for resubmission, identify all changes made since previous submission.
 - a. Reviewing of resubmitted Shop Drawings by the Architect shall be limited to required corrections only, and the Contractor or Subcontractor by resubmitting shall be held to represent that the resubmitted Shop Drawings contain no other alterations, additions or deletions. If additional changes have been made, same shall be specifically noted and described on the Shop Drawing and/or in the covering transmittal.
 - b. Architect's services beyond those stipulated in the Owner/Architect Agreement may be a cause for the Owner to impose reimbursement by the Contractor for these additional services performed by the Architect. As a guide to establish limits of these services and provide a base for the Contractor to use in preparing its Bid, the following limits shall apply:
 - 1) Up to two (2) reviews for each Shop Drawing, Product Data item, Sample and similar submittals.
 14. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 15. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 16. Submittals not requested will be recognized, and will be returned "Submittal Not Requested (SNR)".
 17. Fabrication commenced prior to completion of review by Architect shall be at the sole risk of the Contractor.
- B. Product Data Procedures:
1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.
 3. Submit concurrently with related shop drawing submittal unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 4. Do not submit (Material) Safety Data Sheets for materials or products.
 - a. Submit Material Data Safety Sheets to Owner if requested.
 5. Submit sustainable design reporting submittals under separate cover.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Use of reproductions of Contract Documents in digital data form to create shop drawings is only permitted with Architect approval.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
 2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
-

3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.12 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt, but will take no other action.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 1. Refer to Section 013300.01, "Administrative Requirements Appendix 01", for sample action stamp.
 2. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "Reviewed (R)", or language with same legal meaning.
 - 1) Proceed on Basis of Information Received.
 - b. "Reviewed as Noted (RAN)", or language with same legal meaning.
 - 1) Proceed on Basis of Revised Information Noted.
 - c. "Reviewed and Resubmit for Record (RRR)", or language with same legal meaning.
 - 1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
 - d. "Submittal Not Requested, Not Reviewed (SNR)" , or language with same legal meaning.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Provide as Specified (PAS)".
 - 1) Work shall not proceed based on non-specified information submitted. Resubmit.
 - b. "Revise and Resubmit (RR)".
 - 1) Work shall not proceed based on information submitted. Resubmit.
- E. Architect's and consultants' actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Received" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 013000

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SECTION 013000.01 - ADMINISTRATIVE REQUIREMENTS APPENDIX 01

ARCHITECT'S ACTION STAMP SAMPLE



Submittal Review

Architect/Engineer's review is for general conformance with the design concept and the intent of the contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departure therefrom. The Contractor remains responsible for details and accuracy. This review does not authorize any additional cost or schedule change. Refer to the Contract Documents relative to submittals for clarification of Contractor responsibility.

HED Project Number/Name: [Redacted]

Submittal Number: [Redacted]

Discipline	Reviewer	Date	Remarks Attached
A+D			<input type="checkbox"/>
Civil / Site			<input type="checkbox"/>
Structural			<input type="checkbox"/>
Interiors			<input type="checkbox"/>
Mechanical			<input type="checkbox"/>
Electrical			<input type="checkbox"/>

<input type="checkbox"/>	Reviewed (R) Work May Proceed	<input type="checkbox"/>	Reviewed & Resubmit for Record (RRR) Work May Proceed. Revise & Resubmit for Record.
<input type="checkbox"/>	Reviewed as Noted (RAN) Work May Proceed on Basis of Revised Information Noted	<input type="checkbox"/>	Revise & Resubmit (RR) Work Shall Not Proceed Based on Information Submitted. Revise & Resubmit.
<input type="checkbox"/>	Submittal Not Requested / Not Reviewed (SNR)	<input type="checkbox"/>	Provide as Specified (PAS) Work Shall Not Proceed Based on Non-Specified Information Submitted. Revise & Resubmit.

Final Action / Selection for Contractor:

Final Review By: _____ Date: _____

END OF SECTION 013000.01

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SECTION 013000.02 - ADMINISTRATIVE REQUIREMENTS APPENDIX 02

CONTRACTOR'S SUBMITTAL LABEL INFORMATION SAMPLE

Project	Project Name
Architect's Project No.	Project Number
Date	Date
Architect	HED Address City, State, Zip
General Contractor (Construction Manager) Address, phone number	Name Address City, State, Zip Phone
Subcontractor Address, phone number	Name Address City, State, Zip Phone
Supplier/Manufacturer Address, phone number	Name Address City, State, Zip Phone
Drawn By (name, not initials)	Name
Specification No. and Title	081113, Hollow Metal Doors and Frames
Drawing No.	A-1
Detail Reference (if applicable)	1/A-501
Name of person and company preparing submittal	Name Company

END OF SECTION 013000.02

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**SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.02 RELATED SECTIONS

- A. Section 011000 - Summary: Work sequence.

1.03 SUBMITTALS

- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

1.04 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- D. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION 013216

**SECTION 013553
SECURITY PROCEDURES**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security measures including formal security program, entry control, personnel identification, guard service, and miscellaneous restrictions.

1.02 SECURITY PROGRAM

- A. Protect Work , existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
- B. Initiate program in coordination with Owner's existing security system at project mobilization.

1.03 ENTRY CONTROL

- A. Restrict entrance of persons and vehicles into Project site and existing facilities.
- B. Allow entrance only to authorized persons with proper identification.
- C. Maintain log of workers and visitors, make available to Owner on request.
- D. All hand tools and personal equipment must be taken by workers, kept safe in a secure and locked space away from easy access, or when leaving the project site.

1.04 PERSONNEL IDENTIFICATION

- A. All contractor and sub-contractors workers will need to fill out Dallas County Sheriff's Department Security Check form, Dallas County Fire Marshal security background check forms and Texas Juvenile Justice Department's background check, including finger printing.
- B. Provide identification badge to each person authorized to enter premises.
- C. Badge To Include: Personal photograph, name, assigned number , expiration date and employer.
- D. Maintain a list of accredited persons, submit copy to Owner on request.
- E. Require return of badges at expiration of their employment on the Work.

1.05 GUARD SERVICE

- A. Owner to provide uniformed armed guard service to provide watch persons at site during contractor crew working hours.
- B. All contractor's crews will need to be escorted at all times.

1.06 RESTRICTIONS

- A. Work hours limited to between the hours of 7:00 am and 4:00 pm Monday through Friday.
- B. Do no work on Saturdays and Sundays.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 013553

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**SECTION 014000
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.

- D. Inspection agencies and services.
- E. Contractor's design-related professional design services.
- F. Control of installation.
- G. Tolerances.
- H. Manufacturers' field services.
- I. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittal procedures.
- B. Section 014216 - Definitions.
- C. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Delegated Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
 - 1. Design Services Types Required:
 - a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- C. Delegated Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.04 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Base design on performance and/or design criteria indicated in individual specification sections.
 - 1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 - 1. Structural Design of Metal Framing: As described in Section 054000 - Cold-Formed Metal Framing.
 - 2. Structural Design of Metal Fabrications: As described in Section 055000 - Metal Fabrications.

3. System Design: As described in Section 230913 - Instrumentation and Control Devices for HVAC.
4. System Design: As described in Section 230923 - Direct-Digital Control System for HVAC.
5. Written Sequence of Operation: Include entire HVAC system and each piece of equipment, as described in Section 230993 - Sequence of Operations for HVAC Controls.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Delegated Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
 - a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Delegated Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 2. Include required product data and shop drawings.
 3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
- E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

-
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
 - F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
 - G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications:
 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.07 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.08 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. Contractor Employed Agency:
 1. Laboratory: Authorized to operate in the State in which the Project is located.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Qualifications to be submitted for personnel working at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 014000

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**SECTION 014100
REGULATORY REQUIREMENTS**

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

- A. Regulatory requirements applicable to this project are the following:
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. 29 CFR 1910 - Occupational Safety and Health Standards; Current Edition.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- E. ICC (IFC) - International Fire Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. ICC (IFGC) - International Fuel Gas Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. ICC (IECC) - International Energy Conservation Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements.

1.03 QUALITY ASSURANCE

- A. Contractor's Designer Qualifications: Refer to Section - 014000 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 014100

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**SECTION 014216
DEFINITIONS**

PART 1 GENERAL

1.01 SUMMARY

- A. This section supplements the definitions contained in the General Conditions.
- B. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Project Manual: The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.
- E. Provide: To furnish and install.
- F. Supply: Same as Furnish.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 014216

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**SECTION 015000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Security requirements.
- D. Waste removal facilities and services.

1.02 RELATED REQUIREMENTS

- A. Section 013553 - Security Procedures
- B. Section 015100 - Temporary Utilities.
- C. Section 015213 - Field Offices and Sheds.
- D. Section 015500 - Vehicular Access and Parking.
- E. Section 015813 - Temporary Project Signage.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

1.04 TEMPORARY UTILITIES - SEE SECTION 015100

- A. Owner will provide the following:
 - 1. Electrical power and metering, consisting of connection to existing facilities.
- B. Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes.
- C. Existing facilities may not be used.
- D. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.05 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
 - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
 - 2. Telephone Land Lines: One line, minimum; one handset per line.
 - 3. Internet Connections: Minimum of one; DSL modem or faster.

1.06 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. Maintain daily in clean and sanitary condition.
- D. At end of construction, return facilities to same or better condition as originally found.

1.07 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.08 FENCING

- A. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.09 SECURITY - SEE SECTION 013553

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.10 WASTE REMOVAL

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.11 FIELD OFFICES - SEE SECTION 015213

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015000

**SECTION 015213
FIELD OFFICES AND SHEDS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Temporary field offices for use of Contractor.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: use of premises and responsibility for providing field offices.
- B. Section 015000 - Temporary Facilities and Controls:
 - 1. Temporary telecommunications services for administrative purposes.
 - 2. Temporary sanitary facilities required by law.

1.03 USE OF EXISTING FACILITIES

- A. Existing facilities shall not be used for field offices.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

- A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONTRACTOR OFFICE AND FACILITIES

- A. Size: For Contractor's needs and to provide space for project meetings.
- B. Telephone: As specified in Section 015000.
- C. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.
- D. Other Furnishings: Contractor's option.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.02 MAINTENANCE AND CLEANING

- A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.
- B. Maintain approach walks free of mud, water, and snow.

END OF SECTION 015213

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**SECTION 015500
VEHICULAR ACCESS AND PARKING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Access roads.
- B. Parking.

- C. Existing pavements and parking areas.
- D. Construction parking controls.
- E. Haul routes.
- F. Maintenance.
- G. Removal, repair.
- H. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: For access to site, work sequence, and occupancy.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 ACCESS ROADS

- A. Use of existing on-site streets and driveways for construction traffic is permitted.
- B. Tracked vehicles not allowed on paved areas.

3.02 PARKING

- A. Use of designated areas of existing parking facilities by construction personnel is permitted.

3.03 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.04 HAUL ROUTES

- A. Confine construction traffic to designated haul routes.
- B. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.05 MAINTENANCE

- A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.06 REMOVAL, REPAIR

- A. Repair existing facilities damaged by use, to original condition.
- B. Remove equipment and devices when no longer required.

C. Repair damage caused by installation.

3.07 MUD FROM SITE VEHICLES

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION 015500

**SECTION 016000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General product requirements.
- B. Re-use of existing products.
- C. Transportation, handling, storage and protection.
- D. Product option requirements.
- E. Substitution limitations.
- F. Procedures for Owner-supplied products.
- G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- B. Section 014000 - Quality Requirements: Product quality monitoring.
- C. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
- D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is not prohibited.
 - 1. If applicable, see drawings for list of items required to be salvaged for reuse and/or relocation.

