

## Notice

### Basic Information

Reference Number	0000387155
Issuing Organization	Dallas County
Owner Organization	
Project Type	IFB - Invitation for Bid (Formal)
Project Number	2025-039-7064
Title	West Tower Jail First Floor Smoke Evacuation System Upgrade
Source ID	PU.AG.USA.2438.C18536526
Piggyback Solicitation	No

### Details

Location	Dallas County, Texas
Description	<p>Closing and Submission Date The bids response must be submitted by the due date June 12, 2025, at 2:00 p.m. (CST)</p> <p>Bid Reading June 12, 2025, at 2:30 p.m. (CST), the reading will be conducted via a live meeting online. Bids will be publicly opened in compliance with the public bid opening statutory requirements.</p>

### Dates

Publication	05/15/2025 08:01 AM CDT
Question Acceptance Deadline	06/03/2025 01:00 PM CDT
Questions are submitted online	Yes
Closing Date	06/12/2025 02:00 PM CDT

Prebid Conference	05/28/2025 11:00 AM CDT
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### Contact Information

Marvin Kines  
214-653-7933  
marvin.kines@dallascounty.org

### Buyer Preferences, Guidelines & Requirements

#### Participation Requirements

- Small Business Participation

#### General Requirements

- Insurance Required

### Bonding Requirements

- Bid Bond	5.00 %
- Performance Bond	100.00 %
- Payment Bond	100.00 %

### Pre-Bidding Events

Event Type	Prebid Conference
Attendance	Recommended
Event date	05/28/2025 11:00 AM CDT
Location	Virtual with Microsoft Teams
Event Note	<p>Optional Pre-Bid Conference Pre-bid conference is on May 28th, 2025 at 11:00 a.m. (CST), this pre-bid conference will be conducted virtually via Microsoft Teams.</p>

#### Join the meeting now

Meeting ID: 255 812 961 526 0  
Passcode: VE3vC2Jf **Dial in by phone**  
+1 469-208-1731,,299135388# United States, Carrollton  
Find a local number  
Phone conference ID: 299 135 388#

**Bid Submission Process**

**Bid Submission Type**

Electronic or Physical Bid Submission

**Pricing**

In attached document

**Pricing**

In attached document

**Bid Documents List**

Item Name	Description	Mandatory	Limited to 1 file
Bid Documents	Documents defining the proposal	No	No
2025 W-9	2025 W-9	No	No
References	Submit reference letters	No	No
SBE Documents	Attachment S - Small Business Enterprise (SBE) Forms	No	No
Cost Template	Attatch Cost Template	No	No

## Documents

### Documents

Document	Size	Uploaded Date	Language
DALLAS COUNTY STANDARD TERMS AND CONDITIONS IFB (1).pdf [pdf]	342 Kb	12/20/2024 02:00 PM CST	English
SBE_Language_for_IFB_2.24.24_ATTACHMENT_S.pdf [pdf]	536 Kb	12/19/2024 11:15 AM CST	English
Specifications - Exhibit 1.pdf [pdf]	5 Mb	05/13/2025 01:57 PM CDT	English
Drawings - Exhibit 2.pdf [pdf]	22 Mb	05/13/2025 01:57 PM CDT	English
Cost Template Generric_031424.pdf [pdf]	36 Kb	05/14/2025 03:09 PM CDT	English
2025-039-7064 IFB West Tower Jail 1st Floor - Smoke Evacuation System Upgrade.pdf [pdf]	212 Kb	05/14/2025 03:14 PM CDT	English

## Categories

### Selected Categories

NIGP Categories (4)	
340	<b>FIRE PROTECTION EQUIPMENT AND SUPPLIES</b>
34080	<b>Smoke Detecting Equipment (Incl. Smoke Alarms)</b> Smoke Detecting Equipment (Incl. Smoke Alarms)
912	<b>CONSTRUCTION SERVICES, GENERAL (INCL. MAINTENANCE AND REPAIR SERVICES)</b>
91220	<b>Construction, Fire Protection (Includes Fire Escapes, Fire and Smoke Barriers, Firestops)</b> Construction, Fire Protection (Includes Fire Escapes, Fire and Smoke Barriers, Firestops)
925	<b>ENGINEERING SERVICES, PROFESSIONAL</b>
92584	<b>Security Systems; Intruder and Smoke Detection/Engineering</b> Security Systems; Intruder and Smoke Detection/Engineering
936	<b>EQUIPMENT MAINTENANCE AND REPAIR SERVICES FOR GENERAL EQUIPMENT</b>
93609	<b>Alarm Equipment Maintenance/Repair (Fire, etc.)</b> Alarm Equipment Maintenance/Repair (Fire, etc.)

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## **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, 21<sup>st</sup> 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 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](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](mailto: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](mailto: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/departments/purchasing](http://www.dallascounty.org/departments/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	\$	%

### Small Business Enterprise

[Records Building](#) - 500 Elm Street, Suite 0300, Dallas, TX 75202  
Telephone: (214) 653-6021 | E-Mail: [sbe@dallascounty.org](mailto:sbe@dallascounty.org)



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? \_\_\_\_\_

### Small Business Enterprise

[Records Building](#) - 500 Elm Street, Suite 0300, Dallas, TX 75202  
Telephone: (214) 653-6021 | E-Mail: [sbe@dallascounty.org](mailto:sbe@dallascounty.org)



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 #: \_\_\_\_\_

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

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:

	Prime	Sub
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	_____	_____



**PROJECT MANUAL**

**FOR**

**LEW STERRETT JUSTICE CENTER WEST TOWER FIRST FLOOR SMOKE EVACUATION SYSTEM  
UPGRADE**

**PROJECT NUMBER: 2023-DC048-002**



**DALLAS COUNTY FACILITIES MANAGEMENT**

**LEW STERRETT WEST TOWER JAIL  
111 W COMMERCE ST.  
DALLAS, TEXAS 75207**

**ISSUED FOR: ISSUE FOR CONSTRUCTION; JANUARY 21, 2025**

**PREPARED BY:**

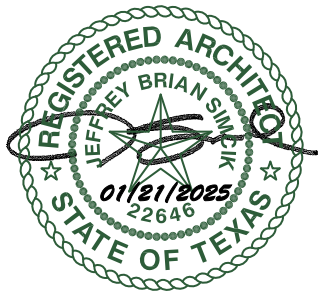
**HED**



SECTION 000107  
SEALS PAGE

ARCHITECTURAL

MEP



1/21/2025

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
- 003100 - Available Project Information

### **SPECIFICATIONS**

#### **Division 01 -- General Requirements**

- 011000 - Summary
- 012000 - Price and Payment Procedures
- 012300 - Alternates
- 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
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- 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
- 015813 - Temporary Project Signage
- 016000 - Product Requirements
- 016116 - Volatile Organic Compound (VOC) Content Restrictions
- 017000 - Execution and Closeout Requirements
- 017800 - Closeout Submittals
- 017900 - Demonstration and Training

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- 024100 - Demolition

**Division 03 -- Concrete (NOT USED)**

**Division 04 -- Masonry**

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**Division 05 -- Metals (NOT USED)**

**Division 06 -- Wood, Plastics, and Composites (NOT USED)**

**Division 07 -- Thermal and Moisture Protection**

072100 - Thermal Insulation

**Division 08 -- Openings**

081113 - Hollow Metal Doors and Frames

087100 - Door Hardware

**Division 09 -- Finishes**

099000 - Painting and Coating

**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)**

**Division 23 -- Heating, Ventilating, and Air-Conditioning (HVAC)**

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

233100 - HVAC Ducts and Casings

233300 - Air Duct Accessories

233416 - Centrifugal HVAC Fans

233419 - Smoke Control Systems

233600 - Air Terminal Units

234000 - HVAC Air Cleaning Devices

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**Division 25 -- Integrated Automation (NOT USED)**

**Division 26 -- Electrical**

260519 - Low-Voltage Electrical Power Conductors and Cables

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  
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**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: January 21, 2025
  3. List: Refer to Drawing G-001 for complete list of drawings.

**END OF SECTION 000115**

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**SECTION 003100  
AVAILABLE PROJECT INFORMATION**

**PART 1 GENERAL**

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

**3.01 OBTAINMENT OF PERMITS**

- A. Contractor to obtain the following required permits, at no cost to Owner:
  - 1. Building Permit.
- B. Building Permit Procedures: When required to obtain this permit:
  - 1. Complete and file permit application(s) with appropriate agency.
  - 2. Pay required fees.
  - 3. Advise Architect if submission of modified documents is necessary to have the authorities having jurisdiction complete the plan review and approval process. Submit modified documents expeditiously.
  - 4. Do not commence execution of any item of work for which a permit has not been obtained.

**END OF SECTION 003100**

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**SECTION 011000  
SUMMARY**

**PART 1 GENERAL**

**1.01 PROJECT**

- A. Project Name: Low Sterrett Justice Center West Tower First Floor Smoke Evacuation System Upgrade
- 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 WORK BY OWNER**

- A. Owner has awarded a contract for supply and installation of smoke control panels which will commence on TBD.

**1.05 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.

**1.06 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 work to the hours between 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.

**1.07 WORK SEQUENCE**

- A. Coordinate construction schedule and operations with Owner/ Dallas County Facilities Manager.

**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. Balance to Finish.
  - 9. 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 10 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 012300  
ALTERNATES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Description of Alternates.

**1.02 ACCEPTANCE OF ALTERNATES**

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

**1.03 SCHEDULE OF ALTERNATES**

- A. Alternate No. 01 - Install new inline SEF-1-2 and SEF-1-3 (Ref MEP). Remove existing door at room 1-K and adjacent CMU/Brick wall to facilitate bringing new equipment in to room. Replace CMU/Brick wall. Install new frame and re-install salvaged door and hardware.:

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION 012300**

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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 006325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).
- B. Section 013000 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 016000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.
- D. 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

(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. Site mobilization meeting.
- D. Progress meetings.
- E. Construction progress schedule.
- F. Contractor's daily reports.
- G. Coordination drawings.
- H. Submittals for review, information, and project closeout.
- I. Number of copies of submittals.
- J. Requests for Information (RFI) procedures.
- K. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 013216 - Construction Progress Schedule: Form, content, and administration of schedules.
- B. Section 016000 - Product Requirements: General product requirements.
- C. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.
- D. 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 SITE MOBILIZATION MEETING**

- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect.
  - 4. Contractor's superintendent.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements.
  - 3. Construction facilities and controls provided by Owner.
  - 4. Temporary utilities provided by Owner.
  - 5. Survey and building layout.
  - 6. Security and housekeeping procedures.
  - 7. Schedules.
  - 8. Application for payment procedures.
  - 9. Procedures for testing and inspections and coordination with field personnel.
  - 10. Procedures for maintaining record documents.
  - 11. Requirements for start-up of equipment.
  - 12. Inspection and acceptance of equipment put into service during construction period.
- 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.

### **3.03 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.

### **3.04 CONSTRUCTION PROGRESS SCHEDULE**

- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

### **3.05 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.

### **3.06 COORDINATION DRAWINGS**

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

### **3.07 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.
- 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.

### **3.08 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.

### **3.09 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.

### **3.10 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.

### **3.11 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.

### **3.12 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.

### **3.13 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.
  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.

### **3.14 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**

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:

Submittal Number:

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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Low Sterrett Justice Center West Tower First Floor  
Smoke Evacuation System Upgrade

HED Project No.: 2023-DC048-002

January 21, 2025

Administrative Requirements Appendix 02  
013000.02 - 1

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**SECTION 013216  
CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Preliminary schedule.

**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 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 contractors and sub-contractors workers will need to fill out Dallas County Sheriff's Department Security Check Form.
- 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 crews working hours.
- B. All contractor's crews will need to be escorted at all times.

**1.06 RESTRICTIONS**

- A. Work hours limited between the hours of 7:00 am and 4:00 pm Monday through Friday.
- B. Do no work on Saturdays or 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. Structural Calculations: As described in Section 074213.23 - Metal Composite Material Wall Panels.
4. Structural Design: Include physical characteristics, engineering calculations, and resulting dimensional limitations as described in Section 084313 - Aluminum-Framed Storefronts.
5. Structural Design and Calculations: As described in Section 108213 - Exterior Grilles and Screens.

#### **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. Owner will 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.

## **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. 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 015100 - Temporary Utilities.
- B. Section 015213 - Field Offices and Sheds.
- C. Section 015500 - Vehicular Access and Parking.
- D. 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; 2009 (Reapproved 2016).

**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 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 SECURITY - SEE SECTION 013553**

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

### **1.09 VEHICULAR ACCESS AND PARKING - SEE SECTION 015500**

- A. Coordinate access and haul routes with governing authorities and Owner.
- B. Provide and maintain access to fire hydrants, free of obstructions.
- C. Provide means of removing mud from vehicle wheels before entering streets.
- D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.
- E. Existing parking areas may be used for construction parking.

### **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 PROJECT SIGNS - SEE SECTION 015813**

### **1.12 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.

**1.03 USE OF EXISTING FACILITIES**

- A. Designated existing spaces may be used for field offices: Coordinate with Owner prior to commencement of construction activities..

**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. Permanent pavements and parking facilities.
- E. Construction parking controls.
- F. Haul routes.
- G. Traffic signs and signals.
- H. Maintenance.
- I. Removal, repair.
- J. 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 not permitted.

**3.02 PARKING**

- A. Use of designated areas of existing parking facilities by construction personnel is permitted.
- B. Arrange for temporary parking areas to accommodate use of construction personnel.