2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. See Section 014000 - Quality Requirements, for additional source quality control requirements.
- C. Use of products having any of the following characteristics is not permitted:
 - 1. Made using or containing CFC's or HCFC's.
 - 2. Containing lead, cadmium, or asbestos.
- D. Where other criteria are met, Contractor shall give preference to products that:
 - 1. If used on interior, have lower emissions, as defined in Section 016116.
 - 2. If wet-applied, have lower VOC content, as defined in Section 016116.

2.03 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 012500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
 - B. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
-

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4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

- A. Provide protection of stored materials and products against theft, casualty, or deterioration.
- B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 017419.
 - 1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.
- C. Store and protect products in accordance with manufacturers' instructions.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 016000

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**SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittal procedures.
- B. Section 014000 - Quality Requirements: Procedures for testing and certifications.
- C. Section 016000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.
- D. Section 079200 - Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
 - 7. Free-standing furniture.
 - 8. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Clay brick.
 - 3. Metals that are plated, anodized, or powder-coated.
 - 4. Glass.
 - 5. Ceramics.
 - 6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2018).
- C. BIFMA e3 - Furniture Sustainability Standard; Business and Institutional Furniture Manufacturers Association; 2019.
- D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2; 2017.
- E. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; Current Edition.
- F. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.
- G. CHPS (HPPD) - High Performance Products Database; Current Edition.
- H. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- I. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).
- J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).
- K. SCS (CPD) - SCS Certified Products; Current Edition.
- L. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1. Wet-Applied Products: State amount applied in mass per surface area.
 - 2. Paints and Coatings: Test tinted products, not just tinting bases.
 - 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.
 - 4. Product data submittal showing VOC content is NOT acceptable evidence.
 - 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
 - b. Published product data showing compliance with requirements.
 - c. Certification by manufacturer that product complies with requirements.

- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
 - 1. Evidence of Compliance: Acceptable types of evidence are:
 - a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
 - d. Certification by manufacturer that product complies with requirements.
- D. Furnishings Emissions Standard and Test Method: BIFMA e3 Sections 7.6.1 and 7.6.2, tested in accordance with BIFMA M7.1.
 - 1. Evidence of Compliance:
 - a. Test report showing compliance and stating exposure scenario used.
- E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
 - 1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 - 2. Furnishings: Comply with Furnishings Emissions Standard and Test Method.
 - 3. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2. Joint Sealants: SCAQMD 1168 Rule.
 - 3. Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 016116

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**SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 013000 - Administrative Requirements: Submittals procedures.
- C. Section 014000 - Quality Requirements: Testing and inspection procedures.
- D. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- E. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- F. Section 017900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- G. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.
- H. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.

- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
 - 2. Identify demolition firm and submit qualifications.
 - 3. Include a summary of safety procedures.
- D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.

1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- B. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 QUALITY ASSURANCE

- A. Do not cut and patch structural work in a manner that could result in a reduction of load-carrying capacity or an increase in the structure's deflection. Obtain approvals from the Owner, Engineer of Record and Architect before cutting and patching any structural member or assembly.
 - 1. EXCEPTION: Modifications to structural work done in accordance with specific details included in the Contract Documents stamped by the Engineer of Record and approved by the Authorities Having Jurisdiction in the State in which the Project is located.
- B. Do not cut and patch operational elements or safety related components in a manner resulting in a reduction of capacities to perform in a manner intended or resulting in a decreased operational life, increased maintenance, or decreased safety.

1.07 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
 - 1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.

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- D. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.08 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that established by Owner provided survey.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.
- L. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions.
 - 2. Provide sound retardant partitions of construction indicated on drawings.
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.

5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
 1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
 3. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- D. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-complying work.
- E. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- F. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- G. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- H. Restore work with new products in accordance with requirements of Contract Documents.
- I. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- J. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.
- K. Patching:
 - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 - 2. Match color, texture, and appearance.
 - 3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- E. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
- F. Waste Disposal: Do not wash waste materials down sewers or into waterways.

3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- C. Start all equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 017900 - Demonstration and Training.
- B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- C. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Testing, adjusting, and balancing HVAC systems: See Section 230593 - Testing, Adjusting, and Balancing for HVAC.

3.13 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.
- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 017000

**SECTION 017800
CLOSEOUT SUBMITTALS**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Project record documents.

- B. Operation and maintenance data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.

- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Field changes of dimension and detail.
 - 2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

- A. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- B. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- C. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

END OF SECTION 017800

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**SECTION 017900
DEMONSTRATION AND TRAINING**

PART 1 GENERAL

1.01 SUMMARY

- A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Electrical systems and equipment.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures; except:
 - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
 - 2. Submit one copy to the Commissioning Authority, not to be returned.
 - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
 - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.
- B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Commissioning Authority for review and inclusion in overall training plan.
 - 2. Submit not less than four weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.
 - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.
- C. Demonstration may be combined with Owner personnel training if applicable.
- D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

- A. Commissioning Authority will prepare the Training Plan based on draft plans submitted.
- B. Conduct training on-site unless otherwise indicated.
- C. Owner will provide classroom and seating at no cost to Contractor.
- D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.
- E. Provide training in minimum two hour segments.
- F. The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.
- G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- I. Product- and System-Specific Training:

1. Review the applicable O&M manuals.
 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 6. Discuss common troubleshooting problems and solutions.
 7. Discuss any peculiarities of equipment installation or operation.
 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 10. Review spare parts and tools required to be furnished by Contractor.
 11. Review spare parts suppliers and sources and procurement procedures.
- J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 017900

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**SECTION 024100
DEMOLITION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.
- B. Salvage of existing items to be reused or recycled.
- C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- C. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- D. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- E. Mechanical and Electrical Sections (Divisions 21 through 28) for demolition and cutting and patching requirements specified within them.

1.03 DEFINITIONS

- A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.
- B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. ASSE A10.6 - Safety and Health Program Requirements for Demolition Operations; 2006 (R2016).
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.

2. Identify demolition firm and submit qualifications, including qualifications for refrigerant recovery technician.
- D. Pre-demolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.
- E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.
- G. Inventory: Submit a list of items that have been removed and salvaged.
- H. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.06 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
- B. Professional Engineer Qualifications: Comply with Section 014000 - Quality Requirements.
- C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.07 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

- A. Remove portions of existing building as indicated on the Drawings.
- B. Remove other items indicated, for salvage, relocation, recycling, and reinstallation.

3.02 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

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- D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
 - E. Survey of Existing Conditions: Record existing conditions by use of measured drawings, pre-construction photographs or videos.
 - 1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.03 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.
- B. Dangerous materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

3.04 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with requirements in Section 017000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
 - 3. Comply with applicable requirements of ASSE A10.6 and NFPA 241.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
- G. Cover and protect furniture, furnishings, and equipment that have not been removed.

- H. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
 - 1. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- I. Hazardous Materials:
 - 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
- J. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- K. Existing Utilities:
 - 1. Refer to Divisions 21 through 28 Mechanical and Electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.
 - 2. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
 - 3. Protect existing utilities to remain from damage.
 - 4. Do not disrupt public utilities without permit from authority having jurisdiction.
 - 5. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
 - a. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 6. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
 - a. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 7. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
 - 8. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
 - 9. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.
- L. Selective Demolition for Alterations:
 - 1. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - a. Verify construction and utility arrangements are as indicated.
 - b. Report discrepancies to Architect before disturbing existing installation.
 - c. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
 - 2. Separate areas in which demolition is being conducted from areas that remain occupied.
 - a. Provide, erect, and maintain temporary dustproof partitions.
 - b. Provide sound retardant partitions of construction indicated on drawings.

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- c. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
 3. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
 4. Remove existing work as indicated and required to accomplish new work.
 - a. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - b. Remove items indicated on drawings.
 5. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - a. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 1) Maintain fire-protection facilities in service during selective demolition operations.
 - b. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - c. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - 1) Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2) Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - 3) Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4) Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5) Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - 6) Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 7) Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
 - d. See Section 011000 - Summary for limitations on outages and required notifications.
 - e. Verify that abandoned services serve only abandoned facilities before removal.
 - f. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
 6. Protect existing work to remain.
 - a. Prevent movement of structure. Provide shoring and bracing as required.
 - b. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - c. Repair adjacent construction and finishes damaged during removal work.
 - d. Patch to match new work.
 7. Comply with Owner's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
 8. Removed and Salvaged Items:
 - a. Clean salvaged items.
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- b. Pack or crate items after cleaning. Identify contents of containers.
 - c. Store items in a secure area until delivery to Owner.
 - d. Transport items to Owner's storage area designated by Owner.
 - e. Protect items from damage during transport and storage.
9. Removed and Reinstalled Items:
- a. Clean and repair items to functional condition adequate for intended reuse.
 - b. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - c. Protect items from damage during transport and storage.
 - d. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
10. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.05 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 7 Sections for new roofing requirements.
 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 2. Remove existing roofing system down to substrate.

3.06 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction by selective demolition operations.
- B. Patching: Comply with Section 017000 - Execution and Closeout Requirements.
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
 1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture and appearance. Remove existing floor and wall coverings and replace with new materials if necessary, to achieve uniform color and appearance.
 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

2. Where patching occurs over a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide even-plane surface of uniform appearance.
- G. Debris and Waste Removal:
1. Remove debris, junk, and trash from site.
 2. Remove from site all materials not to be reused on site; do not burn or bury.
 3. Leave site in clean condition, ready for subsequent work.
 4. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

**SECTION 23 00 10
GENERAL REQUIREMENTS FOR HVAC SYSTEMS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The General Requirements for Mechanical Work are intended to be complementary to the General Requirements of the Construction Contract.
- B. Work Included: Provide complete mechanical systems where shown on the drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to the following summary of work:
 - 1. [Replace existing roof mounted AHUs with matching capacity and function]
 - 2. Extend existing comfort controls providing complete air side controls including but not limited to AHUs, terminal boxes, and exhaust fans
 - 3. [Provide UL864 smoke control BMS. Control system shall replace with identical function and sequence the existing systems which are no longer supported or have replacement parts available]
 - 4. Provide new DDC controls and integrate with the existing building DDC system.
 - 5. Test & Balance: will be provided by the Owner. Contractor responsibilities to support the Test & Balance effort are contained in Section 23 05 93.
 - 6. Other items and services required to complete the systems.

1.2 QUALITY ASSURANCE AND APPLICABLE STANDARDS

- A. Use adequate numbers of skilled workers that are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Architect/Engineer/Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. Codes: Perform all work in accordance with the latest edition of the following codes:
 - 1. State and city building, fire, plumbing, and mechanical codes.
 - 2. National Electrical Code (NEC)
 - 3. National Fire Protection Association (NFPA)
 - 4. American with Disabilities Act (ADA)
 - 5. Texas Accessibility Standards (TAS)
 - 6. Texas Department of Criminal Justice (TDCJ) Standards
 - 7. Minimum Jail Standards of the Texas Commission on Jail Standards
 - 8. All authorities having jurisdiction.
- D. Where conflicts occur between drawings, specifications, and code requirements, the most stringent requirement shall take precedence.