**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 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.

**END OF SECTION 015500**

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**SECTION 015813  
TEMPORARY PROJECT SIGNAGE**

**PART 2 PRODUCTS**

**END OF SECTION 015813**

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**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.

**1.04 QUALITY ASSURANCE**

- A. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 100 miles (160.9 Km) from the Project site.

**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.
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**

**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.scs-certified.com](http://www.scs-certified.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.

- 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.

- 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.
  - 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.
  - 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 are 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 are 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**

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**SECTION 042000  
UNIT MASONRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Concrete block.
- B. Clay facing brick.
- C. Common brick.
- D. Mortar and grout.
- E. Reinforcement and anchorage.
- F. Flashings.
- G. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 072100 - Thermal Insulation: Insulation for cavity spaces.
- B. Section 072700 - Air Barriers: Air barriers applied to exterior face of backing sheathing or unit masonry substrate.
- C. Section 079200 - Joint Sealants: Sealing control and expansion joints.

**1.03 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2020a.
- C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2023.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- G. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- I. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
- J. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- K. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- L. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.
- M. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
- N. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.

- O. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.
- P. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- Q. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
- R. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
- S. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2021.
- T. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- U. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- V. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
- W. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- X. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- Y. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
- Z. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- AA. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

### **PART 2 PRODUCTS**

#### **2.01 CONCRETE MASONRY UNITS**

- A. Concrete Block: Comply with referenced standards and as follows:
  - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
  - 2. Load-Bearing Units: ASTM C90, normal weight.
    - a. Hollow block.
    - b. Exposed Faces: Special color and texture, as follows: \_\_\_\_\_.
    - c. Pattern: Match existing..

3. Nonloadbearing Units: ASTM C129.
  - a. Hollow block.
4. Pre-Faced Units: ASTM C90, hollow block, with smooth, resinous facing complying with ASTM C744.
  - a. Colors and styles: Match existing..

## 2.02 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
  1. Color and texture: Match existing..
  2. Nominal size: \_\_\_\_\_.
  3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.
  4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

## 2.03 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Grout Aggregate: ASTM C404.
- D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
  1. Color(s): Match existing..
  2. Manufacturers:
    - a. Davis Colors, a division of Venator Materials PLC; \_\_\_\_\_: [www.daviscolors.com/#sle](http://www.daviscolors.com/#sle).
    - b. Solomon Colors, Inc; \_\_\_\_\_: [www.solomoncolors.com/#sle](http://www.solomoncolors.com/#sle).
- E. Water: Clean and potable.
- F. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
  1. Color: Match existing..

## 2.04 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed billet bars; galvanized.
- B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
  1. Type: Truss or ladder.
  2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
  3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- D. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
  1. Type: Ladder, with adjustable ties or tabs spaced at 16 in (406 mm) on center.
  2. Material: stainless steel complying with ASTM A580/A580M Type 304.

3. Size: 0.1875 inch (4.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm) wire, width of components as required to provide not less than 5/8 inch (16 mm) of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 1 1/4 inches (32 mm).
5. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.
- E. Strap Anchors: Bent steel shapes, 1-1/2 inch (38 mm) width, 0.105 inch (2.7 mm) thick, 24 inch (610 mm) length, with 1-1/2 inch (38 mm) long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.
- G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
  1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
  2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
  3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

## 2.05 FLASHINGS

- A. Metal Flashing Materials:
    1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch (0.48 mm) thick; finish 2B to 2D.
  - B. Combination Non-Asphaltic Flashing Materials - Stainless Steel:
    1. Stainless Steel Flashing - Self-adhering: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet with 8 mil (0.20 mm) of butyl adhesive and a removable release liner.
      - a. Manufacturers:
        - 1) VaproShield, LLC; \_\_\_\_\_: [www.vaproshield.com/#sle](http://www.vaproshield.com/#sle).
        - 2) WIRE-BOND; \_\_\_\_\_: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).
        - 3) York Manufacturing, Inc; York 304: [www.yorkmfg.com/#sle](http://www.yorkmfg.com/#sle).
  - C. Factory-Fabricated Flashing Corners and End Dams: Stainless steel.
    1. Manufacturers:
      - a. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
      - b. Mortar Net Solutions; CompleteFlash: [www.mortarnet.com/#sle](http://www.mortarnet.com/#sle).
      - c. York Manufacturing, Inc; \_\_\_\_\_: [www.yorkmfg.com/#sle](http://www.yorkmfg.com/#sle).
  - D. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.
  - E. Termination Bars: Stainless steel; compatible with membrane and adhesives.
    1. Manufacturers:
      - a. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
      - b. Mortar Net Solutions; Termination Bars: [www.mortarnet.com/#sle](http://www.mortarnet.com/#sle).
      - c. York Manufacturing, Inc; Termination Bar: [www.yorkmfg.com/#sle](http://www.yorkmfg.com/#sle).
  - F. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
    1. Manufacturers:
-

- a. Hohmann & Barnard, Inc; \_\_\_\_\_: [www.h-b.com/#sle](http://www.h-b.com/#sle).
- b. Mortar Net Solutions; Metal Drip Edges: [www.mortarnet.com/#sle](http://www.mortarnet.com/#sle).
- c. York Manufacturing, Inc; \_\_\_\_\_: [www.yorkmfg.com/#sle](http://www.yorkmfg.com/#sle).

## 2.06 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
- D. Building Paper: ASTM D226/D226M, Type I ("No.15") asphalt felt.
- E. Weeps:
  - 1. Type: Polyester mesh.
  - 2. Color(s): As selected by Architect from manufacturer's full range.
- F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

## 2.07 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
  - 1. Exterior, loadbearing masonry: Type N.
  - 2. Exterior, non-loadbearing masonry: Type N.
  - 3. Interior, loadbearing masonry: Type N.
- B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
- C. New Mortar for Old Brick: Proportion by volume only; no more than 20 percent of the total volume of Portland cement and lime combined to be Portland cement.
  - 1. Sand: Match original mortar as closely as possible in color, size, and texture, without use of other additives.
  - 2. Repointing Mortar: Use proportions from 1 part lime to 2 parts sand with no Portland cement, up to 2 parts Portland cement to 3 parts lime to 6 parts sand.
- D. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- E. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- F. Mixing: Use mechanical batch mixer and comply with referenced standards.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.

### 3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

### **3.03 COLD AND HOT WEATHER REQUIREMENTS**

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

### **3.04 COURSING**

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
  - 3. Mortar Joints: Concave.
- D. Brick Units:
  - 1. Bond: Running.
  - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
  - 3. Mortar Joints: Concave.

### **3.05 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- F. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- G. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

### **3.06 WEEPS/CAVITY VENTS**

- A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

### **3.07 CAVITY MORTAR CONTROL**

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

### **3.08 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY**

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.



- D. Lap joint reinforcement ends minimum 6 inches (150 mm).
- E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.
- F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches (38 mm) with at least 5/8 inch (16 mm) mortar cover to the outside face of the anchor.

### **3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER**

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches (400 mm) on center vertically and 36 inches (900 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

### **3.10 MASONRY FLASHINGS**

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  - 1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 1 inch (25.4 mm), minimum, to form watertight pan at nonmasonry construction.
  - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
  - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
  - 1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.
  - 2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
  - 3. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.
  - 4. Anchor vertical leg of flashing into backing with a termination bar and sealant.
  - 5. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- E. Support flexible flashings across gaps and openings.
- F. Lap end joints of flashings at least 6 inches (152 mm), minimum, and seal watertight with flashing sealant/adhesive.

### **3.11 LINTELS**

- A. Install loose steel lintels over openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
  - 1. Openings to 42 inches (1070 mm): Place two, No. 3 (M9) reinforcing bars 1 inch (25 mm) from bottom web.
  - 2. Do not splice reinforcing bars.
  - 3. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
  - 4. Place and consolidate grout fill without displacing reinforcing.
  - 5. Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 8 inch (203 mm) bearing on each side of opening.

### **3.12 GROUTED COMPONENTS**

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

### **3.13 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.

### **3.14 BUILT-IN WORK**

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
  - 1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

### **3.15 TOLERANCES**

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).
- C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- E. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

### **3.16 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
- B. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

### **3.17 CLEANING**

- A. Remove excess mortar and mortar droppings.
- B. Clean soiled surfaces with cleaning solution.

### **3.18 PROTECTION**

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

**END OF SECTION 042000**

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**SECTION 072100  
THERMAL INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Board insulation and integral vapor retarder at cavity wall construction and exterior wall behind brick veneer wall finish.

**1.02 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2022.
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.
- H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2023.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

**1.04 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

**PART 2 PRODUCTS**

**2.01 APPLICATIONS**

- A. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) board.
- B. Insulation on Inside of Concrete and Masonry Exterior Walls: Extruded polystyrene (XPS) board.

**2.02 FOAM BOARD INSULATION MATERIALS**

- A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
  - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.

5. Complies with fire resistance requirements \_\_\_\_\_ as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
6. Type and Water Absorption: Type XII, 0.3 percent by volume, maximum, by total immersion.
7. Products:
  - a. DuPont de Nemours, Inc; Styrofoam Brand \_\_\_\_\_: [building.dupont.com/#sle](http://building.dupont.com/#sle).
  - b. Owens Corning Corporation; FOAMULAR Type \_\_\_\_ Extruded Polystyrene (XPS) Insulation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Comply with ASTM C578, and manufactured using carbon black technology.
  1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
  5. Complies with fire resistance requirements \_\_\_\_\_ as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
  6. Board Size: 15-3/4 inch by 96 inch (400 mm by 2440 mm).
  7. Board Thickness: 1-3/4 inch (44.5 mm).
  8. Board Edges: Square.
  9. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
  10. Products:
    - a. DuPont de Nemours, Inc; Styrofoam Brand Cavitymate Ultra: [building.dupont.com/#sle](http://building.dupont.com/#sle).

## 2.03 ACCESSORIES

- A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
  1. Application: Sealing of interior circular penetrations, such as pipes or cables.
  2. Width: Are required for application.
- B. Flashing Tape: Special reinforced film with high performance adhesive.
  1. Application: Window and door opening flashing tape.
  2. Width: As required for application.
  3. Primer: Tape manufacturer's recommended product.
  4. Products:
    - a. Rmax Inc; R-SEAL 6000: [www.rmax.com/#sle](http://www.rmax.com/#sle).
- C. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
  1. Width: 3-1/2 inches (89 mm).
  2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
  - B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.
-

### **3.02 BOARD INSTALLATION AT EXTERIOR WALLS**

- A. Adhere 6 inches (152 mm) wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
- B. Install boards horizontally on walls.
  - 1. Place boards to maximize adhesive contact.
  - 2. Install in running bond pattern.
  - 3. Butt edges and ends tightly to adjacent boards and protrusions.
- C. Extend boards over expansion joints, unbonded to wall on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.03 BOARD INSTALLATION AT CAVITY WALLS**

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.

### **3.05 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION 072100**

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**SECTION 081113  
HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Thermally insulated hollow metal doors with frames.

**1.02 RELATED REQUIREMENTS**

- A. Section 087100 - Door Hardware.

**1.03 REFERENCE STANDARDS**

- A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.
- B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- F. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- G. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: <https://steeldoors.org/sdi-certified/#sle>.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Hollow Metal Doors and Frames:

1. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
2. Curries, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
3. Steelcraft, an Allegion brand: [www.allegion.com/#sle](http://www.allegion.com/#sle).
4. Substitutions: See Section 016000 - Product Requirements.

## **2.02 PERFORMANCE REQUIREMENTS**

- A. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

## **2.03 HOLLOW METAL DOORS**

- A. Door Finish: Factory primed and field finished.
- B. Type A , Exterior Doors: Thermally insulated.
  1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 1 - Standard-duty.
    - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Model 1 - Full Flush.
    - d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm), minimum.
  2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
  4. Door Face Sheets: Flush.
  5. Weatherstripping: Integral, recessed into door edge or frame.

## **2.04 HOLLOW METAL FRAMES**

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
  1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
  2. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
  3. Weatherstripping: Integral, recessed into frame edge.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

### **3.02 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Install door hardware as specified in Section 087100.

### **END OF SECTION 081113**

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**SECTION 087100  
DOOR HARDWARE**

**PART 2 PRODUCTS**

**1.01 DESIGN AND PERFORMANCE CRITERIA**

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
  - 1. Applicable provisions of federal, state, and local codes.
- D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.
- E. Fasteners:
  - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
    - a. Aluminum fasteners are not permitted.
    - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
  - 2. Fire-Rated Applications: Comply with NFPA 80.
    - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
    - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

**1.02 HINGES**

- A. Hinges: Comply with BHMA A156.1, Grade 1.
  - 1. Provide hinges on every swinging door.
  - 2. Provide following quantity of butt hinges for each door:
    - a. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.

**1.03 LOCK CYLINDERS**

- A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
  - 1. Provide cylinders from same manufacturer as locking device.
  - 2. Provide cams and/or tailpieces as required for locking devices.

**1.04 FINISHES**

- A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
  - 1. Primary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
  - 2. Secondary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
    - a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.