- E. Standards: The specifications and standards of the following organizations are by reference made a part of these specifications. All work, unless otherwise indicated, shall comply with the requirements and recommendations wherever applicable:
1. American National Standards Institute (ANSI)
 2. Air Conditioning and Refrigeration Institute (ARI)
 3. American Gas Association (AGA)
 4. American Society for Testing and Materials (ASTM)
 5. American Society of Plumbing Engineers (ASPE)
 6. American Society of Mechanical Engineers (ASME)
 7. American Society of Refrigeration, Heating and Air Conditioning Engineers (ASHRAE)
 8. Electrical Testing Laboratories (ETL)
 9. National Bureau of Standards (NBS)
 10. National Electrical Manufacturer's Association (NEMA)
 11. National Fire Protection Association (NFPA)
 12. Sheet Metal and Air Conditioning National Association (SMACNA)
 13. Underwriters Laboratories, Inc. (UL)
- F. Electrical Characteristics for Equipment: Equipment of differing electrical characteristics may be furnished provided such equipment is proposed on the "Alternate Manufacturer Evaluation Form", subsequently approved, and connecting electrical services, circuit breakers, and conduit sizes appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
- G. When requested, provide the Owner's Authorized Representative with manufacturer's certificate that materials meet or exceed minimum requirements as specified.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. The requirements and recommendations of the latest edition of the Occupational Safety and Health Administration (OSHA) Act are by reference made a part of these specifications. All work shall comply with the requirements and recommendations wherever applicable.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. All Other Sections of Divisions 21, 22, and 26 (as applicable).
- B. All other divisions of the contract documents. Refer to each division's specifications and drawings for all requirements

1.5 SUBMITTALS

- A. Comply with pertinent provisions of Division 01.
- B. Provide Specifications per Division 01 for all submitted alternate equipment.
- C. Product Data: Submit the following:
1. Materials list of items proposed to be provided under Division 23.
 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. The term "Compliance" is understood to mean that the Contractor certifies that the submitted equipment will meet or exceed the contract document requirements. Items that do not clearly meet this definition should be identified and explained as required in the following paragraph.

3. Identify the difference between the specified item or function and the proposed. Explain with enough detail so that the Architect/Engineer/Owner can easily determine that the item complies with the functional intent. List any disadvantages or advantages of the proposed item versus the specified item. Submit technical data sheets and pictures and diagrams to support and clarify. Organize in a clear and concise format. All substitutions shall be approved in writing by Architect/Engineer. The Architect/Engineer's decision shall be final.
 4. Allow a minimum of ten (10) working days for the review of submittals and each re-submittal.
 5. Compliance with the Contract documents shall be the sole responsibility of the Contractor. Items on equipment that are were not accepted by the Architect/Engineer in writing as an approved equal shall be replaced or revised to comply with the contract documents at the Contractor's expense.
 6. Manufacturer's recommended installation procedures which, when reviewed by the Architect/Engineer, shall become the basis for accepting or rejecting actual installation procedures used on the work.
 7. Sign the submittal as an indication of compliance with the contract documents. Any deviations from the contract documents shall be indicated on the submittal prior to signing. Any deviations not indicated shall be cause for rejection and removal of the non-complying equipment at the Contractor's expense.
- D. See individual specification Sections for submittal requirements of materials and equipment.
- E. Resubmittals of rejected submittals shall be limited to one (1) in number. Costs for processing subsequent resubmittals in excess of the first resubmittal, resulting from the Contractor's disregard of Architect/Engineer's primary submittal rejection comments, shall be borne by the Contractor. Costs shall be based on Architect/Engineer's hourly rates as published in their current professional fee schedules and shall also include reimbursable costs for delivery, mailing, and photocopies at direct cost plus fifteen percent (15%).
- F. Shop Drawings: Upon written request of the Contractor, the Architect/Engineer will provide directly to the Contractor electronic backgrounds of drawings required to produce shop drawings. The requirements to secure electronic files for shop drawing purposes are the same as for record drawing purposes. See 230010, Paragraph 1.15.H.2.

1.6 SUBSTITUTIONS

- A. The use of manufacturers' names and catalog numbers followed by the phrase "or equal" is generally used to establish a standard of quality and utility for the specified items and to provide a dimensional reference for construction documents that are drawn to scale.
- B. Submittals for "equal" items shall, where applicable, include the following data that are not necessarily required for specified items:
 1. Performance characteristics.
 2. Materials.
 3. Finish.
 4. Certification of conformance with specified codes and standards.
 5. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. The term "Compliance" is understood to mean that the Contractor certifies that the submitted equipment will meet or exceed the contract

document requirements. Items that do not clearly meet this definition should be identified and explained as required in Paragraph 6 below.

6. Identify the difference between the specified item or function and the proposed. Explain with enough detail so that the Architect/ Engineer/Owner can easily determine that the item complies with the functional intent. List any disadvantages or advantages of the proposed item versus the specified item. Submit technical data sheets and pictures and diagrams to support and clarify. Include shop drawings for all piping and ductwork equipment per Paragraph 1.5 Submittals. Organize in a clear and concise format.
 - C. Submittals of "equal" components or systems may be rejected if:
 1. The material or equipment would necessitate the alteration of any portion of the mechanical, electrical, architectural or structural design.
 2. Dimensions vary from the specified material or equipment in such a manner that accessibility or clearances are impaired or the work of other trades is adversely affected.
 - D. Proposed substitutions for materials or equipment must be submitted ten (10) days prior to final bid date for consideration as approved equals. Otherwise, such substitutions will not be permitted. Only Prime Bidders are allowed to make proposals for substitutions. Manufacturers, distributors, and sub-contractors shall not make proposals to the Architect/Engineer for substitutions.
 - E. No substitution shall be made unless authorized in writing by the Architect/Engineer. Should a substitution be accepted, and should the substitute material prove defective or otherwise unsatisfactory for the service intended, and within the guarantee period, replace this material or equipment with material or equipment specified, at no additional cost to the Architect/Engineer/Owner, and to the satisfaction of the Architect/Engineer.
 - F. Contractors submitting bids on substitute materials and equipment must also provide a written performance guarantee certifying that the substitute materials and equipment will produce the specified effects and meet the approval of the Architect/Engineer.
- 1.7 ORDINANCES, PERMITS, METERS, UTILITIES, AND ROYALTIES
- A. Procure all permits and licenses necessary for completion of this project and pay all lawful fees required and necessary pursuant in obtaining said permits and licenses. All required certificates of approvals and inspections by local governing and regulating authorities shall be obtained and paid for by the Contractor.
 - B. Pay all fees required for the connection of water, gas, and sewer to utility mains, and any meter fees if required.
 1. Pay any royalty payments required or fees for the use of patented equipment or systems. Defend all law suits or claims for infringement of any patent rights and shall hold the Owner and Architect/Engineer harmless from loss as a result of said suits or claims.
- 1.8 COMPATIBILITY OF EQUIPMENT
- A. Assume full responsibility for satisfactory operation of all component parts of the mechanical systems to assure compatibility of all equipment and performance of the integrated systems in accordance with the requirements of the specifications. Should the Contractor consider any part of the specifications or drawings as rendering his acceptance of such responsibility impossible, prohibitive, or restrictive, he shall notify the Architect/Engineer before submitting his bid, and the

bid shall be accompanied by a written statement of any objections or exceptions to the specifications and drawings.

1.9 JOBSITE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Include required work to correct conditions detrimental to the timely and proper completion of all Division 23 Work. Do not proceed until unsatisfactory conditions are corrected.

1.10 PREPARATION AND COORDINATION

- A. Perform coordination work in strict accordance with provisions of these specifications and the following:
 - 1. Coordinate as necessary with other trades to assure proper and adequate interface with all work.
 - 2. Where ducts, pipes and other mechanical items are shown in conflict with locations of structural members and other equipment, include labor and materials required for extensions, offsets and supports to clear the encroachment.
 - 3. Although such work is not specifically indicated, provide all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation.
 - 4. Coordinate accepted equipment changes from those scheduled or specified with other trades affected. Additional compensation to other trades for equipment changes is the responsibility of the Contractor making the change.
- B. Mechanical Drawings are diagrammatic. Follow the drawings as closely as actual construction and work of other trades will permit. Duct and piping arrangement have been designed for maximum economy consistent with good practice and other considerations. Install the systems arranged as shown on the drawings, except as otherwise approved in advance by the Architect/Engineer.
- C. Data indicated on the Drawings and in these Specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the Drawings and Specifications should be used only for guidance in such regard.
- D. Where items such as diffusers, thermostats, switches, and control panels are not specifically located on the Drawings, provide an RFI to the Architect/Engineer, and locate as determined in the field by the Architect/Engineer. Where such items are installed without such specific direction, relocate as directed by the Architect/Engineer, and at no additional cost to the Architect/Engineer/Owner.
- E. Verify all dimensions and distances. No additional compensation will be allowed because of differences between work shown on the Drawings and actual dimensions and distances at the jobsite.

1.11 CONSTRUCTION REQUIREMENTS

- A. The drawings show the arrangements of work. Should project conditions necessitate rearrangement, or if the materials or equipment can be installed to a better advantage in a different manner, before proceeding with the work, prepare and submit five copies of Drawings

of the proposed arrangement for the Architect/Engineer's review. Allow a minimum of ten (10) working days for review.

- B. Should the Contractor propose to install equipment requiring space conditions other than those shown, or rearrange the equipment, he shall assume responsibility for the rearrangement of the space and shall have the Architect/Engineer review the change before proceeding with the work. The request for such changes shall be accompanied by contractor-generated detailed shop drawings of the space in question. Identify monetary credits proposed or other benefits of the change. Allow a minimum of ten (10) working days for review.
- C. Properly locate and size all slots, holes, and openings in the building structure pertaining to the work and for the correct location of pipe sleeves, duct sleeves, fire dampers, etc., as applicable to the work.

1.12 CUTTING AND PATCHING

- A. Perform cutting and patching associated with the work in strict accordance with the provisions of Division 01 of these Specifications and the following:
 - 1. Coordinate work to minimize cutting and patching work.
 - 2. Request for Architect/Engineer's Consent
 - a. Prior to cutting or coring of the building structure, submit a written request to the Architect/Engineer for permission to proceed with cutting. Include x-rays of any floor area where cutting or coring is proposed.
 - b. Contractor is cautioned that concrete floor may contain steel tendons, pipes, and electrical/telecom conduits, all of which can not be cut or damaged.
 - 3. Perform Architect/Engineer-approved cutting and demolition by methods that will prevent damage to other portions of the work and provide proper surfaces to receive installation of new work and repair.
 - 4. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.
 - 5. Provide all core drilling of holes. Where sleeves and blockouts are required, they shall be cut or provided at locations required. On completion of this work or as work progresses, make all repairs and do all patching required as a result of work under this Contract. All patching shall be performed in a manner that will restore the surrounding work to its original condition to the satisfaction of the Architect/Engineer.
 - 6. Assume responsibility for the proper size of all sleeves and blockouts in the building structure pertaining to the work and for providing the correct location of pipe sleeves and blockouts.
 - 7. Where openings are cut through masonry walls, provide lintels or structural supports to protect the remaining masonry. Provide adequate support during the cutting operation to prevent any damage to the affected masonry.