**PART 3 EXECUTION**

**2.01 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.

- B. Use templates provided by hardware item manufacturer.
- C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
- D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

**END OF SECTION 087100**

**SECTION 099000  
PAINTING AND COATING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Interior painting and coating systems.
- C. Scope:
  - 1. Finish surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
    - a. Exterior:
      - 1) Metal: Zinc-coated (galvanized).
      - 2) Metal, Ferrous metal.
    - b. Interior:
      - 1) Masonry CMU: Concrete, split face, scored, smooth, high density, low density, and fluted.
      - 2) Metal: Zinc-coated (galvanized).
      - 3) Metal: Ferrous metal.
      - 4) Drywall: Walls, ceilings, gypsum board, and similar items.
  - 2. Paint exposed surfaces of all new work whether or not colors are designated in the Finish Materials List or on the Finish Plans, except where a surface or material is specifically indicated not to be painted or is to remain natural. If the Finish Materials List or the Finish Plans do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not the Finish Materials List or the Finish Plans indicate colors. If the Finish Materials List or Finish Plans do not indicate color or finish, the Architect will select from standard colors and finishes available.
    - a. Painting includes field painting of exterior and interior exposed bare and covered pipes and ducts, except for pipe identification which is work of Division 22, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment, except as otherwise indicated.
  - 3. Access Panels and Electric Panelboards: Paint access panels and electric panelboards to match adjacent wall or ceiling.
  - 4. Do not paint or finish the following:
    - a. Prefinished items include the following factory-finished components (except as otherwise specified):
      - 1) Architectural woodwork and casework.
      - 2) Metal lockers.
      - 3) Metal toilet enclosures.
      - 4) Wood doors.
      - 5) Elevator equipment.
      - 6) Finished mechanical and electrical equipment.
      - 7) Light fixtures.
      - 8) Distribution cabinets.
    - b. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      - 1) Furred areas.
      - 2) Ceiling plenums.
      - 3) Pipe spaces.

- 4) Duct shafts.
    - 5) Elevator shafts.
  - c. Finished metal surfaces include the following:
    - 1) Anodized aluminum.
    - 2) Stainless steel.
    - 3) Chromium plate.
    - 4) Copper.
    - 5) Bronze.
    - 6) Brass.
  - d. Operating parts include moving parts of operating equipment and the following:
    - 1) Valve and damper operators.
    - 2) Linkages.
    - 3) Sensing devices.
    - 4) Motor and fan shafts.
  - e. Labels: Do not paint over Underwriter's Laboratories (UL), Factory Mutual (FM) or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
5. Painting will be required on the following prefinished items that do not blend with color scheme of the Architect.
- a. Grilles.
  - b. Diffusers.
  - c. Door closers.

## **1.02 RELATED REQUIREMENTS**

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Divisions 21, 22, 23 and 26: Prime painting of shop-fabricated or factory built mechanical and electrical equipment or accessories.

## **1.03 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. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- C. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- D. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

## **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
  - 1. Product characteristics.
  - 2. Surface preparation instructions and recommendations.
  - 3. Primer requirements and finish specification.
  - 4. Storage and handling requirements and recommendations.
  - 5. Application methods.
  - 6. Clean-up information.
- C. Samples: Submit four paper draw down samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.

- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Applicator's qualification statement.
- F. Maintenance Data: Submit coating maintenance manual including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Paint and Finish Materials: 5 percent, but not less than 1 gallon (4 L) of each color; from the same product run, store where directed.
  - 3. Label each container with color in addition to manufacturer's label.

### **1.05 QUALITY ASSURANCE**

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 3 years experience and approved by manufacturer.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, product name, product code, color designation, VOC content, batch date, environmental handling, surface preparation, application, and use instructions.
- C. Paint Materials: Store at a minimum of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.
- D. Handling: Maintain a clean, dry storage area to prevent contamination or damage to materials.

### **1.07 FIELD CONDITIONS**

- A. Do not apply materials when environmental conditions are outside the ranges required by manufacturer.
- B. Follow manufacturer's recommended procedures for producing the best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
  - 1. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com)
  - 2. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - 3. Sherwin-Williams Company: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
- C. Colors and Sheen: To match existing.

### **2.02 PAINTINGS AND COATINGS**

- A. General:
  - 1. Provide factory-mixed coatings unless otherwise indicated.
  - 2. Do not reduce, thin, or dilute coatings or add materials to coatings unless specifically indicated in manufacturer's instructions.
- B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of State in which the project is located.
  2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site, or other method acceptable to authorities having jurisdiction.
- C. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

### **2.03 PAINT SYSTEMS - INTERIOR**

- A. Masonry CMU: Concrete, split face, scored, smooth, high density, low density, and fluted.
1. Acrylic Enamel Systems:
    - a. Eg-Shel/Satin Finish: Walls.
      - 1) 1st Coat:
        - (a) Benjamin Moore; 160 Super Spec Latex Block Filler.
        - (b) PPG Paints; 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
        - (c) Sherwin-Williams; Heavy Duty Block Filler B42 Series.
          - (1) 75 to 125 sq ft/gal (1.8 to 3.1 sq m/L).
      - 2) 2nd and 3rd Coat:
        - (a) Benjamin Moore; 274 Super Spec Latex Eggshell.
        - (b) PPG Paints; 6-411 Series Speedhide Eggshell Latex Wall and Trim Enamel.
        - (c) Sherwin-Williams; Promar 200 Zero VOC Interior Latex Eg-Shel B20 Series.
          - (1) 4 mils wet, 1.7 mils dry per coat.
- B. Metal: Zinc-Coated (Galvanized).
1. Acrylic Enamel Systems:
    - a. Semi-Gloss:
      - 1) 1st Coat:
        - (a) Benjamin Moore; P04 Super Spec HP Acrylic Metal Primer.
        - (b) PPG Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
        - (c) Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series.
          - (1) 5 mils wet, 2 mils dry per coat.
      - 2) 2nd and 3rd Coat:
        - (a) Benjamin Moore; 276 Super Spec Latex SemiGloss.
        - (b) PPG Paints; 6-500 Series Speedhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex..
        - (c) Sherwin-Williams; Pro Industrial Acrylic Semi-Gloss B66 Series.
          - (1) 2 to 4 mils dry per coat.
- C. Metal: Ferrous.
1. Acrylic Enamel Systems:
    - a. Semi-Gloss:
      - 1) 1st Coat:
        - (a) Benjamin Moore; P064 Super Spec HP Acrylic Metal Primer.



- (b) PPG Paints; 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
    - (c) Sherwin-Williams; Pro-Cryl Universal Primer B66-1310 Series.
      - (1) 5 mils wet, 2 mils dry per coat.
  - 2) 2nd and 3rd Coat:
    - (a) Benjamin Moore; 276 Super Spec Latex SemiGloss.
    - (b) PPG Paints; 6-500 Series Speedhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.
    - (c) Sherwin-Williams; Pro Industrial Acrylic Semi-Gloss B66 Series.
      - (1) 2 to 4 mils dry per coat.
- D. Drywall: Walls, ceilings, gypsum board, and similar items.
  - 1. Acrylic Enamel Systems:
    - a. Eg-Shel Finish: Walls
      - 1) 1st Coat:
        - (a) Benjamin Moore; 253-00 Super Spec Latex Enamel Undercoater Primer Sealer.
        - (b) PPG Paints; 6-2 Series Speedhide Interior Latex Primer-Sealer.
        - (c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer B28W02600.
          - (1) 4 mils wet, 1.5 mils dry per coat.
      - 2) 2nd and 3rd Coat:
        - (a) Benjamin Moore; 274 Super Spec Latex Eggshell.
        - (b) PPG Paints; 6-411 Series Speedhide Eggshell Latex Wall and Trim Enamel.
        - (c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Eg-Shel B20 Series.
          - (1) 4 mils wet, 1.7 mils dry per coat.
    - b. Flat Finish: Ceilings.
      - 1) 1st Coat:
        - (a) Benjamin Moore; 253-00 Super Spec Latex Enamel Undercoater Primer Sealer.
        - (b) PPG Paints; 6-2 Series Speedhide Interior Latex Primer-Sealer.
        - (c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Primer B28W02600.
          - (1) 4 mils wet, 1.5 mils dry per coat.
      - 2) 2nd and 3rd Coat:
        - (a) Benjamin Moore; 275 Super Spec Latex Flat.
        - (b) PPG Paints; 6-70 Series Speedhide Interior Wall Flat Latex Paint.
        - (c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Flat B30 Series.
          - (1) 4 mils wet, 1.6 mils dry per coat.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Confirm moisture content of substrates does not exceed manufacturer's limitations when measured with an electronic moisture meter.

- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean surfaces thoroughly and correct defects prior to application.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- D. Remove mildew from impervious surfaces by scrubbing with solution of water and bleach. Rinse with clean water and allow surface to dry.
- E. Masonry: Remove efflorescence and chalk.
- F. Gypsum Board: Fill minor defects with filler compound; sand smooth and remove dust prior to painting.
- G. Galvanized Surfaces:
  - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
  - 2. Prepare surface according to SSPC-SP 2.
- H. Ferrous Metal:
  - 1. Solvent clean according to SSPC-SP 1.
  - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.
  - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

### **3.03 APPLICATION**

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions.
- C. Apply coatings at spread rate required to achieve manufacturer's recommended dry film thickness.
- D. Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- E. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
- F. Use applicators and techniques suited for paint and substrate indicated.
- G. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- H. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

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- I. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
  - J. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - K. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  - L. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  - M. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  - N. Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in finished spaces.
    - 1. Mechanical items to be painted include, but are not limited to, the following:
      - a. Units as designated on the drawings.
      - b. Piping, pipe hangers, and supports.
      - c. Heat exchangers.
      - d. Tanks.
      - e. Ductwork.
      - f. Insulation.
      - g. Supports.
      - h. Motors and mechanical equipment.
      - i. Accessory items.
      - j. Grilles, diffusers, convector covers, fin tube covers, unit ventilators, and similar items.
    - 2. Electrical items to be painted include, but are not limited to, the following:
      - a. Conduit and fittings.
      - b. Lighting and power panels.

### **3.04 PRIMING**

- A. Apply primer to all surfaces unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.
- B. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to top coat manufacturers.

### **3.05 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Clean surfaces immediately of overspray, splatter, and excess material.
- C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

### **3.06 PROTECTION**

- A. Protect finished coatings from damage until completion of project.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- C. Touch-up damaged finishes after Substantial Completion.

### **END OF SECTION 099000**

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**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. the implimentation of Schneider Electric BMS contr
  - 2. re-certificatoin of the smoke exhaust system
  - 3. renovation and of the smoke exhaust system
  - 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 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.



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### 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. 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).
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- C. 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 EQUIPMENT FOUNDATIONS

- A. Provide equipment foundations associated with the work in accordance with the provisions of these specifications
- B. Provide concrete bases for all pad or floor mounted equipment. Bases shall be four inches (4") high above finished floors or grades (unless otherwise noted) and shall protrude two inches (2") beyond all sides of equipment and shall have exposed chamfer edges. Construct bases from ready-mixed hardrock concrete, ASTM C94, reinforced with #3 rebar, ASTM A615, Grade 40, at 18" on center each way.
- C. Field verify exact location of outdoor pad mounted equipment with the Architect/Engineer. Supply necessary fill and grade site to provide natural drainage away from equipment.

#### 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**

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**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. Commissioning activities.

**1.2 RELATED REQUIREMENTS**

- A. Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.
- B. Section 23 08 00 - Commissioning of HVAC.

**1.3 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).

**1.4 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](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://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 Outlets and Inlets: Adjust total to within plus 5 percent design to space.

### 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.

### 3.7 COMMISSIONING

- A. See Sections 01 91 13 - General Commissioning Requirements and 23 08 00 for additional requirements.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Fill out Prefunctional Checklists for:
  - 1. Air side systems.
  - 2. Water side systems.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.
- E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for \_\_\_\_ percent of the air handlers plus a random sample equivalent to \_\_\_\_ percent of the final TAB report data as directed by Commissioning Authority.
  - 1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
  - 2. Use the same test instruments as used in the original TAB work.
  - 3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
  - 4. For purposes of re-check, failure is defined as follows:
    - a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    - b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control,



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- deviation of more than 30 percent at intermediate supply flow.
  - c. Temperatures: Deviation of more than one degree F.
  - d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
  - e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
  - 5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.
  - F. In the presence of the Commissioning Authority, verify that:
    - 1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
    - 2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
    - 3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.
- 3.8 SCOPE
- A. Test, adjust, and balance the following:
    - 1. HVAC Pumps.
    - 2. Fans.
    - 3. Air Terminal Units.
    - 4. Air Inlets and Outlets.
- 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. V-Belt Drives:
    - 1. Identification/location.
    - 2. Required driven RPM.
    - 3. Driven sheave, diameter and RPM.
    - 4. Belt, size and quantity.
    - 5. Motor sheave diameter and RPM.
    - 6. Center to center distance, maximum, minimum, and actual.
  - C. Air Moving Equipment:
    - 1. Location.
    - 2. Manufacturer.
    - 3. Model number.
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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.
- D. Exhaust Fans:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Serial number.
  5. Air flow, specified and actual.
  6. Total static pressure (total external), specified and actual.
  7. Inlet pressure.
  8. Discharge pressure.
  9. Sheave Make/Size/Bore.
  10. Number of Belts/Make/Size.
  11. Fan RPM.
- E. Duct Traverses:
1. System zone/branch.
  2. Duct size.
  3. Area.
  4. Design velocity.
  5. Design air flow.
  6. Test velocity.
  7. Test air flow.
  8. Duct static pressure.
  9. Air temperature.
- F. Duct Leak Tests:
1. Description of ductwork under test.
  2. Duct design operating pressure.
  3. Duct design test static pressure.
  4. Duct capacity, air flow.
  5. Maximum allowable leakage duct capacity times leak factor.
  6. Test apparatus:
    - a. Blower.
    - b. Orifice, tube size.
    - c. Orifice size.
    - d. Calibrated.
  7. Test static pressure.
  8. Test orifice differential pressure.
  9. Leakage.
- G. 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.
- H. Air Distribution Tests:
1. Air terminal number.
  2. Room number/location.
  3. Terminal type.
  4. Terminal size.
  5. Design air flow.
  6. Test (final) air flow.
  7. Percent of design air flow.