1.13 PROJECT RECORD DOCUMENTS

- A. Provide the record documents associated with the work of Division 23 in strict accordance with the provisions of these specifications.
- B. Throughout progress of the Division 23 Work, maintain an accurate record of changes in the Contract Documents that apply to work of Division 23. Changes shall include all addendums

- issued during bidding. Maintain an accurate record of the location of mechanical service lines and outlets and all outside utilities.
- C. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Architect/Engineer. Submit in writing at the pre-construction conference the name and credentials of the person responsible for record mark-ups and maintenance.
- D. Accuracy of Records
1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of drawings and other documents where such entry is required to show the change properly. Match the symbology and format of the base documents.
 2. Accuracy of records shall be such that a future verification of items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.
- E. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the work and transfer of all recorded data to the final Project Record Documents.
- F. Making Entries on Drawings
1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
 2. Date all entries.
 3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
 4. In the event of overlapping changes, use different colors for the overlapping changes.
 5. Make entries within 24 hours after receipt of information that the change has occurred.
 6. Maintain the base drawing format and use the same symbology.
 7. Convert field mark-ups to finished CADD record drawings when required in this section.
- G. Conversion of Schematic Layouts
1. In some cases on the drawings, arrangements of ductwork and piping and similar items are shown schematically and are not intended to portray precise physical layout. Determine final physical arrangement subject to the Architect/Engineer's approval. However, design of future modifications of the facility may require accurate information as to the final physical layout of items that are shown only schematically on the drawings.
 2. Show on the job set of record drawings, by dimension accurate to within one inch, the centerline of each run of items such as all sleeves and piping, etc., below grade, in walls, or in the concrete slab. A surface mounted device indicates the exact location:
 - a. Clearly identify the item by accurate note such as "Chilled Water" and the like.
 - b. Show, by symbol or note, the vertical location of the item "under slab," "in ceiling plenum," "exposed," and the like.
 - c. Make all identification sufficiently descriptive that it may be related reliably to the specifications.
- H. Final Project Record Documents
1. The purpose of the final Project Record Documents is to provide factual

- a. information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.
- 2. Provide completed record drawings on CD and one Mylar film reproducible of each drawing.
- 3. Refer to Section 017839 for additional requirements.

1.14 OPERATION AND MAINTENANCE DATA

- A. Well before substantial completion, submit two copies of a preliminary draft of the proposed manual(s) to the Architect/Engineer for review and comments. Allow a minimum of ten (10) working days for review.
- B. Submit specified number copies of the approved manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.
- C. Prepare in accordance with the following standards:

Format:	8½" x 11"
Size:	White bond, at least 20 lb. weight
Paper:	Neatly written or printed
Text:	11" in height preferable; bind in with text; foldouts acceptable; larger drawings are acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
Drawings:	
Flysheets:	Separate each section of the Manual with neatly prepared flysheets briefly describing contents of the ensuing section; flysheets may be in color.
Binding:	Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside the manual; 3-ring

	binders will be acceptable; all binding is subject to the Architect/ Engineer's approval.
Measurements:	Provide all measurements in U.S. standard units such as feet-and-inches, lbs, and cfm. Where items may be expected to be measured within ten years in accordance with metric formulae, provide additional measurements in the "International System of Units" (SI).

- D. Provide front and back covers for each manual, using durable material approved by the Architect/Engineer, and clearly identified on or through the cover with at least the following information:
1. Name and Address of Work
 2. Name of Contractor
 3. General subject of this manual
 4. Space for approval signature of the Architect/Engineer and approval date

1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Contents: Include at least the following:
1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency information regarding the installation.
 2. Complete instructions regarding operation and maintenance of all equipment provided including lubrication, disassembly, and reassembly.
 3. Complete nomenclature of all parts of all equipment.
 4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
 5. Copy of all guarantees and warranties issued.
 6. Manufacturer's bulletins, drawings, and descriptive data, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
 7. Such other data as required in other sections of these specifications.

1.16 PAINTING

- A. All equipment shall be delivered to the job with suitable factory finish. Should the finish be damaged in transit or during the installation, it shall be finished to match appearance of original finish. All work shall be subject to approval by Architect/Engineer.

1.17 TESTING AND INSPECTION

- A. Provide personnel and equipment, make required tests, and secure required approvals from the Architect/Engineer and governmental agencies having jurisdiction.

- B. Make written notice to the Architect/Engineer, adequately in advance, of each of the following stages of construction:
 - 1. When all rough-in is complete, but not covered;
 - 2. As specified in all Division 23 sections.
 - 3. At the completion of the work of Division 23.
- C. When material or workmanship is found to not comply with the specified requirements, remove the noncomplying items from the job site and replace them with items complying with the specified requirements at no additional cost to the Architect/Engineer/Owner. This shall be performed within 3 days after receipt of written notice of noncompliance.

1.18 WARRANTY

- A. Warranty all equipment and workmanship for a period of one year after date of substantial completion and replace or repair any faulty equipment or installation at no cost to the Architect/Engineer/Owner for such service during this period, all in accordance with requirements of Division 01.
- B. Provide full material warranty on all compressors for a period of five years after date of substantial completion.
- C. This warranty shall not void specific warranties issued by manufacturers for greater periods of time. Nor shall it void any rights guaranteed to the Owner by law.
- D. Warranties shall be in writing in a form satisfactory to the Owner, and shall be delivered to the Owner before final payment is made.

1.19 PROJECT COMPLETION

- A. Upon completion of the work of Division 23, thoroughly clean all exposed portions of the mechanical installation, removing all traces of soil, labels, grease, oil, and other foreign material, and using only the type cleaner recommended by the manufacturer of the item being cleaned.

END OF SECTION

**SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.

1.2 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, with Errata (2017).

1.3 SUBMITTALS

- A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Architect.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
 - 4. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Identification and types of measurement instruments to be used and their most recent calibration date.
 - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - e. Final test report forms to be used.
 - f. Detailed step-by-step procedures for TAB work for each system and issue, including:
 - 1) Terminal flow calibration (for each terminal type).
 - 2) Diffuser proportioning.
 - 3) Branch/submain proportioning.
 - 4) Total flow calculations.
 - 5) Rechecking.
 - 6) Diversity issues.

- g. Details of how TOTAL flow will be determined; for example:
 - 1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
 - 2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
 - h. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.
 - 6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Architect.
 - g. Project Engineer.
 - h. Project Contractor.
 - i. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 2. Having minimum of three years documented experience.
 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.
- 3.2 EXAMINATION
- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, and vented.
 13. Pumps are rotating correctly.
 14. Proper strainer baskets are clean and in place.
 15. Service and balance valves are open.
 - B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
 - C. Beginning of work means acceptance of existing conditions.
- 3.3 PREPARATION
- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- 3.4 ADJUSTMENT TOLERANCES
- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
 - B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 10 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
 - C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.6 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

- M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- N. On fan powered VAV boxes, adjust air flow switches for proper operation.

3.7 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 SCOPE

- A. Test, adjust, and balance the following:
 - 1. Air Handling Units.
 - 2. Air Terminal Units.

3.9 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Sheave Make/Size/Bore.
- B. Cooling Coils:
 - 1. Identification/number.
 - 2. Location.
 - 3. Service.
 - 4. Manufacturer.
 - 5. Air flow, design and actual.
 - 6. Entering air DB temperature, design and actual.
 - 7. Entering air WB temperature, design and actual.
 - 8. Leaving air DB temperature, design and actual.
 - 9. Leaving air WB temperature, design and actual.

10. Water flow, design and actual.
 11. Water pressure drop, design and actual.
 12. Entering water temperature, design and actual.
 13. Leaving water temperature, design and actual.
 14. Saturated suction temperature, design and actual.
 15. Air pressure drop, design and actual.
- C. Heating Coils:
1. Identification/number.
 2. Location.
 3. Service.
 4. Manufacturer.
 5. Air flow, design and actual.
 6. Water flow, design and actual.
 7. Water pressure drop, design and actual.
 8. Entering water temperature, design and actual.
 9. Leaving water temperature, design and actual.
 10. Entering air temperature, design and actual.
 11. Leaving air temperature, design and actual.
 12. Air pressure drop, design and actual.
- D. Air Moving Equipment:
1. Location.
 2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Arrangement/Class/Discharge.
 6. Air flow, specified and actual.
 7. Return air flow, specified and actual.
 8. Outside air flow, specified and actual.
 9. Total static pressure (total external), specified and actual.
 10. Sheave Make/Size/Bore.
 11. Number of Belts/Make/Size.
 12. Fan RPM.
- E. Terminal Unit Data:
1. Manufacturer.
 2. Type, constant, variable, single, dual duct.
 3. Identification/number.
 4. Location.
 5. Model number.
 6. Size.
 7. Minimum static pressure.
 8. Minimum design air flow.
 9. Maximum design air flow.
 10. Maximum actual air flow.

11. Inlet static pressure.

END OF SECTION

**SECTION 23 08 00
COMMISSIONING OF HVAC**

PART 1 GENERAL

1.1 SUMMARY

- A. See Section 01 91 13 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 91 13.
- B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.
- C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.
- D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
 - 1. Control system.
 - 2. Major and minor equipment items.
 - 3. Terminal units.
 - 4. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.
- E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.2 REFERENCE STANDARDS

- A. ASHRAE Guideline 1.1 - HVAC&R Technical Requirements for the Commissioning Process; 2007, with Errata (2012).

1.3 SUBMITTALS

- A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.
- B. Draft Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
 - 1. System name.
 - 2. List of devices.
 - 3. Step-by-step procedures for testing each controller after installation, including:
 - a. Process of verifying proper hardware and wiring installation.
 - b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
 - c. Process of performing operational checks of each controlled component.

- d. Plan and process for calibrating valve and damper actuators and all sensors.
 - e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
 4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
 5. Description of the instrumentation required for testing.
 6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.
- C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.
- D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
 2. Full as-built set of control drawings.
 3. Full as-built sequence of operations for each piece of equipment.
 4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
 - a. Floor.
 - b. Room number.
 - c. Room name.
 - d. Air handler unit ID.
 - e. Reference drawing number.
 - f. Air terminal unit tag ID.
 - g. Heating and/or cooling valve tag ID.
 - h. Minimum air flow rate.
 - i. Maximum air flow rate.
 5. Full print out of all schedules and set points after testing and acceptance of the system.
 6. Full as-built print out of software program.
 7. Electronic copy on disk of the entire program for this facility.
 8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
 9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
 10. Control equipment component submittals, parts lists, etc.
 11. Warranty requirements.
 12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
 13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
 - a. Sequences of operation.

- b. Control drawings.
 - c. Points lists.
 - d. Controller and/or module data.
 - e. Thermostats and timers.
 - f. Sensors and DP switches.
 - g. Valves and valve actuators.
 - h. Dampers and damper actuators.
 - i. Program setups (software program printouts).
- E. Project Record Documents: See Section 01 78 00 for additional requirements.
- 1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
 - 2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.
- F. Draft Training Plan: In addition to requirements specified in Section 01 79 00, include:
- 1. Follow the recommendations of ASHRAE Guideline 1.1.
 - 2. Control system manufacturer's recommended training.
 - 3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.
- G. Training Manuals: See Section 01 79 00 for additional requirements.
- 1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.1 PREPARATION

- A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.
- B. Furnish additional information requested by the Commissioning Authority.
- C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

- D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.
- E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.
 - 1. Include cost of sheaves and belts that may be required for testing, adjusting, and balancing.
- F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.
- G. Provide temperature and pressure taps in accordance with Contract Documents.
 - 1. Provide a pressure/temperature plug at each water sensor that is an input point to the control system.

3.2 INSPECTING AND TESTING - GENERAL

- A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.
- B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.
- C. Provide two-way radios for use during the testing.
- D. Valve/Damper Stroke Setup and Check:
 - 1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
 - 2. Set pump/fan to normal operating mode.
 - 3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
 - 4. Command valve/damper open; verify position is full open and adjust output signal as required.
 - 5. Command valve/damper to a few intermediate positions.
 - 6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
 - 7. Closure for Heating Coil Valves - Normally Open:
 - a. Set heating setpoint 20 degrees F above room temperature.
 - b. Observe valve open.
 - c. Remove control air or power from the valve and verify that the valve stem and actuator position do not change.
 - d. Restore to normal.
 - e. Set heating setpoint to 20 degrees F below room temperature.
 - f. Observe the valve close.
 - g. Restore to normal.
- E. Coil Valve Leak Check:
 - 1. Method 1 - Water Temperature With 2-Way Valve:

- a. Calibrate water temperature sensors on each side of coil to be within 0.2 degree F of each other.
 - b. Turn off air handler fans, close outside air dampers. Keep pump running. Make sure appropriate coil dampers are open.
 - c. Normally closed valves will close.
 - d. Override normally open valves to the closed position.
 - e. After 10 minutes observe water delta T across coil. If it is greater than 2 degrees F (, leakage is probably occurring.
 - f. Reset valve stroke to close tighter.
 - g. Repeat test until compliance is achieved.
 2. Method 2 - Air Temperature With 2 or 3-Way Valve: Water leak-by less than 10 percent will likely not be detected with this method.
 - a. Calibrate air temperature sensors on each side of coil to be within 0.2 degree F of each other.
 - b. Air handler fans should be on.
 - c. Change mixed or discharge air setpoint, override values or bleed or squeeze bulb pneumatic controller to cause the valve to close.
 - d. After 5 minutes observe air delta T across coil. If it is greater than one degree F (, leakage is probably occurring.
 - e. Reset valve stroke to close tighter.
 - f. Repeat test until compliance is achieved.
 - F. Isolation Valve or System Valve Leak Check: For valves not by coils.
 1. With full pressure in the system, command valve closed.
 2. Use an ultra-sonic flow meter to detect flow or leakage.
 - G. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
- 3.3 TAB COORDINATION
- A. TAB: Testing, adjusting, and balancing of HVAC.
 - B. Coordinate commissioning schedule with TAB schedule.
 - C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.
 - D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.
 - E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.
 - F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.
- 3.4 CONTROL SYSTEM FUNCTIONAL TESTING
- A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the

requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

- B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.
- C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.
- D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
 - 1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
 - 2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.
- E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.
- F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.
 - 1. Setpoint changing features and functions.
 - 2. Sensor calibrations.
- G. Demonstrate to the Commissioning Authority:
 - 1. That all specified functions and features are set up, debugged and fully operable.
 - 2. That scheduling features are fully functional and setup, including holidays.
 - 3. That all graphic screens and value readouts are completed.
 - 4. Correct date and time setting in central computer.
 - 5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
 - 6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
 - 7. Power failure and battery backup and power-up restart functions.
 - 8. Global commands features.
 - 9. Security and access codes.
 - 10. Occupant over-rides (manual, telephone, key, keypad, etc.).
 - 11. O&M schedules and alarms.
 - 12. Occupancy sensors and controls.
 - 13. Fire alarm interlocks and response.
 - 14. All control strategies and sequences not tested during controlled equipment testing.
- H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.5 OPERATION AND MAINTENANCE MANUALS

- A. See Section 01 78 00 for additional requirements.
- B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

3.6 DEMONSTRATION AND TRAINING

- A. See Section 01 79 00 for additional requirements.
- B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.
- C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.
- D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned.
- E. TAB Review: Instruct Owner's personnel for minimum 8 hours, after completion of TAB, on the following:
 - 1. Review final TAB report, explaining the layout and meanings of each data type.
 - 2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
 - 3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
 - 4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
 - 5. Other salient information that may be useful for facility operations, relative to TAB.
- F. HVAC Control System Training: Perform training in at least three phases:
 - 1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
 - a. This training may be held on-site or at the manufacturer's facility.
 - b. If held off-site, the training may occur prior to final completion of the system installation.
 - c. For off-site training, Contractor shall pay expenses of up to two attendees.
 - 2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 8 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:

- a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
 - b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
 - c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
 - d. Every display screen, allowing time for questions.
 - e. Point database entry and modifications.
3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 4 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.
- G. Provide the services of manufacturer representatives to assist instructors where necessary.
- H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

100% Construction Documents

**SECTION 23 09 23
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC**

Henry Wade JJC Air Handler Replacement
December 5, 2025

HED Project No: 2024-DC048-002
Direct-Digital Control System for HVAC
23 09 23-1

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. System description.

1.2 RELATED REQUIREMENTS

- A. Section 23 09 93 - Sequence of Operations for HVAC Controls.
- B. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

- A. ASHRAE Std 147 - Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems; 2019, with Addendum (2022).
- B. Modbus (PS) - The Modbus Organization Communications Protocol.; Latest Update.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
 - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
 - 2. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
 - 3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 - 4. Indicate description and sequence of operation of operating, user, and application software.
- D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
 - 2. Include submittals data in final "Record Documents" form.
- E. Operation and Maintenance Data:
 - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
 - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
 - 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Existing Products: Trane Tracer control system.

2.2 MANUFACTURERS

- A. Trane.

2.3 SYSTEM DESCRIPTION

- A. Extend existing Trane Tracer control system. smoke control shall be provided on UL864 compliant controls utilizing smoke control sequences and weekly auto-testing of system components

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.2 INSTALLATION

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 09 93.
- C. Provide conduit and electrical wiring in accordance with Section 26 05 83. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
- B. Provide service engineer to instruct Owner's representative in operation of systems plant and equipment for 3 day period.

- 3.4 DEMONSTRATION AND INSTRUCTIONS
- A. Demonstrate complete and operating system to Owner.

END OF SECTION

**SECTION 23 21 13
HYDRONIC PIPING**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Chilled water piping, above grade.
- D. Equipment drains and overflows.
- E. Pipe hangers and supports.
- F. Unions, flanges, mechanical couplings, and dielectric connections.
- G. Valves:
 - 1. Ball valves.
 - 2. Butterfly valves.
 - 3. Pressure independent temperature control valves and balancing valves.

1.2 REFERENCE STANDARDS

- A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.
- B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- E. ASME B16.15 - Cast Copper Alloy Threaded Fittings: Classes 125 and 250; 2018.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- H. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2020.
- I. ASME B31.9 - Building Services Piping; 2020.
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- K. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2019a.
- L. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- M. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts; 2014 (Reapproved 2020).

- N. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2022.
 - O. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
 - P. ASTM B32 - Standard Specification for Solder Metal; 2020.
 - Q. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
 - R. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
 - S. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
 - T. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2020.
 - U. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2021.
 - V. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2020.
 - W. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020.
 - X. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2022).
 - Y. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).
 - Z. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2022).
 - AA. AWWA C606 - Grooved and Shouldered Joints; 2015.
 - BB. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- 1.3 SUBMITTALS
- A. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
 - B. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.
 - C. Shop Drawings: Indicate pipe fittings, particulars such as gages, sizes, and configuration prior to start of work for [all piping] systems. Provide drawings in 1/4" per foot scale or larger.
- 1.4 QUALITY ASSURANCE
- A. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.6 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
 - 3. Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
 - b. Grooved mechanical connections and joints comply with AWWA C606.
 - 1) Ductile Iron: Comply with ASTM A536, Grade 65-45-12.
 - 2) Steel: Comply with ASTM A106/A106M, Grade B or ASTM A53/A53M.
 - c. Use rigid joints unless otherwise indicated.
 - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
 - 1. Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.
- D. Valves: Provide valves where indicated:
 - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
 - 2. For throttling, bypass, or manual flow control services, use ball or butterfly valves.
 - 3. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.
 - 4. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

2.2 HEATING WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
 - 4. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16 22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.3 CHILLED WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
 - 4. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16 22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.4 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
 - 1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.
 - 2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
- C. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
 - 1. Fittings: ASTM D2466 or D2467, PVC.
 - 2. Joints: Solvent welded in accordance with ASTM D2855.

2.5 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58. Refer to Section 230529 Hangers and Supports for HVAC Piping and Equipment.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe of 2 Inches and Less:
 - 1. Ferrous Piping: 150 psi brass or malleable iron, threaded.
 - 2. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.
 2. Copper Piping: Bronze.
 3. Gaskets: 1/16 inch thick, preformed neoprene.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
1. Dimensions and Testing: In accordance with AWWA C606.
 2. Mechanical Couplings: Comply with ASTM F1476.
 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.7 BUTTERFLY VALVES

- A. Manufacturers:
1. Anvil International: www.anvilintl.com/#sle.
 2. Apollo Valves: www.apollovalves.com/#sle.
 3. Grinnell Products: www.grinnell.com/#sle.
 4. Victaulic Company: www.victaulic.com/#sle.
- B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, grooved, or _____ ends, extended neck.
- C. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, Buna-N encapsulation, or _____.
- D. Operator: 10 position lever handle.

2.8 PRESSURE INDEPENDENT TEMPERATURE CONTROL VALVES AND BALANCING VALVES

- A. Control Valves: Factory-fabricated pressure independent with internal differential pressure regulator (DPRV), which automatically adjusts to normal changes in system pressure and provides 100 percent control valve authority at all positions of the valve.
1. PICV to accurately control the flow from 0 to 100 percent full rated flow with an operating pressure differential range of 3 to 60 psig.
 2. Provide control valve to incorporate control, balancing, and flow limiting. Hydronic system pressure independent control valve bodies to comply with ASME B16.34 or ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150 percent of the system design operating pressure and have the following characteristics:
 - a. 2 NPS and Smaller: Class 150 bronze body with union connections, stainless steel trim trim, stainless steel rising stem, stainless steel disc or ball, and screwed ends with backseating capacity repackable under pressure.
 - b. 2-1/2 NPS and Larger: Class 125 iron or ductile iron body, stainless steel trim, stainless steel rising stem, stainless steel disc or ball, flanged ends with backseating capacity repackable under pressure.
 - c. Pressure Control Seat: Brass construction with vulcanized EPDM.
 - d. Sizing: Line-size.

- e. Close-Off (Differential) Pressure Rating: Combination of actuator, DPRV action, and trim to provide a minimum close-off pressure rating of 150 percent of total system (pump) head.
- B. Electronic Actuators: Direct-mounted, self-calibrating type designed for minimum 60,000 full-stroke cycles at rated force.
- C. Provide actuator with visible position indication. Fail positions on power failure to include in-place, open or closed as indicated in the controls specifications.

PART 3 EXECUTION

1.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

1.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interference with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls, and floors.
- G. Slope piping and arrange to drain at low points.
- H. Grooved Joints:
 - 1. Install in accordance with the manufacturer's latest published installation instructions.
 - 2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.
- I. Inserts:
 - 1. Provide inserts for placement in concrete formwork.
 - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- J. Install valves with stems upright or horizontal, not inverted.