**END OF SECTION**

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**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.

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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.
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- 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).
- E. 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.
- F. 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.

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- 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.
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- 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**

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

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. iBMS: Intelligent-building management system.
- B. BMS: Building management system.
- C. \_WS: System workstations and servers.
- D. NSC: Network server controllers.
- E. SDCU: Connected room solutions.
- F. SDCU: BACnet IP controllers.
- G. SDCU: BACnet MS/TP controllers.
- H. Room controllers / thermostats.
- I. SDCU: LonWorks controllers.
- J. I/O: Input-output devices.

**1.2 RELATED REQUIREMENTS**

- A. Section 22 05 19 - Meters and Gauges for Plumbing Piping.
- B. Section 23 05 19 - Meters and Gauges for HVAC Piping.
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 08 00 - Commissioning of HVAC.
- E. Section 23 09 13 - Instrumentation and Control Devices for HVAC - Schneider Electric.
- F. Section 23 09 34 - Variable-Frequency Motor Controllers for HVAC.
- G. Section 23 09 43 - Pneumatic Control System for HVAC.
- H. Section 25 01 90 - Diagnostic System for Integrated Automation.
- I. Section 25 05 00 - Common Work Results for Integrated Automation.
- J. Section 25 08 00 - Commissioning of Integrated Automation.
- K. Section 25 11 13 - Integrated Automation Network Servers.
- L. Section 25 11 19 - Integrated Automation Network Workstations.
- M. Section 25 15 00 - Integrated Building Automation System - Schneider Electric.
- N. Section 25 35 00 - Integrated Automation Instrumentation and Terminal Devices for HVAC.
- O. Section 25 36 00 - Integrated Automation Instrumentation and Terminal Devices for Electrical Systems.
- P. Section 25 36 13 - Integrated Automation Power Meters.
- Q. Section 26 09 23 - Lighting Control Devices.
- R. Section 26 27 13 - Electricity Metering.
- S. Section 26 29 23 - Variable-Frequency Motor Controllers.
- T. Section 28 10 00 - Access Control.
- U. Section 28 20 00 - Video Surveillance.

- V. Section 28 44 00 - Refrigerant Detection and Alarm.
- W. Section 28 46 00 - Fire Detection and Alarm.

### 1.3 ABBREVIATIONS AND ACRONYMS

#### A. Standard:

1. ASHRAE: American Society Heating, Refrigeration, Air Conditioning Engineers.
2. AHU: Air Handling Unit.
3. BAS: Building Automation System for HVAC, same as BMS.
4. BMS: Building Management System for HVAC, same as BAS.
5. Cx: Commissioning.
6. CxA: Commissioning Agent.
7. DDC: Direct Digital Controller.
8. EIA: Electronic Industries Alliance.
9. FIP: Field Interface Panel.
10. GUI: Graphical User Interface.
11. HMI: Human-Machine Interface, hardware- or software-based interface.
12. HVAC: Heating, Ventilation, and Air Conditioning.
13. iBMS: Intelligent Building Management System or BMS for facility services.
14. IEEE: Institute Electrical Electronic Engineers.
15. MER: Mechanical Equipment Room.
16. PID: Proportional, Integral, and Derivative.
17. VAV: Variable Air Volume Box.
18. RTC: Real time clock.

#### B. Communications and Protocols:

1. ARP: Address Resolution Protocol.
2. BACnet: Building Automation and Control Networks.
3. CORBA: Common Object Request Broker Architecture.
4. CSMA/CD: Carrier Sense Multiple Access/Collision Detect.
5. DALI: Digital Addressable Lighting Interface.
6. DDE: Dynamic Data Exchange.
7. FTP: File Transfer Protocol.
8. FTT: Free Topology Transceivers.
9. HTTP: Hyper Text Transfer Protocol.
10. IIOP: Internet Inter-ORB Protocol.
11. IP: Internet Protocol.
12. LAN: Local Area Network.
13. LON: Echelon Communication – Local Operating Network.
14. MS/TP: Master Slave Token Passing.
15. OBIX: Open Building Information Exchange.
16. ODBC: Open Database Connectivity.
17. ORB: Object Request Broker.
18. SNVT: Standard Network Variables Types.
19. SQL: Structured Query Language.
20. TCP/IP: Transmission Control Protocol over Internet Protocol (suite of protocols).
21. UDP: User Datagram Protocol.
22. XML: eXtensible Markup Language.

#### C. BMS Controllers:

1. NSC: Network or Supervisory Controller(s).
2. Server(s) loaded with BMS specific software.
3. OWS: Workstation(s) loaded with BMS specific software.

4. B-OWS: BACnet Workstation(s) loaded with BMS specific software.
  5. EWS: Administration and Programming (Engineering) Workstations.
  - D. DDC Types:
    1. ASD: Application Specific Device.
    2. AAC: Advanced Application Controller.
    3. ASC: Application Specific Controller.
    4. CAC: Custom Application Controller.
    5. CR: Analog or Digital Chart Recorders.
    6. DCU: Distributed Control Unit.
    7. HRC: Hotel Room Controller.
    8. LCM: Local Control Module.
    9. MC: MicroControllers.
    10. MPC: Multipurpose Controller.
    11. NSC: Network Server Controller.
    12. PEM: Package Equipment Module.
    13. PPC: Programmable Process Controller.
    14. RC: Room Controller.
    15. RPC: Room Purpose Controller.
    16. SDCU: Standalone Digital Control Units or DDCs.
    17. SLC: Supervisory Logic Controller.
    18. SSC: Standalone Server Controller.
    19. UEC: Unitary Equipment Controller.
    20. VAVDDC: Variable Air Volume Direct Digital Controller.
  - E. Tools and Software:
    1. AFDD: Automated Fault Detection and Diagnostic.
    2. APEO: Automated Predictive Energy Optimization.
    3. DR: Demand Response.
    4. CCDT: Configuration, Commissioning and Diagnostic Tool.
    5. BPES: BACnet Portable Engineering Station.
    6. LPES: LON Portable Engineering Station.
    7. POT: Portable Operator's Terminal.
    8. PEMS: Power and Energy Management Software.
    9. MTBF: Mean Time Between Failure.
- 1.4 REFERENCE STANDARDS
- A. 21 CFR 11 - Part 11, Electronic Records; Electronic Signatures — Scope and Application; Current Edition.
  - B. 47 CFR 15 - Radio Frequency Devices; current edition.
  - C. 47 CFR 68 - Connection of Terminal Equipment to the Telephone Network; Current Edition .
  - D. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2022).
  - E. Bluetooth CS - Bluetooth Core Specification; 2016, Addendum 2017.
  - F. IEC 60929 - AC and/or DC-Supplied Electronic Control Gear for Tubular Fluorescent Lamps - Performance Requirements; 2011, with Amendment (2015).
  - G. IEC 62443-4-1 - Security for Industrial Automation and Control Systems – Part 4-1: Secure Product Development Lifecycle Requirements; 2018.
  - H. IEEE 802.3 - Ethernet; 2018 (Amended 2019).

- I. IEEE 802.11 - IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications; 2020, with Amendment (2021).
- J. IEEE 802.15.4 - IEEE Standard for Low-Rate Wireless Networks; 2020, with Amendment (2021).
- K. ISO/IEC 27034-1 - Information Technology – Security Techniques – Application Security – Part 1: Overview and Concepts; 2011 (Corrigendum 2014).
- L. LonMark Interoperability Guide - LonMark Application-Layer Interoperability Guide and LonMark Layer 1-6 Interoperability Guide; Version 3.4; 2005.
- M. Modbus (PS) - The Modbus Organization Communications Protocol.; Latest Update.
- N. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- O. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- Q. NFPA 92 - Standard for Smoke Control Systems; 2021.
- R. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- S. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- T. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.
- U. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- V. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- W. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

#### 1.5 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Prebid Submittals:
  - 1. Provide for proposed substitute systems or products as specified; submit the data described in this article under the terms given for substitutions.
  - 2. Include manufacturer profile with local installation and service organization.
  - 3. Include description of how the system meets and achieves each specified criteria in terms of configuration, operation, and control.
  - 4. Show system architecture with single line riser diagram showing each component required to meet scope including digital controllers, routers, hubs, and other related products.
  - 5. Show proposed Cx procedure with time required to startup and commission each system.
  - 6. Show proposed approach for project planning and management.
  - 7. Provide duct data for each component, DDC panels, and each accessory listed according to this specification.
  - 8. Provide examples of actual graphic-panel screens from other similar projects.
  - 9. List number and types of DDC panels required for this installation.
  - 10. List number and types of spare points provided with the proposed system.
  - 11. Provide recommended spare parts list with respective price schedules.
  - 12. List of two similar systems in size, point capacity, total installed value installed and commissioned by the local office including listed installers, manufacturers, design team

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- members, and owners contact information for each project.
  13. Provide service offerings samples including list of current similar service contracts with respective contact reference information.
  14. List and resumes of management and employee teams who will be involved with project design, commissioning, project management, and after installation service. Include copies of manufacturer certifications for proposed products per resume.
  15. Provide reviewed copy of this specification having check marks to the left margin of each paragraph to signify that manufacturer equipment and software fully conforms to specified requirements otherwise indicate in writing the reasons or limitations to meet intended requirement with proposed alternate.
  16. Develop formal presentation concerning proposed system for potential meeting to formally complete the review process prior to make final decision.
- C. Submittals:
1. Product Data:
    - a. Include manufacturer data for hardware and software products required to complete specified work.
    - b. Develop and include schedules for valves, dampers, and air flow stations indicating location, size, configuration, capacity, and accessories.
  2. Shop Drawings:
    - a. Develop drawings using Visio Professional or AutoCAD software and include pdf copies.
    - b. Include riser diagram depicting location of each controller, workstations, and associated network wiring.
    - c. Include individual schematics of each mechanical system showing each connected point with reference to their associated controller. Typical will be allowed where appropriate.
    - d. Include narrative descriptions of sequences of operation, program listings, point lists, and complete list with descriptions of graphic-panels, reports, alarms, and configuration work furnished as part of \_WS software work.
  3. Provide five hardbound copies using three-ring binder with index and tabs. Include diagrams using folded 11 by 17 inch paper size. Make printed copies in color when color is used to differentiate information.
  4. Provide soft-copy loaded on CD, DVD, thumb drive, or downloadable content-holding web page.
  5. Once reviewed, return hardbound or pdf submittal; copy may include review comments for corrections or requesting additional data required for approval. Address written comments and update content until document is fully approved. Once approved, work can begin.
  6. Certificates:
    - a. Certify that products of this section meet or exceed specified requirements.
    - b. Reputable third party certification stating that supplier and vendor conformance with IEC 62443-4-1 Security Development Lifecycle process.
    - c. Certify that vendor controls guidance for IT and OT convergence comply with ISO/IEC 27034-1 and IEC 62443-4-1 Security Development Lifecycle.
    - d. Certify that system supplier and installer were subject to regular and verifiable best practice Cybersecurity testing by manufacturer. Results of this testing will be made available upon request prior to system deployment.
  7. Evaluation Service Reports: Show compliance with specified requirements.
  8. Manufacturer qualification statement.
  9. Installer qualification statement. Include specifics for fiber optic work.
- D. Maintenance contract.
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- E. Executed warranty.
  - F. Specimen warranty.
  - G. Project Record Documents:
    - 1. Closeout Submittal:
      - a. System architecture drawing.
      - b. Layout drawing for each control panel.
      - c. Wiring diagram for individual components.
      - d. System flow diagram for each controlled system.
      - e. Instrumentation list for each controlled system.
      - f. Sequence of control.
      - g. Binding map.
      - h. BMS Schedule: IP and field level addresses with communication settings.
      - i. Operation and Maintenance Manuals.
    - 2. BMS-Specific References:
      - a. Product manuals for key software tasks.
      - b. Operating the system.
      - c. Adminstrating the system.
      - d. Engineering the OWS and EWS.
      - e. Application programming.
      - f. Engineering the network.
      - g. Setting up the web server.
      - h. Report creation.
      - i. Graphics creation.
      - j. All other engineering tasks.
      - k. System architecture diagram.
      - l. List of recommended maintenance tasks with description and frequency for associated system, data, and web servers, operator workstations, and web clients.
      - m. Product manual reference that includes task executing instructions.
      - n. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
      - o. Licenses, guarantees, and warranty documents for equipment and systems.
    - 3. Site-Specific Information:
      - a. System architecture diagram for components annotated with specific location information.
      - b. As-built drawing for each control panel.
      - c. As-built wiring design diagram for each component.
      - d. Installation design details for each I/O device.
      - e. As-built system flow diagram for each system.
      - f. Sequence of control for each system.
      - g. Building binding map.
      - h. Product data sheet for each component.
      - i. Installation data sheet for each component.
  - H. Software:
    - 1. Provide copies of each loaded software with associated licensing documentation and support contact information. Indicate that licensing is in Owner name for sign-off.
    - 2. Once signed, manufacturer's standard software and firmware licensing agreement grants unrestricted usage of the same including custom-developed programs and applications denoting manufacturer's right to disclose of trade secrets contained within source or applied software code.
    - 3. Licensing agreement will not preclude software use by third-party individuals for tasks related to commissioning, servicing, or future altering of installed-system configuration as
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- long as licensed software products reside within Owner-controlled devices.
  - 4. Firmware Files: Submit copy of pre-installed or downloaded firmware files loaded on electronic-erasable memory of installed devices unless firmware is loaded on non-erasable chip requiring factory or field replacement(s).
  - 5. Project-developed software, files, and documentation is to become Owner property. These include but are not limited to:
    - a. Server and workstation software.
    - b. Application programming tools and listing.
    - c. Configuration tools.
    - d. Network diagnostic tools.
    - e. Addressing tools.
    - f. Application files.
    - g. Configuration files.
    - h. Graphic files.
    - i. Report files.
    - j. Graphic symbol libraries.
    - k. Descriptive point lists.
    - l. Application program listing.
    - m. Application programs with comments.
    - n. Printouts of each report.
    - o. Alarm list.
    - p. Printouts of each graphic panel.
    - q. Commissioning and system startup reports.
    - r. Copy of each database, configuration file, or specific system file developed.