1.3 SCHEDULES

- A. Piping Applications:
 - 1. Hot-water heating piping, above ground, NPS 2 and smaller, shall be one of the following:

- a. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or mechanical pressure-seal joints.
- b. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; threaded or pressure-seal joints.
2. Hot-water heating piping, above ground, NPS 2-1/2 and larger, shall be one of the following:
 - a. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints; pressure seal joints are acceptable on piping NPS 4 and smaller.
 - b. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints; pressure seal joints are acceptable on piping NPS 4 and smaller.
 - c. Schedule 40 steel pipe, grooved, mechanical joint coupling and fitting; and grooved mechanical joints.
3. Chilled-water piping, above ground, NPS 2 and smaller, shall be one of the following:
 - a. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or mechanical pressure-seal joints.
 - b. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; threaded or pressure-seal joints.
4. Chilled-water piping, above ground, NPS 2-1/2 and larger, shall be one of the following:
 - a. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints; pressure seal joints are acceptable on piping NPS 4 and smaller.
 - b. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints; pressure seal joints are acceptable on piping NPS 4 and smaller.
 - c. Schedule 40 steel pipe, grooved, mechanical joint coupling and fitting; and grooved mechanical joints.
5. Condensate drain piping shall be one of the following:
 - a. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or mechanical pressure-seal joints.
 - b. Schedule 40 PVC plastic pipe and fittings and solvent-welded joints.

END OF SECTION

**SECTION 23 33 00
AIR DUCT ACCESSORIES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Turning vanes.
- B. Backdraft dampers - metal.
- C. Combination fire and smoke dampers.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connectors.
- H. Smoke dampers.
- I. Volume control dampers.

1.2 RELATED REQUIREMENTS

- A. Section 23 31 00 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. NFPA 92 - Standard for Smoke Control Systems; 2021.
- C. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- E. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- F. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- G. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- H. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Fusible Links: One of each type and size.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 **TURNING VANES**

2.2 BACKDRAFT DAMPERS - METAL

2.3 COMBINATION FIRE AND SMOKE DAMPERS

- A. Dynamic; fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
- B. Provide factory sleeve and collar for each damper.
- C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.
- D. Operators: UL listed and labelled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft.
- E. Normally Open Smoke Responsive Fire Dampers: Curtain type, closing upon actuation of electro thermal link, flexible stainless steel blade edge seals to provide constant sealing pressure, stainless steel springs with locking devices to ensure positive closure for units mounted horizontally.
- F. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.4 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.
 - 1. Less Than 12 inches Square: Secure with sash locks.
 - 2. Up to 18 inches Square: Provide two hinges and two sash locks.
 - 3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Provide an additional hinge.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.5 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 FIRE DAMPERS

- A. Dynamic; fabricate in accordance with NFPA 90A and UL 555, and as indicated.

- B. Ceiling (Radiation) Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame and 16-gauge, 0.0598-inch flap, two layers of 0.125-inch thick ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
 - 1. Boot Fitting: Factory-provided el type (90 degree). Include field-provided collar.
 - 2. Rated for three hour service in compliance with UL 555C.
- C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1-inch pressure-class ducts up to 12 inches in height.
- D. Fusible Links: UL 33, separate at 165 degrees F.

2.7 FLEXIBLE DUCT CONNECTORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
 - a. Net Fabric Width: Approximately 2 inches wide.
 - 2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.
- C. Maximum Installed Length: 14 inch.

2.8 SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B. Dampers: UL Class 1 airfoil blade type smoke damper, normally closed automatically operated by electric actuator.
- C. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

2.9 MANUAL VOLUME DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Splitter Dampers:
 - 1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.
- C. Single Blade Dampers:
 - 1. Fabricate for duct sizes up to 6 by 30 inch.
 - 2. Blade: 24 gauge, 0.0239 inch, minimum.
- D. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.
 - 1. Blade: 18 gauge, 0.0478 inch, minimum.

- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch size access door for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers and combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- G. Demonstrate re-setting of fire dampers to Owner's representative.
- H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- I. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- J. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.
- K. Use turning vanes only where indicated.

- L. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

**SECTION 23 36 00
AIR TERMINAL UNITS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single-duct terminal units.
 - 1. Variable-volume units.

- B. Fan-powered units.

1.2 RELATED REQUIREMENTS

- A. Section 23 09 93 - Sequence of Operations for HVAC Controls.
- B. Section 23 31 00 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017.
- C. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).
- D. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.4 SUBMITTALS

- A. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum eight years of documented experience.

PART 2 PRODUCTS

2.1 SINGLE-DUCT, VARIABLE-VOLUME UNITS

- A. Manufacturers:

1. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.
 2. Krueger-HVAC
 3. Enviromental Technologies, Inc.
 4. Metalaire, a brand of Metal Industries Inc.
 5. Price Industries, Inc.
 6. Titus.
 7. Trane, a brand of Ingersoll Rand.
- B. General:
1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
 2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.
- C. Unit Casing:
1. Minimum 22 gauge, 0.0299 inch galvanized steel.
 2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
 3. Unit Discharge: Rectangular, with slip-and-drive connections.
 4. Acceptable Liners:
 - a. 3/4 inch thick, coated, fibrous-glass complying with ASTM C1071.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with non-porous foil.
 - b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.
- D. Sound Attenuator:
1. Provide if required to meet scheduled acoustical performance requirements.
 2. Construction to consist of a continuous extension of the casing and liner as required to achieve required attenuation.
 3. At 2000 fpm inlet velocity, the minimum operating pressure with attenuator added not to exceed 0.14 in-wc.
- E. Damper Assembly:
1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
 2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak damper blades for tight airflow shutoff.
 - a. Air Leakage Past Closed Damper: Maximum two percent of unit maximum airflow at 3 in-wc inlet static pressure, tested in accordance with ASHRAE Std 130.
- F. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
 2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.

- a. Two rows with ten fins-per-inch heating capacity density.
 3. Coil leak tested to minimum 350 psig.
 4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.
- G. Electric Heating Coil:
1. Listed and provided by the terminal unit manufacturer.
 2. Coil Casing: 20 gauge, 0.0359 inch galvanized steel.
 3. Heating Elements: Nickel chrome, supported by ceramic insulators.
 4. Integral Control Panel: NEMA EN 10250, Type 2 enclosure with hinged access door for access to all controls and safety devices.
 5. Furnish a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow.
 6. Provide the following additional components, mounted and/or wired within the control enclosure:
 - a. Fused or non-fused door interlocking disconnect switch.
 - b. Mercury contactors.
 - c. Fuse block.
 7. Factory wired, including all limit switches and steps of control as indicated on the equipment schedule, with the SSR (solid-state relay) proportional heat control.
 8. Provide SCR (Silicon Controlled Rectifier) controller.
- H. Electrical Requirements:
1. Single-point power connection.
 2. Equipment wiring to comply with requirements of NFPA 70.
- I. Controls:
1. DDC (Direct-Digital Controls):
 - a. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
 - b. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
 - 1) Occupied and unoccupied operating mode.
 - 2) Remote reset of temperature or CFM set points.
 - 3) Proportional, plus integral control of room temperature.
 - 4) Monitoring and adjusting with portable terminal.
 - c. Room Sensor:
 - 1) Compatible with temperature controls specified.
 - 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
 2. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
 - a. Signal accuracy: Plus/minus five percent throughout terminal operating range.
- 2.2 FAN-POWERED PARALLEL UNITS
- A. Manufacturers:
1. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.
 2. Enviromental Technologies, Inc.

3. Krueger.
 4. Metalaire, a brand of Metal Industries Inc.
 5. Price Industries, Inc.
 6. Titus.
 7. Trane, a brand of Ingersoll Rand.
- B. General:
1. Factory-assembled and wired, AHRI 880 (I-P) rated, horizontal fan-powered terminal unit with blower, blower motor, mixing plenum, and primary air damper contained in a single unit housing.
- C. Unit Casing:
1. Minimum 22 gauge, 0.0299 inch galvanized steel.
 2. Primary Air Inlet Collar: Suitable for standard flexible duct sizes.
 3. Unit Discharge: Rectangular, suitable for flanged duct connection.
 4. Plenum Inlet: Filter rack with disposable filters.
 - a. 1 inch thick disposable fiberglass filters.
 - b. Minimum Efficiency Reporting Value (MERV): 6, when tested in accordance with ASHRAE Std 52.2.
 5. Acceptable Liners:
 - a. 3/4 inch thick, coated, fibrous-glass complying with ASTM C1071.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with non-porous foil.
- D. Sound Attenuator:
1. Provide if required to meet scheduled acoustical performance requirements.
 2. Construction to consist of a continuous extension of the casing and liner as required to achieve required attenuation.
- E. Primary Air Damper Assembly:
1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid shaft rotating in bearings.
 2. Provide indicator on damper shaft or alternative method for indicating damper position over full range of 90 degrees.
 3. Incorporate low leak (2 percent) damper blades for tight airflow shutoff.
 4. Fan(s): Forward curved, centrifugal type.
 5. Fan Motor:
 - a. ECM (Electrically Commutated Motor);
 - b. Fan motor shaft directly connected to fan and isolated from unit casing to prevent transmission of vibration.
- F. Electric Heating Coil:
1. Listed and provided by the terminal unit manufacturer.
 2. Coil Casing: Minimum 20 gauge, 0.0359 inch galvanized steel.
 3. Heating Elements: Open wire, nickel chrome, supported by ceramic insulators.
 4. Integral Control Panel: NEMA EN 10250, Type 2 enclosure, with hinged access door for access to all controls and safety devices.

5. Provide a primary automatic reset thermal cutout and differential pressure airflow switch for proof of airflow or electrical interlock to prevent heater operation when fan is not running.
 6. Provide the following additional components, mounted and/or wired within the control enclosure:
 - a. Fused or non-fused door interlocking disconnect switch.
 - b. Mercury contactors.
 - c. Fuse block.
 7. Provide SCR (Silicon Controlled Rectifier) controller.
- G. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal unit with flanged discharge for attachment to downstream ductwork.
 2. Heavy-gauge aluminum fins, mechanically bonded to tubes.
 3. Copper Tubes: 0.016 inch minimum wall thickness with male solder header connections.
 4. Coil leak tested to minimum 305 psig.
 5. Base performance data on tests run in accordance with AHRI 410.
- H. Electrical Requirements:
1. Single-point power connection.
 2. Equipment wiring to comply with requirements of NFPA 70.
- I. Controls:
1. DDC (Direct-Digital Controls):
 - a. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
 - b. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFMs.
 - 1) Occupied and unoccupied operating mode.
 - 2) Remote reset of temperature or CFM set points.
 - 3) Proportional, plus integral control of room temperature.
 - 4) Monitoring and adjusting with portable terminal.
 - c. Room Sensor:
 - 1) Compatible with temperature controls specified.
 - 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
 2. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
 - a. Signal accuracy: Plus/minus five percent throughout terminal operating range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that conditions are suitable for installation.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

- C. Provide ceiling access doors or locate units above easily removable ceiling components.
- D. Do not support from ductwork.
- E. Connect to ductwork in accordance with Section 23 31 00.
- F. Verify that electric power is available and of the correct characteristics.

3.3 FIELD QUALITY CONTROL

- A. Provide manufacturer's field representative to inspect field-assembled components and equipment installation, including connections and to assist in field testing. Report results in writing.
 - 1. Leak Test:
 - a. After installation, fill water coils and test for leaks.
 - b. Repair leaks and retest until no leaks exist.
 - 2. Operational Test:
 - a. After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - b. Test and adjust controls and safeties.
 - c. Replace damaged and malfunctioning controls and other equipment.
 - d. Remove and replace malfunctioning units and retest as specified above.

3.4 CLEANING

- A. Vacuum clean coils and inside of units.
- B. Install new filters.