- I. Maintenance Materials:
  - 1. See Section 01 60 00 - Product Requirements for additional provisions.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
  - 1. Unlisted Manufacturers: Other manufacturers interested in participating as acceptable bidders for this project not listed as prequalified will furnish detailed technical prebid submittal with associated information to Architect at least two weeks prior to published bid date to allow adequate time to review bidder's credentials and capabilities.
- B. Installer Qualifications:
  - 1. Provide proof of being listed as authorized distributor or branch office of specified manufacturer specializing in performing work of specified type and with at least three years of documented experience.
  - 2. Provide address of existing full service facility within 100 miles of the work site:
    - a. Staffed with engineers trained and certified by manufacturer for BMS configuration, programming, and service.
    - b. Staffed with technicians fully capable of providing instructions, maintenance, and emergency service on installed system components.
  - 3. Installers not listed as prequalified will submit credentials as detailed in prebid submittal for Architect review at least two weeks prior to bid date. Failure to follow attached formats will disqualify potential alternate bidders. Credentials must attest that installer meets specified requirements. Architect judgment regarding approval to bid as an acceptable installer after reviewing submitted data will be final.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.



- D. Documents at Project Site: Maintain one copy of manufacturer instructions and shop drawings.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Prior to delivery, ensure suitable storage space is available to store products and materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, extreme humidity, and corrosive atmospheres within manufacturer-stated storage requirements.
- C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified within contract documents.
- D. Store materials indoor in clean, dry space with uniform temperature to prevent condensation. In addition, protect electronics from electrical and magnetic energy emanations that could reasonably cause damage.
- E. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to Architect.

#### 1.8 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 1-year manufacturer warranty for components, software, parts, and other furnished products. Complete forms in Owner name and register with manufacturer.
- C. Installer Warranty:
  - 1. Provide 1-year warranty for furnished and installed products commencing on Date of Substantial Completion. Complete forms in Owner name and register with installer.
  - 2. Act as manufacturer-agent to apply manufacturer warranty against defects in materials and workmanship for furnished products.
  - 3. Verify corrective software modifications made during warranty period are updated on user documentation and both user and manufacturer archived software disks.
  - 4. Furnish labor to repair, reprogram, or replace these products and components at no extra charge during normal working hours within warranty period.
  - 5. Ensure warranty service request response issued within 24 business hours from initial request.
- D. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Schneider Electric: EcoStruxure Building Operation: [www.se.com/#sle](http://www.se.com/#sle).
  - 1. \_WS; WebStation: EcoStruxure Building Operation.
  - 2. NSC: AS-B Series, SpaceLogic Edge Server.
  - 3. SDCU: Connected Room Solutions: RPC Series, SpaceLogic IP Controllers.
  - 4. SDCU: BACnet IP Controllers: MP Series, SpaceLogic IP Controllers.
  - 5. SDCU: BACnet MS/TP Controllers: MP/RP SpaceLogic Series.
  - 6. SDCU: LonWorks Controllers.
- B. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Source Limitations: Furnish products produced by same manufacturer as other controls systems, produced by single manufacturer, and obtained from single supplier.

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## 2.2 BAS - OPEN, INTEROPERABLE ARCHITECTURE DESCRIPTION

- A. BAS provides control, alarm detection, scheduling, reporting, graphical, and information management for entire facility over LAN or WAN by using distributed NSCs, SDCUs, APWs, and WOWs. Modular BAS design is intended for distributed processing capability that allows future expansion.
- B. Open architecture that utilizes LonMark Interoperability Guide, EIA standard 709.1, LonTalk protocol and/or ASHRAE Std 135, BACnet protocol for interoperability with equipment supporting HVAC open protocols to reduce future building maintenance, upgrade, and expansion costs.
  - 1. BACnet:
    - a. BACnet devices connect via Ethernet IP or MS/TP.
    - b. Support BACnet SC node, hub, and router functions as defined in Annex AB of ASHRAE Std 135.
    - c. AAC devices capable of communicating either as MS/TP device or BACnet IP device on TCP/IP trunk.
    - d. BACnet system architecture utilizes MS/TP selectable between 9.6 to 76.8 kbaud as common communication protocol between controllers to assure interoperability between system components.
  - 2. LonTalk:
    - a. Encapsulate LonTalk packets into TCP/IP messages to take advantage of existing infrastructure or to increase network bandwidth where necessary or desired.
    - b. Encapsulate LonTalk protocol into IP datagrams; comply with existing LonMark guide functionality lines based on industry-standard protocols.
    - c. Encapsulate LonTalk protocol into IP datagrams to comply with existing LonMark guide functionality lines, based on industry standard protocols.
    - d. Connect physical LonWorks devices via Ethernet IP or FTT-10A.
    - e. Products used in constructing BMS to comply with LonMark.
    - f. When Lon-Mark devices are unavailable, BMS system supplier provides device resource files and external interface definitions for LonMark devices.
  - 3. Modbus: System supports both TCP and RTU protocols natively and use of gateways not required.
  - 4. Include software tools required for network management of both LonTalk and BACnet protocols.
- C. System Features:
  - 1. Complete temperature-control DDC with electronic sensors and electronic or electric actuation of MER valves, dampers, and electronic actuation of terminal equipment valves and actuators.
  - 2. BMS seamlessly connects devices throughout building regardless of subsystem type, such as variable frequency drives, low-voltage lighting systems, electrical circuit breakers, power metering, and card access easily coexist on same network channel.
  - 3. Supplied system required to access all data using HTML5-enabled browsers without requiring proprietary operator interface and configuration programs. Do not require system browser to enable JAVA.
  - 4. Hierarchical topology required to assure reasonable system response times and to manage the flow and sharing of data, without unduly burdening customer's internal Intranet network.
  - 5. Scalable and expandable at each system level using same software interface, TCP/IP level, and fieldbus level controllers. Systems requiring replacement of either workstation software or field controllers in order to expand system are unacceptable.

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6. BAS is capable of operating normally without restrictions at multiple software version levels. Enterprise Servers manage NSCs of different versions, provided that Enterprise Server is same or newer version than most recent interconnected NSC version.
- D. System Components:
1. OWS:
    - a. BACnet clients to comply with B-OWS device profile with ability to support data read and write functionality.
    - b. Administration and Programming Workstations: Workstation or server-loaded, front-end manufacturer-specific, factory-tested software for system operation that conforms to B-OWS device profile. Third-party workstation software is not acceptable.
    - c. Web-Based Operator Workstations: Utilizes compatible web browser interface for direct access into system points, graphics, setpoints, alarms, and related features such as trends, reports, charts, and other engineering tools typically available at workstation end. Comply with B-OWS device profile. No additional computer hardware required to support web-based user interface.
  2. NSC:
    - a. Ethernet-based controller with built-in router connects with system workstations at minimum speed of 100 Mbps for communication with SDCU and/or other Input/Output Modules.
    - b. Comply with BACnet device profile B-BC. NSC utilizing RS-232 serial or ARCNET to communicate with workstations are not acceptable.
    - c. NSC supports using graphical and/or line application programming language.
    - d. Web-based operation is directly supported by NSCs without additional software requirements.
    - e. NSC Native Protocols: Each NSC supports Modbus RTU/ASCII (and J-bus), Modbus TCP, BACnet MS/TP, BACnet IP, LonTalk, and WebServices as native protocol without needing to provide multiple NSCs nor additional software, allowing native support of 3-concurrent protocols.
    - f. NSC fieldbus layer supports the following types of SDCUs:
      - 1) BACnet IP: Supports up to 5 subnetworks of 50 SDCUs connected in daisy chain topology, totaling 250 SDCUs or 6 RSTP subnetworks of 39 SDCUs totaling 234 SDCUs maximum.
      - 2) BACnet MS/TP: Supports up to 2 subnetworks of up to 127 SDCUs at minimum speed of 76.8 kbps connected in daisy chain topology, totaling 254 SDCUs.
      - 3) LonWorks: Supports up peer-to-peer, event-driven FFT-10A subnetwork of up to 64 SDCUs at minimum speed of 76.8 kbps connected in daisy chain topology. If using TAC Xenta controllers, then 30 of the 64 can be Xenta SDCUs. If using I/A MNL controllers, then up to 127 SDCUs can be supported.
      - 4) Modbus: Supports up to 2 subnetworks of 31 SDCUs when Modbus RTU (RS-485 or RS-232) is used totaling 62 SDCUs. If utilizing Modbus TCP, then supports up to 100 SDCUs.
      - 5) EnOcean: Supports wireless devices in 315, 868, or 902 Mhz frequency band. This protocol requires external-mount RP-SMA antenna.
      - 6) ZigBee Pro: Supports wireless devices. This protocol requires external-mount RP-SMA antenna.
  3. SDCUs: Standalone microcomputer controllers of modular design containing I/O and programs for application specific or programmable control. Typically furnished for distributed control of mechanical equipment such as air handlers, central plant heating and/or cooling equipment, and terminal units. Comply with BACnet device profile B-AAC.
  4. Enterprise Level BAS:
    - a. Consists of an Enterprise Server which enables multiple NSCs, including all graphics, alarms, schedules, trends, programming, and configuration; accessible from a single
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- workstation simultaneously for operations and engineering tasks.
  - b. Supports built-in reporting functionality without dependency on other software.
  - c. Supports standard data accessing for third-party reporting or analytics software.
  - d. Supports hosting up to 250 servers or NSCs beneath it.
  - e. Supports robust reporting capability outside of trend chart and listing OWS capacity by using Microsoft Windows SQL software which can be installed on same computer as Enterprise Server. Use Timescale DB compression to allow server disk space reduction.
  - f. Supports deployment of central server that gathers and reports on data from as many as 50 different Enterprise Level BAS Servers to accommodate very large sites with requirements for full data aggregation.
- E. LAN:
- 1. Consists of 10/100 Mbps Ethernet network that supports BACnet, Modbus, XML, and HTTPS protocols for maximum integration flexibility of building data with enterprise information systems while providing support for multiple interconnected NSCs and OWSs.
  - 2. Configure system using top-level 10/100 Mbps Ethernet network using BACnet/IP, LonWorks IP, and/or Modbus TCP protocol.
  - 3. Comply with IEEE 802.3 at the Enterprise level and utilize CSMA/CD protocol, ARP, and UDP.
  - 4. Supports having each NSC, workstation, and server residing directly on Ethernet TCP/IP LAN/WAN with no required gateways. NSCs, workstations, and servers can use standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches, and hubs; allows Owner to utilize existing, new enterprise network, or structured cabling system with option delegating maintenance to IT or Information Systems Department.
- F. WAN:
- 1. BAS supports software segmentation into multiple LANs distributed over WAN so a workstation can manage a single LAN, building, and/or entire system while keeping each LAN segment portion on updated database.
  - 2. Single WAN isolated behind campus firewall connects each building at TCP/IP protocol utilizing fixed IP addresses at each WAN-connected device.
- G. Provide equipment and labor not specifically referred to herein or on the plans, and required to meet functional intent, without additional cost to Owner.
- H. Ensure work described in this section is installed, wired, circuit tested, and calibrated by factory-certified technicians qualified for this work and in regular employment of approved manufacturer local field office, with minimum of three years of documented installation experience with the manufacturer. Include documented experience in bid and submittal package verifying longevity of installing company relationship with manufacturer.
- I. Ensure system supervision, hardware engineering, software engineering, calibration, and checkout services are executed by direct employees of approved manufacturer local field office that are not subcontracted.
- J. Ensure controls contractor support facility located within 100 miles of site provides factory-certified technicians and engineers, spare parts inventory, necessary testing and diagnostic equipment required for installed system, and offers emergency services 24 hours per day, 7 days per week.
- K. Provide Commissioning, Configuration, and Diagnostic Tool (CCDT) consisting of color-displayed personal computer software and interfaces for uploading or downloading I/O objects, monitoring overrides, timed overrides, and controller resident time schedules for High Point Count Controllers (AAC), Unitary Equipment Controllers (UEC), and VAV Controllers
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(VAVDDC).

## 2.3 IBMS: INTELLIGENT BUILDING MANGEMENT SYSTEM

- A. BMS that includes additional capacity and interface-specific features to host both HVAC and non-HVAC systems for specific intelligently coordinated automatic control; see Section 25 15 00.
- B. Required Systems Integrations:
  - 1. Network lighting controls system.
  - 2. Lighting control devices; see Section 26 09 23.
  - 3. Access control system; see Section 28 10 00.
  - 4. EPMS (Energy and Power Management System).
    - a. Load Shedding: Coordinate integrated system to execute automatic HVAC system load shedding.
    - b. Microgrid Control System: Integrate and coordinate local energy resource production from wind, solar, and other energy resources to automatically reduce utility energy demand.
    - c. Plug-Load Control: Interconnect power outlets for plug-load control to reduce peak demand and apply power conservation measures.
  - 5. Spatial Monitoring System: Designed to optimize use of spaces and provide data on how those spaces are used. The system will also be capable of wayfinding and have applications for occupant control of items such as lighting levels and temperatures using mobile app.
  - 6. Hotel Management System: Guest room management solution.

## 2.4 BMS: BUILDING MANGEMENT SYSTEM

- A. Open architecture that utilizes LonTalk protocol according to LonMark Interoperability Guide over EIA 709.1 ASHRAE Std 135, BACnet to assure interoperability between interconnected system components such as NSCs, SDCUs, \_WS, and others while ensuring that full project support using open protocols to reduce future building maintenance, upgrade, and expansion costs.
- B. Graphical, web-based, operator interface that allows for instant system access using standard browser to PC-based workstations and microcomputer controllers of modular design providing distributed processing capability and allowing future expansion of both input/output points and processing/control functions.
- C. Seamlessly connect devices throughout the facility regardless of subsystem type where variable frequency drives, low-voltage lighting systems, electrical circuit breakers, power meters, and card access system easily coexist.
  - 1. Web-browser interface is to access data using HTML5 markup language to present content without requiring proprietary operator interface, special configured programs, or JAVA-supported software.
  - 2. Data to reside in supplier-installed server for common database access.
  - 3. Determine hierarchical topology required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the Intranet network.
- D. Field HMI: Provide HMI app for portable devices; see Section 25 35 00.
- E. System Expansion Requirements:
  - 1. Scalable and expandable using existing software interface and controllers. Systems that require software or field controller replacement(s) in order to expand it will not be acceptable.

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- 2. The Enterprise Server will manage one or more NSCs loaded with matching or previous software versions as long as the server operates using matching or most recent software version.
  - F. Software Tools: Include commissioning, configuration and diagnostic tool (CCDT) software tool and required special connectors to interface each field-installed DDC.
  - G. Automatic Fault Detection and Diagnostic for HVAC Controls: See Section 25 01 90.
  - H. Balance of Work:
    - 1. Safety Interlocks: Provide wiring and incidental items such as relays to enable this functionality as indicated on drawings besides those listed.
      - a. Air handler shutdown from duct-mounted smoke detectors or fire alarm panel in compliance with NFPA 90A.
      - b. Boiler plant shutdown from emergency shutdown hand-stations or safety devices.
      - c. Chiller plant shutdown and leak-purge ventilation from refrigeration-leak detector or other safety devices.
      - d. Smoke control management from fire smoke control panel, fire alarm system, or other safety device(s) in compliance with UL 555, UL 555C, UL 555S, and UL 864 UUKL.
      - e. Stairwell pressurization control when enabled from fire alarm system or other safety device(s).
    - 2. Except as otherwise specified, review approved submittals to identify and provide HVAC-control interface products when equipment manufacturer or system division does not provide these as indicated on drawings.
    - 3. Provide HVAC controls for the following:
      - a. Air handling units.
      - b. Air source heat pumps.
      - c. Boilers including hot water pumps.
      - d. Cabinet unit heater controls.
      - e. Chilled water system including pumps, chillers, and cooling towers.
      - f. Chillers.
      - g. Computer room air handling units.
      - h. Variable air volume terminal units.
      - i. Cooling towers.
      - j. CRAC units.
      - k. Exhaust fans.
      - l. Fan coil units.
      - m. Finned tube radiation control.
      - n. Hot water loop pumps.
      - o. Monitoring points for packaged equipment such as emergency generators.
      - p. Outside air units.
      - q. Power wiring to DDC devices, smoke control dampers and BMS panels except as otherwise specified.
      - r. Refrigerant leak detection system.
      - s. Return air fans.
      - t. Rooftop units.
      - u. Smoke evacuation sequence of AHUs and return fans including smoke control dampers and fire command override panel.
      - v. Supply fans.
      - w. Unit heaters.
      - x. Unit ventilators.
      - y. Variable volume and constant volume box control including interlocks with finned tube radiation.
      - z. Variable frequency drives.
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- aa. VRF units.
- bb. Water source heat pumps.
- I. Communication Requirements:
  - 1. Network: Extend existing Ethernet backbone in compliance with IEEE 802.3 at minimum speed of 100/10 Mbps.
    - a. Support XML HTTPS and other listed protocols for maximum flexibility of building data integration with enterprise information systems and providing support to multiple NSC and OWS.
    - b. Enterprise Systems: Utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP).
  - 2. Link NSC and \_WS devices over LAN/WAN communications using BACnet IP, LonWorks IP, Modbus IP or combination thereof.
  - 3. Segmentation: Allow software linked-device segmentation into multiple LAN across WAN.
  - 4. Gateways: Not allowed, unless noted otherwise.
  - 5. Configure using graphical and/or line-based NSC application programming language.
  - 6. Connect each building over TCP/IP layer on single WAN isolated behind campus firewall using fixed IP address for each WAN connected device.
  - 7. Configure \_WS to interface and manage one or more building system while keeping their respective databases separate.
  - 8. BMS devices including NSCs, \_WS, and servers will reside directly on Ethernet TCP/IP LAN/WAN with no required gateways using standard, commercially available, off-the-shelf infrastructure components such as routers, switches, and hubs interconnected over new or existing structured cabling system thus allowing direct control by assigned IT Department.
- J. Electronic Records; Electronic Signatures Requirements:
  - 1. Provide factory-configured BMS software to execute in compliance with 21 CFR 11.
  - 2. Subpart B - Electronic Records, Section 11.10 - Controls for Closed Systems:
    - a. Validate systems to ensure accuracy, reliability, consistent intended performance, and ability to discern invalid or altered records.
      - 1) Altered Records Detection: If records can be altered by tools outside the BMS then detect and trace each action on each altered record. Include copy of each altered record as detected in the audit trail.
      - 2) Detection of Invalid Records: Configure system to detect invalid records.
      - 3) Records: System to generate accurate and complete records including metadata.
    - b. Generate accurate and complete copies of electronic records (e-records) in both human readable and electronic form suitable for inspection, review, and copying. Include reference for direct contact in case of questions regarding ability to perform such review and copying.
      - 1) Support viewing of e-records or generation of valid paper copies. Audit and historical data viewable from within BMS operating system with no need for additional viewers.
      - 2) Export e-records to portable file formats, either manually or automatically on demand or via schedule. Format audit and historical data into pdf reports protected by digital certificates. In turn, digitally signed reports can be verified using standard technologies such as Adobe Acrobat Reader.
      - 3) Enable review of, and production of reports on historical data for custom filtered time period(s) throughout the full retention period.
      - 4) Produce Mean Kinetic Value/Temperature reports for custom filtered time period(s) throughout the full retention period.

- c. Configure protection of records to enable their accurate and ready retrieval throughout the records retention period.
  - 1) Archive e-records using standard file format when internal retention strategy does not include keeping e-records in the originating system format.
  - 2) For automated archiving, include transaction safeguards to prevent deletion of e-records from source until confirmed as successfully archived.
- d. Limit system access to authorized individuals:
  - 1) Include security mechanism that uses at least two distinct identification components (e.g., User ID/ password, PKI mechanisms) or biometrics. System users will gain access via unique user name and encrypted password.
  - 2) Allow setting individual accounts; shared accounts for access levels other than read only, are not acceptable.
  - 3) Passwords must be stored using encrypted form. In case encryption of passwords is not possible, then file(s) containing passwords and user-IDs will be secured by technical means and their access strictly controlled with no read option by any user; include SOP/strict instructions for administrator(s) to access and read secured file(s) containing password and user-IDs references.
  - 4) Screen displayed password entry fields will be obscured when being filled (e.g., \*\*\*\*\*).
  - 5) Allow for quality passwords that use configurable number of alphanumeric and special characters and enforce their use. Establish password policy to allow for password aging, quantity of characters, types of characters, required cases and frequency of reuse.
  - 6) Include log-off mechanism to execute after predefined period of user inactivity, or mechanism where user ID entry is required after inactivity period.
  - 7) System is to force users to change their password after the first login. Changes to passwords or to other properties of users (except for one's own password) will require approval and signature of two people with both user names and comments recorded permanently in the audit trail.
- e. Use of secure, computer-generated, time-stamped audit trails to independently record operator date and time entries and actions that create, modify, or delete electronic records. Record changes are not to obscure previously recorded information. Such audit trail documentation will be retained and available for agency review and copying.
  - 1) Provide secure, computer-generated time stamped audit trails for e-records every time operator entries or actions create, modify or delete electronic records.
  - 2) Computer-generated audit trails contain information about the person or equipment performing the activity, date and time of execution, and what was changed or done.
  - 3) The audit trail changes recorded are not to obscure or destroy original recorded information.
  - 4) Audit trails cannot be turned off.
  - 5) Audit trails will be available for review and be copied during the entire retention period.
  - 6) Audit trails will be part of each back up.
  - 7) Computer-generated audit trails record every hour and minute and be as precise as required by intended business process (e.g., to verify correct sequencing of events).
  - 8) Use server time for time stamp generation.
  - 9) Subject time and date settings to rigorous control to ensure accuracy of time stamps. Provide ability to restrict access to time settings. Prevent users from



- changing time and date settings.
- 10) Time clock can be synchronized to central system.
- 11) System spanning multiple time zones will be able to display and print time zone used.
- 12) Audit trails can be reviewed.
- f. Use of authority checks to ensure that only authorized individuals can use the system, electronically sign a record, access the operation or computer system input or output device, alter a record, or perform the operation at hand.
  - 1) System to apply authority checks to ensure that only authorized individuals can:
    - (a) Make use of system functions and features.
    - (b) Electronically sign a record.
    - (c) Create, modify, inactivate/logically delete, or delete records.
    - (d) Access input and/or output devices.
    - (e) Perform operations at hand.
  - 2) Implement authority checks by role-based access.
  - 3) Automatically system captured records (e.g., process data) must not be modified. Provide mechanisms that prevent users, except system administrators, from having access other than "read" to such records. If the system lacks such controls, computer-generated audit trails must be implemented.
  - 4) If it is critical for intended process that specific hardware items, devices, or equipment (e.g., shop-floor terminals, barcode readers) create, submit or modify records then include reporting and alarm features (prompts, flags, or other help features) in place to ensure consistency of records and to alert user of records being out of acceptable range.
- 3. Subpart B - Electronic Records, Section 11.50 - Signature Manifestations:
  - a. Signed electronic records will contain information associated with the signing that clearly indicate the following:
    - 1) The printed name of the signer.
    - 2) The date and time when the signature was executed.
    - 3) The meaning (such as review, approval, responsibility, or authorship) associated with the signature.
      - (a) The system is to record the unique identifier of the person executing the signature, the date & time of the signature, the meaning of a signature (e.g., approval, review, responsibility, authorship) for/ to each signature event. Ideally, e-signatures will be applied directly to records. Alternatively, separate e-signature records are allowable if they are unambiguously linked with the record to which they apply.
      - (b) Ensure that each user is uniquely identifiable in the system. Where the user ID is not the user's full name, ensure it is traceable to the user's full name. This does not impact the requirement that signed records used for GxP purposes will display the full name (at least name & surname) of the signer.
      - (c) The system is to allow for preprogramming of signature meanings (e.g., via configurable picklists), if this makes a good business sense, e.g., in case of predictable and/or recurrent signature meanings (e.g., approval / rejection of documents). Where preprogramming of meanings for signatures appears not useful, implement free text comments associated with the signature.
    - 4) Only specifically designated users will be given the right to sign records.
    - 5) Users' rights to sign records can be controlled by schedule.
    - 6) Users' rights to sign records can be controlled by location, i.e., IP address.