END OF SECTION

**SECTION 23 74 13
PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Packaged roof top unit.
- B. Unit controls.
- C. Roof mounting curb and base.

1.2 RELATED REQUIREMENTS

- A. Section 23 05 48 - Vibration and Seismic Controls for HVAC.
- B. Section 23 40 00 - HVAC Air Cleaning Devices.

1.3 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.4 SUBMITTALS

- A. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- B. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Trane Technologies, PLC: www.trane.com/#sle.
- B. Substitutions: No substitutions allowed. Substitutions will be acceptable only on owner's approval.

2.2 MANUFACTURED UNITS

- A. General: Roof mounted units having _____ and electric refrigeration.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, heat exchanger and burner, heat recovery coil, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.
- C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.
- D. Disconnect Switch: Factory mount disconnect switch in control panel.

2.3 FABRICATION

- A. Cabinet: Steel with baked enamel finish, including access doors with piano hinges and locking handle. Structural members shall be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.
- B. Heat Exchangers: Stainless steel, of welded construction.
- C. Air Filters:
 - 1. 2 inch thick glass fiber disposable media in metal frames.
 - 2. See Section 23 40 00.
- D. Roof Mounting Curb: 24 inches high galvanized steel, channel frame with gaskets, nailer strips.

2.4 ELECTRIC HEATING COIL

- A. Finned tube heating elements easily accessible with automatic reset thermal cut-out, built-in magnetic contactors, galvanized steel frame, control circuit transformer and fuse, manual reset thermal cut-out, airflow proving device, toggle switch (pilot duty), load fuses.
- B. Controls: Start supply fan before electric elements are energized and continue operating until air temperature reaches minimum setting, with switch for continuous fan operation.

2.5 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration cooling capacity and larger.

2.6 COMPRESSOR

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.
- B. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

2.7 CONDENSER COIL

- A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

- B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.8 MIXED AIR CASING

- A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position. Relief dampers may be gravity balanced.
- B. Gaskets: Provide tight fitting dampers with edge gaskets and maximum leakage 5 percent at 2 in-wc pressure differential.
- C. Damper Operator: 24 volt with gear train sealed in oil.

2.9 OPERATING CONTROLS - SINGLE ZONE UNITS

- A. Electric solid state microcomputer based room thermostat, located as indicated.
- B. Room thermostat shall incorporate:
 - 1. Automatic switching from heating to cooling.
 - 2. Programming based on weekdays, Saturday and Sunday.
- C. Room thermostat display shall include:
 - 1. Time of day.
 - 2. Actual room temperature.
 - 3. Programmed temperature.
 - 4. System model indication: heating, cooling, auto, off, fan auto, fan on.
 - 5. Stage (heating or cooling) operation.

2.10 HEAT RECOVERY COIL

- A. Provide copper tube aluminum fin coil assembly with multiple circuits arranged to provide heat recovery.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NFPA 90A.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.3 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation.

3.4 CLOSEOUT ACTIVITIES

- A. Demonstrate operation to Owner's maintenance personnel.

END OF SECTION

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Wire pulling lubricant.
- G. Cable ties.
- H. Firestop sleeves.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

- J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 183 - Manufactured Wiring Systems; Current Edition, Including All Revisions.
- O. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- Q. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- S. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.
- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- J. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- K. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
 - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.

- L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- M. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.
 - d. Isolated Ground, All Systems: Green with yellow stripe.
 - e. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC.
 - b. Encore Wire Corporation.
 - c. General Cable Technologies Corporation.
 - d. Service Wire Co.
 - e. Southwire Company.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
 - 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

2.4 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc.
 - 2. Encore Wire Corporation.

- 3. Service Wire Co.
- 4. Southwire Company.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Grounding: Full-size integral equipment grounding conductor.
 - 1. Provide additional isolated/insulated grounding conductor where indicated or required.
- G. Armor: Steel, interlocked tape.

2.5 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 - 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 - 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 - 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- F. Mechanical Connectors: Provide bolted type or set-screw type.

1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO.
 - c. Thomas & Betts Corporation.
 - G. Compression Connectors: Provide circumferential type or hex type crimp configuration.
 1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO.
 - c. Thomas & Betts Corporation.
 - H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
 1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO.
 - c. Thomas & Betts Corporation.
- 2.6 ACCESSORIES
- A. Electrical Tape:
 1. Manufacturers:
 - a. 3M.
 - b. Plymouth Rubber Europa.
 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
 - B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
 - C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 - D. Cable Ties: Material and tensile strength rating suitable for application.
 - E. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:
 - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Circuiting Requirements:
 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 2. When circuit destination is indicated without specific routing, determine exact routing required.
 3. Arrange circuiting to minimize splices.
 4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
 7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
 8. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- H. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
 - c. MC cable shall be permitted where allowed by NFPA 70, local codes or the local AHJ. MC cable shall be used for 20A branch circuits for switch or receptacle drops, lighting fixture whips, or short flex connections to devices where concealed in ceilings, walls, and partitions and where it will not subject to vibration or movement. MC cable should not be used in wet locations.
 - d. All homeruns and branch circuit feeders shall be installed in non-flexible metallic conduits. Cable shall transition to rigid type conduit within ceiling space outside room for portion of branch circuit back to source panels or adjacent rooms.
 - e. MC cable shall not be used for HVAC, elevator/escalator, and kitchen equipment branch circuits or within mechanical, electrical or telecommunication equipment rooms.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

- a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

**SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.
- F. Ground enhancement material.
- G. Ground access wells.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2017.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2020.
- E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Shop Drawings:
 - 1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Grounding Electrode System:
 - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
 - 2. Metal Underground Water Pipe(s):

- a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
- b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
- c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
 - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
 - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Ring:
 - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
 - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
 - c. Provide ground enhancement material around conductor where indicated.
 - d. Provide connection from ground ring conductor to:
 - 1) Perimeter columns of metal building frame.
6. Ground Rod Electrode(s):
 - a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
 - b. Space electrodes not less than 10 feet from each other and any other ground electrode.
 - c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
 - d. Provide ground enhancement material around electrode where indicated.
 - e. Provide ground access well for each electrode.
7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
 - a. Ground Bar Size: 1/4 by 4 by 12 inches unless otherwise indicated or required.
 - b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
 - c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.
- E. Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
 2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- F. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
1. Provide grounding electrode system for each separate building or structure.
 2. Provide equipment grounding conductor routed with supply conductors.
 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- G. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
 - a. Transformers (except auto transformers such as buck-boost transformers).
 - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
 - c. Generators, when neutral is switched in the transfer switch.
 2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
 3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
 4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
 5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
 6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
 7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- H. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 - c. Metal process piping.
 8. Provide bonding for interior metal air ducts.
 9. Provide bonding for metal building frame.
 10. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
- I. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
 2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
 3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.
- J. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
 - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

2.2 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
 - 1) Use mechanical connectors for connections to electrodes at ground access wells.
 - 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - a. Exceptions:
 - 1) Use exothermic welded connections for connections to metal building frame.
 - 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT).
 - b. Burndy LLC.
 - c. Harger Lightning & Grounding.
 - d. Thomas & Betts Corporation.
 - 5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC.
 - b. Cadweld, a brand of Erico International Corporation.
 - c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC.
- D. Ground Bars:
 - 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 - 2. Standard Size: 1/4"D x 4"D x 12"L unless noted otherwise.
 - 3. Holes for Connections: As indicated or as required for connections to be made.
 - 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT).
 - b. Erico International Corporation.
 - c. Harger Lightning & Grounding.
- E. Ground Rod Electrodes:
 - 1. Comply with NEMA GR 1.
 - 2. Material: Copper-bonded (copper-clad) steel.
 - 3. Size: 3/4 inch diameter by 10 feet in length, unless otherwise indicated.
 - 4. Manufacturers:

- a. Advanced Lightning Technology (ALT).
 - b. Erico International Corporation.
 - c. Galvan Industries, Inc.
 - d. Harger Lightning & Grounding.
- F. Ground Access Wells:
- 1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
 - 2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
 - a. Round Wells: Not less than 8 inches in diameter.
 - b. Rectangular Wells: Not less than 12 by 12 inches.
 - 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
 - 4. Cover: Factory-identified by permanent means with word "GROUND".
 - 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT).
 - b. Erico International Corporation.
 - c. Harger Lightning & Grounding.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
 - 2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- E. Identify grounding and bonding system components in accordance with Section 26 05 53.

END OF SECTION

**SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- E. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.

3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be

- supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation.
 - b. Erico International Corporation.
 - c. O-Z/Gedney, a brand of Emerson Electric Co.
 - d. Thomas & Betts Corporation.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton.
 - b. Erico International Corporation.
 - c. O-Z/Gedney, a brand of Emerson Electric Co.
 - d. Thomas & Betts Corporation.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 3. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
 5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation.
 - b. Thomas & Betts Corporation.
 - c. Unistrut, a brand of Atkore International Inc.

- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
 - e. Outlet Boxes: 1/4 inch diameter.
 - f. Luminaires: 1/4 inch diameter.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Hollow Masonry: Use toggle bolts.
 - 5. Hollow Stud Walls: Use toggle bolts.
 - 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 7. Sheet Metal: Use sheet metal screws.
 - 8. Wood: Use wood screws.
 - 9. Plastic and lead anchors are not permitted.
 - 10. Powder-actuated fasteners are not permitted.
 - 11. Hammer-driven anchors and fasteners are not permitted.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.

- 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Conduit Support and Attachment: Also comply with Section 26 05 33.13.
- I. Box Support and Attachment: Also comply with Section 26 05 33.16.
- J. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.
- K. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.
- L. Secure fasteners according to manufacturer's recommended torque settings.
- M. Remove temporary supports.

END OF SECTION

**SECTION 26 05 33.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. PVC-coated galvanized steel rigid metal conduit (RMC).
- D. Flexible metal conduit (FMC).
- E. Liquidtight flexible metal conduit (LFMC).
- F. Electrical metallic tubing (EMT).
- G. Rigid polyvinyl chloride (PVC) conduit.
- H. Liquidtight flexible nonmetallic conduit (LFNC).
- I. Conduit fittings.
- J. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 33.16 - Boxes for Electrical Systems.
- F. Section 26 05 33.23 - Surface Raceways for Electrical Systems.
- G. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.

1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2025.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.

- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- R. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- S. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- T. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

- C. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Underground:
 - 1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 - 2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
 - 3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 - 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
 - 5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
 - 6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
 - 7. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.
- D. Embedded Within Concrete:

1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
 4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.
- E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- K. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
- L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
1. Maximum Length: 6 feet.
- N. Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit.
 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 3. Maximum Length: 6 feet unless otherwise indicated.
 4. Vibrating equipment includes, but is not limited to:
 - a. Transformers.
 - b. Motors.
- 2.2 CONDUIT REQUIREMENTS
- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
 - B. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - C. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4 inch (21 mm) trade size.
 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 3. Control Circuits: 1/2 inch (16 mm) trade size.
 4. Underground, Interior: 3/4 inch (21 mm) trade size.
 5. Underground, Exterior: 1 inch (27 mm) trade size.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- 2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)
- A. Manufacturers:
1. Allied Tube & Conduit.
 2. Nucor Tubular Products.
 3. Western Tube, a division of Zekelman Industries.
 4. Wheatland Tube, a division of Zekelman Industries.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation.
 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel.
 5. Connectors and Couplings:
- 2.4 INTERMEDIATE METAL CONDUIT (IMC)
- A. Manufacturers:
1. Allied Tube & Conduit.
 2. Nucor Tubular Products.
 3. Western Tube, a division of Zekelman Industries.
 4. Wheatland Tube, a division of Zekelman Industries.
- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- C. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation.
 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
4. Material: Use steel.
5. Connectors and Couplings: Compression type.

2.5 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 1. Thomas & Betts Corporation.
 2. Robroy Industries.
 3. Allied Tube & Conduit.
 4. Calbond.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
- C. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.
- D. Interior Coating: Urethane, minimum thickness of 2 mil.
- E. PVC-Coated Fittings:
 1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
 2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel or malleable iron.
 5. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.
 6. Interior Coating: Urethane, minimum thickness of 2 mil.
- F. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil.

2.6 FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:
 1. AFC Cable Systems, Inc.
 2. Electri-Flex Company.
 3. International Metal Hose.
- B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.

2.7 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Electri-Flex Company.
 - 3. International Metal Hose.
- B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.

2.8 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Allied Tube & Conduit.
 - 2. Nucor Tubular Products.
 - 3. Western Tube, a division of Zekelman Industries.
 - 4. Wheatland Tube, a division of Zekelman Industries.
- B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- C. Fittings:
 - 1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney, a brand of Emerson Electric Co.
 - c. Thomas & Betts Corporation.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 3. Material: Use steel or malleable iron.
 - 4. Connectors and Couplings: Use compression (gland) or set-screw type.
 - a. Do not use indenter type connectors and couplings.
 - 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 - 6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.9 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
 - 1. Cantex Inc.
 - 2. Carlon, a brand of Thomas & Betts Corporation.
 - 3. JM Eagle.
 - 4. Allied Tube & Conduit.

- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. Electri-Flex Company.
 - 3. International Metal Hose.
- B. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.11 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- G. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

H. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
3. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
4. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
5. Arrange conduit to maintain adequate headroom, clearances, and access.
6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
7. Arrange conduit to provide no more than 150 feet between pull points.
8. Route conduits above water and drain piping where possible.
9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
10. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
11. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.

I. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
4. Use conduit clamp to support single conduit from beam clamp or threaded rod.
5. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
6. Use of wire for support of conduits is not permitted.
7. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

J. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- K. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- L. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16.13.
 2. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 - b. Under Slab on Grade: 12 inches to bottom of slab.
 3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length for service entrance where not concrete-encased.
- M. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Secure conduits to prevent floating or movement during pouring of concrete.
- N. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.
- O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 4. Where conduits are subject to earth movement by settlement or frost.
- P. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- Q. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- R. Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION

**SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Warning signs and labels.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 26 05 73 - Power System Studies: Arc flash hazard warning labels.
- C. Section 26 27 26 Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

1.3 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- C. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchgear:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Use identification nameplate to identify main and tie devices.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - b. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - c. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - d. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location.
 - 4) Identify load(s) served. Include location.
 - e. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location.
 - 3) Identify load(s) served. Include location.
 - f. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.

- g. Enclosed Contactors:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
 - 4) Identify coil voltage.
 - 5) Identify load(s) and associated circuits controlled. Include location.
 - h. Centralized Emergency Lighting Inverters:
 - 1) Identify input and output voltage and phase.
 - 2) Identify power source and circuit number for normal power source. Include location.
 - 3) Identify load(s) served. Include location.
 - i. Transfer Switches:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number for both normal power source and standby power source. Include location
 - 3) Identify load(s) served. Include location.
 - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
 - j. UPS (Uninterruptible Power Supplies)
 - 1) Identify kW / kVA.
 - 2) Identify input and output voltage and phase.
 - 3) Identify power source and circuit number for normal power source. Include location.
 - 4) Identify load(s) served. Include location.
 - k. Electricity Meters:
 - 1) Identify load(s) metered.
2. Service Equipment:
- a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Emergency System Equipment:
- a. Use identification nameplate to identify emergency system equipment in accordance with NFPA 70.
 - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
 - c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.
4. Use identification label to identify highest voltage present for each piece of electrical equipment.
5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.

6. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
 7. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 8. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
 9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
 10. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
 - a. Service equipment.
 - b. Motor control centers.
 - c. Elevator control panels.
 11. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches.
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
 - c. Service Equipment: Include the following information in accordance with NFPA 70.
 - 1) Nominal system voltage.
 - 2) Available fault current.
 - 3) Clearing time of service overcurrent protective device(s).
 - 4) Date label applied.
 12. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
 13. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 14. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 15. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.

2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
 3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 5. Use underground warning tape to identify direct buried cables.
- C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 2. Use color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Color Code:
 - (a) Emergency Power System: Red.
 - (b) Fire Alarm System: Red.
 - 2) Field-Painting: Comply with Section 09 91 23 and 09 91 13.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 5. Use underground warning tape to identify underground raceways.
 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.
- D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
 2. Use color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the following color code:
 - 1) Emergency Power System: Red.
 - 2) Fire Alarm System: Red.
 3. Use identification labels to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
- E. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
 2. Use identification label to identify fire alarm system devices.
 3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:
 - a. Brimar Industries, Inc.
 - b. Kolbi Pipe Marker Co.
 - c. Seton Identification Products.
2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use stainless steel nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:
 - a. Brady Corporation.
 - b. Brother International Corporation.
 - c. Panduit Corp.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 4 inch. L x 3 inch. H
2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
 - a. System Designation: 1/2 inch.
 - b. Equipment Designation: 1/2 inch.
 - c. Other Information: 1/4 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
 - c. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:

1. Minimum Size: 1 inch by 2.5 inches.

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/4 inch.
 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 1/2 inch.
 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Power source and circuit number or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.
- G. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Load controlled or other designation indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Black text on clear background.
- H. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
 2. Legend: Designation indicated and device zone or address.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height: 3/16 inch.
 5. Color: Red text on white background.
- 2.3 WIRE AND CABLE MARKERS
- A. Manufacturers:
1. Brady Corporation.
 2. HellermannTyton.
 3. Panduit Corp.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Brimar Industries, Inc.
 - 3. Seton Identification Products.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
- F. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation.
 - 2. Brimar Industries, Inc.
 - 3. Seton Identification Products.
- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc.
 - 2. Clarion Safety Systems, LLC.

3. Insite Solutions, LLC.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried service lines with one tape per trench at 12 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.

- H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION

**SECTION 26 28 16.16
ENCLOSED SWITCHES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- H. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
 - 3. Identify mounting conditions required for equipment seismic qualification.
- D. Manufacturer's equipment seismic qualification certification.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. ABB/GE.
- B. Eaton Corporation.
- C. Schneider Electric; Square D Products.
- D. Siemens Industry, Inc.
- E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.

- 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- H. Provide with switch blade contact position that is visible when the cover is open.
- I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
 - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- J. Conductor Terminations: Suitable for use with the conductors to be installed.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:
 - 1. Comply with NEMA BS 31047.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

- D. Provide required support and attachment in accordance with Section 26 05 29.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 05 26.
- H. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

END OF SECTION

DALLAS COUNTY - RENOVATION PROJECTS			
COST BREAKDOWN			
Project Name:			
Date:			
ITEM	COST CATEGORY DESCRIPTION	PERCENTAGE (%)	TOTAL AMOUNT (\$)
1	General Requirements:		
2	General Conditions:		
3	Cost of Work:		
4	Contractor Contingency:		
5	Total Construction Costs: (Line Items 1 thru 4)		0
6	Payment & Performance Bonds:		
7	Insurance:		
8	Permit Fee:		
9	Contractor Fee/Profit:		
10	Total Markups (Line Items 6 thru 9)		0
11	Owner Contingency:	5%	0
12	TOTAL SUBMITTED COSTS: (Line Items 5+10+11)		0
13	Alternates:		

- * General Requirements should cover ALL related costs to complete the project with the exception of Cost of Work
- * General Conditions should take into account all Personnel required to complete the project
- * Cost of Work needs to be broken down by ASTM E1557 Uniformat Level II Classification.
- * Cost of Work should include any Allowances if identified in the Bid Documents
- * Owner approval required for use of ALL contingencies. Contractor shall be responsible for procurement and coordination
- * Owner Contingencies are to be a Percentage of Line 5 and subject to relative markups
- * Alternates should be all inclusive of General Conitions, General Requirements and relevant markups.
- * Total costs under Line 12 should be entered in BidSync
- * All Cost Categories need to be separated and filled-in as listed in the Cost Sheet

DALLAS COUNTY - RENOVATION PROJECTS		
UNIFORMAT LEVEL II CLASSIFICATION FORM		
Project Name:		
Solicitation No:		
Vendor Name:		
Date:		
Division	Uniformat Level II Description	Estimated Cost (\$)
Division 01	General Requirements	\$ -
Division 02	Existing Conditions	\$ -
Division 03	Concrete	\$ -
Division 04	Masonry	\$ -
Division 05	Metals	\$ -
Division 06	Wood, Plastics, and Composites	\$ -
Division 07	Thermal and Moisture Protection	\$ -
Division 08	Openings	\$ -
Division 09	Finishes	\$ -
Division 10	Specialties	\$ -
Division 11	Equipment	\$ -
Division 12	Furnishings	\$ -
Division 13	Special Construction	\$ -
Division 14	Conveying Equipment	\$ -
Division 21	Fire Suppression	\$ -
Division 22	Plumbing	\$ -
Division 23	HVAC	\$ -
Division 25	Integrated Automated Systems	\$ -
Division 26	Electrical	\$ -
Division 27	Communications	\$ -
Division 28	Electronic Safety and Security	\$ -
Division 31	Earthwork	\$ -
Division 32	Exterior Improvements	\$ -
Division 33	Utilities	\$ -
Division 34	Transportation	\$ -
Division 35	Waterway and Marine Construction	\$ -
Division 40	Process Integration Manufacturers	\$ -
Division 41	Material Processing and Handling Equipment	\$ -
Division 42	Process Heating, Cooling and Drying Equipment	\$ -
Division 43	Process Gas and Liquid Handling, Purification, and Storage Equipment Manufacturers	\$ -
Division 44	Pollution Control Equipment	\$ -
Division 45	Industry-Specific Manufacturing Equipment	\$ -
Division 46	Water and Wastewater Equipment	\$ -
Division 48	Electrical Power Generation	\$ -
	TOTAL (Cost of Work)***	\$ -

*** Enter under line item 2 on *Bid Cost Sheet*

Questions & Answers

Buyer Organization Dallas County
Question Acceptance Deadline 04/09/2026 03:00 PM CDT
Closing Date 04/23/2026 02:00 PM CDT

No	Vendor Name	Question/Answer	Question Date	Answer Date
Q1	service squad, Inc.	<p>Question: Estimated Budget (by <i>Shoney Mathew</i>) What is the estimated budget for this project</p> <p>No answer has been provided for this question yet.</p>	03/17/2026 05:45 AM CDT	
Q2	service squad, Inc.	<p>Question: Pre-Bid Site Visit (by <i>Shoney Mathew</i>) Is there any pre-bid site visit scheduled?</p> <p>No answer has been provided for this question yet.</p>	03/17/2026 05:46 AM CDT	
Q3	Hearn Company	<p>Question: Estimated Cost (by <i>Kris Hearn</i>) Is there an estimated cost for this project?</p> <p>No answer has been provided for this question yet.</p>	03/17/2026 01:33 PM CDT	