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- 7) System capable of working either with single signature approval, or dual signature approval. When two signatures are required, the audit trail must include a separate time entry for each signature and a separate area for each signer to record that signer's individual comments or justification. Each are separate events in the event log, and the action requested is to take place when both signatures have been completed in their entirety.
  - 8) System to provide means for differentiated user-level permissions based on location and/or time of day.
  - b. The items identified in this section will be subject to the same controls as for electronic records and will be included as part of any human readable form of the electronic record such as electronic display or printout.
    - 1) Whenever a signed record is required to remain used for GxP purposes, ensure that the full name (at least forename and surname) of the signer, date and time of the application of the signature and meaning of the signature are displayed and printed.
    - 2) Electronic signatures and handwritten signatures executed to electronic records will be linked to their respective electronic records to ensure that signatures cannot be excised, copied, or otherwise transferred to falsify an electronic record by ordinary means.
  4. Subpart C - Electronic Signatures, Section 11.100 - General Requirements:
    - a. Each electronic signature will be unique to one individual and will not be reused by, or reassigned to, anyone else.
      - 1) The system must not accept duplicate user accounts. The system will maintain the uniqueness of each combined identification code and password, such that electronic signature will be unique to one individual and will not be reused or reassigned to anyone else.
      - 2) The system must not allow the removal of any retired accounts. If an account becomes inactive due to a person's change in employment status, that account must continue to remain associated with all previous activities.
  5. Subpart C - Electronic Signatures, Section 11.200 - Electronic Signature Components and Controls:
    - a. Electronic signatures that are not based upon biometrics are to:
      - 1) Employ at least two distinct identification components such as an identification code and password.
        - (a) When an individual executes a series of signings during a single, continuous period of controlled system access, the first signing will be executed using all electronic signature components; subsequent signings will be executed using at least one electronic signature component that is only executable and designed for use only by the individual.
        - (b) When an individual executes one or more signings not performed during a single, continuous period of controlled system access, each signing will be executed using all of the electronic signature components.
      - 2) Be used only by their genuine owners.
      - 3) Be administered and executed to ensure that attempted use of an individual electronic signature by anyone other than the genuine owner requires collaboration of two or more individuals.
    - b. Systems must be designed to require two components for the execution of the first e-signature within a session (e.g., User ID and password).
    - c. The system will be designed to require the private component for the execution of subsequent signings within a session.
    - d. To facilitate work, it is allowed that the system prepopulates automatically the user identification information (also for the first signature).
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6. Subpart C - Electronic Signatures, Section 11.300 - Controls for Identification Codes/Passwords:
  - a. Ensuring that identification code and password issuance are periodically checked, recalled, or revised (e.g., to cover such events as password aging).
    - 1) The system will support password-aging processes (prompts for password renewal after user adjusted number of calendar days).
    - 2) The system will allow for configuration of the password aging parameter.
    - 3) The setting of the password aging parameter will be limited to duly authorized personnel only.
    - 4) The system will ensure that an identification code and password are periodically checked, recalled, or revised.
    - 5) Check that the system can lock a user account after a specified number of failed access attempts.
  - b. Use of transaction safeguards to prevent unauthorized use of passwords and/or identification codes, and to detect and report in an immediate and urgent manner any attempts at their unauthorized use to the system security unit, and, as appropriate, to organizational management.
    - 1) The system will be able to log unauthorized access attempts.
    - 2) The system will be able to detect potential unauthorized access attempts and notify immediate and urgent manner the system administrator.

## 2.5 \_WS: SYSTEM WORKSTATIONS AND SERVERS

- A. OWS, General:
  1. Password-protected, licensed system-interface through standard web browser for access to monitor and control system objects such as points, graphic-panels, alarms, graphics, setpoints, trends, reports, and other objects described herein.
  2. Conform to B-OWS BACnet device profile.
  3. Hardware can be thick-client for OWS or thin-client for WebStation (webOWS).
- B. EWS, General:
  1. PC-based programming device loaded with standard software developed and tested for full compatibility with system components. Third party front-end workstation software will not be acceptable.
  2. Computer-device loaded with configuration and application-programming software required to create or modify BMS objects such as NSC and server-loaded databases.
- C. Enterprise Server or Enterprise Central Server: Provide for coordination of large site or multi-site systems.
- D. Communications: Application-programming software will communicate with NSCs using high-resolution color graphics for alarms, trend charts and stored data presentation of user configurable data captures.
- E. Automatic Client/Server (\_WS/NSC) Configuration: Changes or additions applied at single \_WS will automatically appear in other \_WS regardless of type. Applied updates are executed at NSC level, therefore central database systems will not be acceptable.
- F. System Requirements:
  1. Client License Type:
    - a. OWS: Provide three licenses.
    - b. EWS: Provide one license.
    - c. WebStation (webOWS): Provide three licenses.
    - d. Enterprise Server: Provide one license.
    - e. Enterprise Central: Provide one license to host up to 250 NSCs.
  2. Computer Hardware Requirements by Client License Type:

- a. OWS:
  - 1) Processor: Intel Core i5 at 3.0 Ghz or higher processor.
  - 2) Memory: 8 Gb or higher.
  - 3) Communications: 10/100/1000 Mbps Ethernet, USB v. 2.x or later.
  - 4) Storage: 1 Tb or higher using solid-state hard drive.
  - 5) Operating System: Microsoft Windows 11.
  - 6) Other Software Required: Microsoft .Net version 4.7.2 or later.
- b. EWS:
  - 1) Processor: Intel Core i5 at 3.0 Ghz or higher processor.
  - 2) Memory: 8 Gb or higher.
  - 3) Communications: 10/100/1000 Mbps Ethernet, USB v. 2.x or later.
  - 4) Storage: 1 Tb or higher using solid-state hard drive.
  - 5) Operating System: Microsoft Windows 11.
  - 6) Other Software Required: Microsoft .Net version 4.7.2 or later.
- c. WebStation (webOWs):
  - 1) Owner-provided device loaded with internet browser which may include Google Chrome v.71 or higher, Mozilla Firefox v.64 or higher, Microsoft Edge (HTML) v.17 or higher, or Safari v.11.4 or higher.
  - 2) No additional software required for NSC supported operation, there will be no cap on support of multiple webOWs other than what internal-NSC CPU and memory capacity can support.
- d. Enterprise Server:
  - 1) Processor: Intel Core i5 at 3.0 Ghz or higher processor.
  - 2) Memory: 8 Gb or higher, recommended.
  - 3) Communications: 10/100/1000 Mbps Ethernet, USB v. 2.x or later.
  - 4) Storage: 1 Tb or higher using solid-state hard drive.
  - 5) Operating System: Microsoft Windows Server 2022.
  - 6) Other Software Required: Microsoft .Net version 4.7.2 or later.
  - 7) External Log Storage: Microsoft SQL Server 2016 SP1 and later.
- e. Enterprise Central Server:
  - 1) Processor: Intel Core i5 at 4.0 Ghz or higher processor.
  - 2) Memory: 12 Gb or higher.
  - 3) Communications: 10/100/1000 Mbps Ethernet, USB v. 2.x or later.
  - 4) Storage: 4 Tb, recommended using solid-state hard drive.
  - 5) Operating System: Microsoft Windows Server 2022.
  - 6) Other Software Required: Microsoft .Net version 4.7.2 or later.
  - 7) External Log Storage: Microsoft SQL Server 2016 SP1 and later.
- 3. Owner-Provided Hardware: Follow minimum requirements listed by Client-License type; See Section 25 11 19 for workstations and 25 11 13 for servers.
- 4. WebStation (webOWs) Requirements:
  - a. General:
    - 1) BAS web-based workstations (WebStation) to support minimum of 100 concurrent users.
    - 2) Day-to-day system operation will be accessible through standard web-browser interface, allowing technicians and operators to view any part of the system from anywhere on the network.
    - 3) Provide system access on site via mobile device environment with as minimum full access to view and overwrite system values.
    - 4) View predefined groups of points with their values updated automatically.
    - 5) Provide same graphical capabilities as the OWS but automatically reformatting displayed data for use on smaller device(s).

- 6) Automatically detect light mode and dark mode settings within operating system and adapt accordingly.
- 7) Support light/dark display mode setting override independent of operating system's setting.
- 8) Automatically respond and adapt to different screen sizes and orientations from smart phone to smart televisions regardless of size.
- 9) Support slideshow functionality.
- 10) Support presentation mode that when enabled will have any functionality for interactivity disabled.
- 11) Support full screen mode for displaying alarm views, graphics, dashboards, or custom reports.
- b. Graphic Displays:
  - 1) Share same graphical displays as EWS presenting dynamic data on site layouts, floor plans, and equipment graphics. Support commands to change setpoints, enable/disable equipment, and start/stop equipment.
  - 2) Navigate through entire system to change point value or status within any controller. AppleID changes are effective immediately and recorded for storage within system database.
  - 3) Out-of-the-box dashboards that enable customizable views of live data which can be public to users or capable of being user-specific based on log in credentials.
  - 4) Allow user to create custom dashboards.
  - 5) Kiosk mode which allows display of occupant level data on monitors or tablets throughout the building.
- c. Alarm Management:
  - 1) Systems requiring additional client software WebStation viewing will not be considered.
  - 2) Include live alarm viewer identical to OWS or EWS alarm viewer.
  - 3) Once allowed, users must be able to receive, silence, and acknowledge alarms.
  - 4) Allow operator to provide input addition to alarm record before acknowledgement using viewable attachment(s), checklists, and direct operator text input.
5. Administration and Programming Software:
  - a. Allows system architecture configuration setup consisting of client-server relationships where \_WS operates as client(s) while NSC(s) as server(s).
  - b. Allows client device configuration for data presentation with input validation and server configuration for data gathering and delivery.
  - c. Allows data presentation configuration of alarms, reports, graphic-panel(s), and graphic charts generated using short or long term data captures and operator-initiated control actions such as schedule and setpoint adjustments.
  - d. Allows online or offline SDCU programming from any OWS while keeping associated information available within NSC-stored graphic or text displays.
  - e. Allows configuration of graphic displays featuring animation effects that enhances data presentation to alert operators of problems and facilitates locating specifics using mouse selectable operator functions.
6. User Interface:
  - a. Allow creation of custom, browser-style user-linked interface(s). Also, allow creation of customized group-assigned workspace.
  - b. User-linked interface to support creation of "hot-spots" that can be linked to view, edit, or configure any system object. Furthermore, allow interface to become "PC Desktop" with links to run other Windows applications.

- c. Allow use of local or remote Windows security settings to setup each user accounts for BMS access level which may limit PC and LAN/WAN access to prevent, for example, shutdown of active-alarm viewer or PC software loading.
  - d. System to automatically switch between displayed metric or imperial units based on OWS location.
  - e. Capable of displaying data via user-selectable language that includes English, Spanish, German, French, Japanese, Italian, Finnish, Portuguese, Swedish, Russian, and Chinese both in traditional and simplified form without requiring additional add-on(s) from standard OWS software-installer.
  - f. WebStation (webOWS) will automatically redirect traffic into HTTPS connection to ensure more secure communications.
  - g. Synchronize personalized layouts and panels between OWS and WebStations (webOWS) to ensure consistent user experiences between dissimilar.
  - h. Servers and clients can get placed in different time zones and set to synchronize via NTP server.
  - i. OWS to show continuous communication status with server.
7. User Account Management:
- a. Support password policy with the following components:
    - 1) Mandatory change of password at first login with default credentials.
    - 2) Disabling each imported user account by default.
    - 3) Custom password complexity rules and enforcement.
    - 4) Custom password reuse and enforcement.
    - 5) Configurable password black-listing to limit common known password use.
    - 6) Password aging rules.
    - 7) Integration with Windows Active Directory for user log-on credentials.
    - 8) Include configurable reminder for "Days until password expires."
  - b. User Access and Permission Requirements:
    - 1) The BMS will support single sign-on using SAML 2.0 Authentication scheme over HTTPS language to enable secure navigation across multiple systems without the need to login.
    - 2) User and group account management interface to customize system and object accessibility assignment.
    - 3) Once associated group accessible user accounts can inherit group permissions.
    - 4) Support BMS permission integration with Windows Active Directory.
    - 5) Support account, permissions, group, archiving, and audit reports.
    - 6) Link username/password combination to assign capabilities such as object edit, object view, alarm acknowledgement, program enabling/disabling, and change value edits. Apply listed edits independently of each and every system object class.
  - c. Support configurable password policy to include:
    - 1) Minimum number of characters.
    - 2) Minimum number of lowercase characters.
    - 3) Minimum number of numeric characters.
    - 4) Minimum number of special characters.
    - 5) Number of consecutive unique passwords before reuse.
    - 6) No more than three repeating identical characters.
  - d. Guest Account:
    - 1) Enable anonymous access to previously engineered views such as dashboards, graphics, and other objects using configurable permissions without assigning a username or password.
    - 2) Use as default to simplify presentation of Kiosk Mode across multiple screens.

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- 3) Provide time configurability to logout non-guest user and revert to preconfigured presentation view such as offered by the Guest account functionality.
    - 4) Provide configurability in managing access and permission levels based on location, IP addresses, address range(s), schedule, time of day, and combination thereof.
  8. System Security:
    - a. Provide Cybersecurity service incident escalation through dedicated help desk available 7 days, 24 hours a day for 365 days a year.
    - b. Support configuration for inactivity auto log-off of logged clients.
    - c. Support self-signed certificates, default certificates and certification authority (CA) certificates.
    - d. Client web or rich client access communications to support TLS 1.3 or higher encryption.
    - e. Disable devices and software that support HTTP and require access via HTTPS.
    - f. Automatically alarm or generate notification on failed access attempts.
    - g. Support SNMP V3 monitoring of network performance and stack statistics for the purpose of managing denial of service attacks.
    - h. Initiate periodical alarm at predetermined period of time until default password for each device is changed from default factory setting.
    - i. Support encrypted password authentication for serving or consuming web services.
    - j. Use blacklisted and whitelisted IPs and MAC addresses to gate access.
    - k. Differentiate, limit, or enable user access depending on client's IP address or range location (where) and time of day (when).
    - l. BMS system supplier vendor to provide the latest antivirus, anti-malware software, and apply updates automatically during warranty period. Monitor virus updates to detect possible negative impacts to operation of PC-server application software.
  9. Configuration Interface:
    - a. Use familiar Windows Explorer style interface for an operator or programmer to view and/or edit any system object such as controller, point, alarm, report, schedule, and others.
    - b. This interface will present full "network map" of controllers with their associated objects such as points, programs, graphics, alarms, and reports in an easy to understand structure. Object names will be alphanumeric and use Windows long filename conventions.
    - c. User defined object type support for use as building blocks for BMS database creation within system as input, output, string variables, setpoints, alarm algorithms, alarm notification objects, reports, graphic displays, schedules, and programs.
    - d. Set up groups of user defined object types as predefined system and subsystems aggregates. The configuration interface will support copying, pasting, exporting, and importing portions of the database for additional efficiency.
    - e. System to maintain link to created "child" objects. User applied parent-object changes and updates can be replicated to child objects upon user command.
  10. Graphics Display Editor:
    - a. Create and save pages.
    - b. Group and ungroup symbols.
    - c. Modify an existing symbol.
    - d. Modify an existing graphic page.
    - e. Rotate and mirror a symbol.
    - f. Place a symbol on a page.
    - g. Place analog dynamic data in decimal format on a page.
    - h. Place binary dynamic data using state descriptors on a page.
    - i. Create motion through the use of animated .gif files or JavaScript.
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- j. Place test mode indication on a page.
- k. Place manual mode indication on a page.
- l. Place page link using fixed symbol or flyover.
- m. Place link to other graphic(s).
- n. Place link to web site(s).
- o. Place link to note(s).
- p. Place link to time schedule(s).
- q. Place link to OWS executable (.exe) file(s).
- r. Place link to written document(s) using Microsoft Word (.doc) format.
- s. Background color assignment.
- t. Foreground color assignment.
- u. Place page alarm indicator(s).
- v. Dynamically update analog symbol, text, value, or color as function of field value.
- w. Dynamically update binary symbol, text, value, and color as function of field state.
- x. Each symbol used by Schneider Electric EcoBuilding Business for creating graphic pages will be saved to library file for Owner use.
- y. Integral software application for creating user defined, color graphic displays to view mechanical systems, electrical systems, or building schematics.
- z. Once created, graphic displays can include database-mapped objects including point data including point associated attributes such as engineering units and others. In addition, mapped objects will allow operators to operate equipment or change setpoints.
- aa. Ability to import external files using .gif, .png, .bmp, .jpeg, .tif, or CAD-generated pictures as graphic display background with layering ability.
- bb. Support HTML5 enabled graphics.
- cc. Support JavaScript use to customize graphic display behavior.
- dd. Graphics editor to use Scalable Vector Graphics (SVG) technology.
- ee. Include built-in animated object library with graphic objects such as dampers, fans, pumps, buttons, knobs, gauges, and others for placement using software configuration wizard to build graphic displays that mimic field interfaced equipment and systems.
- ff. Support high-DPI icons automatically chosen when accessing graphic(s) on high definition displays such as Retina or 4K type.
- gg. Allow operators to use their user interface for setpoint adjust, equipment start-stop, PID loop parameter modifications, or schedules changes.
- hh. Denote status changes or alarm conditions using highlighted objects and applying other effects such as changing size, color, text, blinking, or assigning specific display(s).
- ii. Ability to link graphic displays through user-actions, user-defined objects, alarm(s), or mathematical expression result(s). Operators must be able to change from one graphic display to another by using their mouse - no menus will be required.
- jj. Allow to create and save graphical components and JavaScript code in reusable and transferable, customized libraries.
- kk. Automatically rescale graphic display based on monitor or viewing device being used.
- ll. Ability to create graphic displays on varying layers that can be moved and repeated.
- mm. Ability to create graphic displays within varying window panes that can be moved and/or referenced. For example, creating pane-attached graphical menu for use and reference on every other graphic page thus allowing to apply single spot updates that push to each page that references it.
- nn. Ability to create reusable cascading menus.
- oo. Allow multiple graphic display instances developed from single instance to facilitate change replication across them.



- pp. Automatically capture and report data gathered from NSC or other controller at user-configurable frequency.
- 11. Alarm Management:
  - a. Integrate alarms regardless of origin for inclusion into notification alerts, operator acknowledgment, graphic displays, or initiating reports.
  - b. Accept alarms generated directly from linked NSCs or other controllers.
  - c. Generate alarms based on NSC or other controller data value when compared to software configured limits or conditional equations.
  - d. Include data search capability for user to sort, filter, and search on any available criteria such as priority, category, origin, alarm type, and other criteria.
  - e. Include minimum of 1,000 alarm notification levels at NSC, OWS, and WebStation devices. Increase minimum number to 10,000 when using Enterprise Server.
  - f. Allow addition of unique set of parameters per notification level for controlling alarm; display, distribution, acknowledgment, keyboard annunciation, and record keeping.
  - g. Include user customizable active alarm viewer allowing to hide or display alarm attribute(s) per user or user type.
  - h. Allow system setting to present alarms with configurable colors based on priority, category, origin, alarm type, and custom criteria.
  - i. Allow system setting to link files, documents, hyperlinks, navigation links, and graphics links to an alarm for easy access upon occurrence.
  - j. Automatically log in database each alarm with respective message, point name, point value, source device, timestamp, time of acknowledgement with user ID, time of alarm silence (soft acknowledgement) with user ID.
  - k. Support multiple alarm notification distribution methods within one notification.
  - l. Support individual and user group alarm notification forwarding to preconfigured list of recipients over email using Simple Mail Transfer Protocol (SMTP) or secure email using Simple Mail Transfer Protocol Secure (SMTPS) without requiring special software interface or email client software running for distribution.
  - m. Support SNMP alarm notifications.
  - n. Support file (on disk) alarm notifications for use by other alarm management services.
  - o. Support alarm assignment to specific users via preconfigured list and date/time. For example, critical high temperature alarm assigned to Facilities Department or central alarming OWS depending on time and/or date.
  - p. Play an audible sound on alarm initiation or return to normal. Support alarm assignment of custom audio sound based on alarm-criteria such as priority, category, origin, alarm type, and other configurable criteria.
  - q. Support custom configuration of active alarm viewer for setting specific instructions. For example, an operator must confirm accomplishment of displayed check list steps prior to alarm acknowledgement.
  - r. Support custom configuration of active alarm viewer to filter and show visible and total number of alarms without the 'return to normal' flag, disabled or hidden.
  - s. Support custom configuration of active alarm viewer to auto hide alarms when triggered.
  - t. Capability to save and apply alarm favorites.
  - u. Support custom configuration of active alarm viewer to require operator to type in text within alarm entry and/or choose alarm actions drop-down list for certain alarms.
  - v. Alarms will be configurable such that an operator must type in text in an alarm entry and/or pick from a drop-down list of causes for certain alarms to ensure accountability (audit trail) for critical alarms response.
  - w. Support custom configuration of active alarm viewer to configure user-actions via user and group permissions when responding.

- x. Support custom configuration of active alarm viewer to have audit trail of operator actions to alarm responses.
12. Reports:
- a. Support built-in reporting functionality without dependency on other software.
  - b. Support standard accessing of data by third party reporting or analytics software.
  - c. Support server-loaded Microsoft SQL to expand reporting capability outside OWS trend chart and listing ability. Use Timescale DB compression to allow reduction of server disk space.
  - d. Custom-Formatted Reporting:
    - 1) Support built-in native reporting capability both at local and NSC level without dependency on external software.
    - 2) Generate custom static-paginated reports either manually, using schedule(s), alarm trigger(s) or custom condition(s) within application software execution.
    - 3) Custom reporting will not be external database dependent and will be capable of generating reports using full range of available data from most recent to historical.
    - 4) Support report generation containing current active alarms.
    - 5) Produce custom reports using .txt, .xlsx and .pdf file formats.
    - 6) Support digital signing of pdf for traceability and authenticity.
13. Dashboard:
- a. Allow dashboard configuration to provide rapid identification of real-time and historical trends, including energy use, operational efficiencies and critical metrics.
  - b. Create dashboard(s) using web-browser interface for custom item selections from wide range of layouts and widgets (dashboard components).
  - c. Dashboard view customization via web browser data point selection(s) without requiring specific tools or prior training.
  - d. Built-in dashboards - Provide minimum set of dashboard components for Owner use:
    - 1) Resource Utilization:
      - (a) Illustrate comparative resource (like energy) consumption over flexible time period.
      - (b) Location-based information ordering that will allow plotting data from multiple locations using common columnar chart for clear analysis and comparison.
    - 2) Utility Performance Index:
      - (a) Enables creation and visualization of one or more Key Performance Index (KPI) charts for comparisons of resource utilization efficiencies for multiple locations.
      - (b) Display total resource consumption (y-axis) versus resource consumption per unit area (x-axis) using scatter plot chart.
      - (c) For example, Energy KPI can be displayed by selecting the locations of interest (e.g., campus offices) prior to select as vertical axis variable their electric consumption in kWh and for their kWh per SF as normalized metric for horizontal axis.
    - 3) Real Time Gauges:
      - (a) Use gauges for real time value tracking for objects such as temperature, pressure, humidity, and level.
    - 4) Historical Gauges:
      - (a) Use gauges for calculations using historical data for presenting maximum, minimum, average values of temperature, pressure, or humidity over given period.
    - 5) Period over Period Comparison:

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- (a) Visually compare historical data such as temperature, energy, or others across multiple overlapping time periods such as hours, days, weeks, or custom setting(s).
  - e. Custom Dashboard Components:
    - 1) Allow access to system information such as system health data, alarms, trends, events, user access, and others.
    - 2) Allow customized dashboard pages to present specific customer-required information.
    - 3) The BMS web-based operating environment will allow Operator to update multiple setpoints or parameters in one single operation from within accessible search tool or graphics.
    - 4) Support custom or out-of-the-box visual dashboards for BMS Alarms and Events that enables interactive visualization, analysis, and organizational KPIs support.
    - 5) At minimum include:
      - (a) Interactive Alarms and Events Sankey Chart with drill down capability across; category or origin; server or controller, priority, types, assigned vs unassigned, status, user activity, and assignment (who).
      - (b) Historical Alarm Count widget that shows how number of alarms have evolved over time.
      - (c) Interactive Pie Chart for alarms and events to illustrate proportion of user defined attribute vs total system alarms or events for user defined timeline.
      - (d) Interactive Pareto Chart enables focusing on the higher impact alarms and events depending on the occurrence.
      - (e) Tracking of Alarms and Event KPIs; assigned or unassigned alarms (workload), alarm counts (system stability), filter by different parts of the (building, server, and others).
  - 14. Scheduling:
    - a. Configure and download schedules for any network controller from OWS or WebStation.
    - b. Use calendar style for time of day schedules viewable in graphical and tabular formats.
    - c. Allow schedule programming for minimum of one year in advance.
    - d. Allow particular day schedule updating where user can simply make desired modifications for single days.
    - e. Display schedule(s) using year, month, week and day format. Allow user to switch view, scroll from one month to the next, or alter scheduled times.
    - f. Assign specific controllers and store in local RAM memory then automatically update OWS or WebStation changes to corresponding controller schedule.
    - g. Support lead schedule assignment such that shadow or local schedules are updated based upon lead changes.
    - h. Support schedule assignment of event exception lists(s) for specific days, dates, or date ranges.
    - i. Display combined views showing all calendars and prioritized exemptions on one screen.
    - j. Support minimum of 16 priority levels.
    - k. Allow direct schedule value control without the need of special program logic.
  - 15. Software Programming Environment:
    - a. Include access to SDCU-supported programming language superset.
    - b. Support both NSC script programming language as well as graphical function-block programming language. For both languages, programmer will be able to configure application software for custom program development and write global control
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- programs. Both languages will have debugging capabilities in their editors.
  - c. Allow offline view and editing of NSC programming prior to field deployment with full access to tasks and features except viewing of live tasks or values.
  - d. Include access to SDCU-supported programming language superset.
  - e. Allow saving custom programs as libraries for system reuse thus allowing access by wizard tool for loading library file programs within program editor.
  - f. View live and real-time graphic programming execution from OWS or WebStation.
  - g. Support 'binding templates' creation thus allowing user to bind multiple points to multiple objects all at once.
  - h. Support text recognition so key terms will appear when typing (IntelliType).
  - i. Support application assignment of different priorities and cycle times for prioritized execution of different function.
  - j. Support object creation to allow system integration of common objects such as power meters, VFD drives, and others with simple import actions without the need of complicated programming or configuration setups.
  - k. Support 'custom variables' created within programming environment, graphics, or as full controller 'templates' that can be pushed as singular reference to multiple objects. This facilitates applying updates or changes by automatically replicating singular change to each remote connected instance.
16. Saving and Reloading Files:
- a. Include OWS application to save and restore NSC and field controller memory files.
  - b. Include capability to save or reload individual NSC or field controller objects. This allows off-line control program debugging prior to reloading with just the modified information.
17. Audit Trail Requirements:
- a. Automatically log and timestamp every OWS or WebStation user operation from logging on/off, changing point value(s), modifying program(s), enabling/disabling object(s), viewing graphic display(s), running report(s), modifying schedule(s), and others.
  - b. Use same user account browser interface, WebStation, and OWS. Operators must not be forced to memorize multiple passwords.
  - c. Record executed commands and user activity within system's activity log, which can later be searched and retrieved by user, date, or both.
  - d. View access to history of alarms, user actions, and commands for any system object individually or at least within the last 5,000 system-recorded event records.
  - e. Preconfigure Enterprise server to store up to 5 million events.
  - f. Event view to support viewing up to 100,000 events.
  - g. Configure, view, and save custom-filtered event information views.
  - h. Support search and view of each forced value within the system.
18. Fault-Tolerant Enterprise Server Operation (Top level NSC):
- a. Single system-component failure will not cause system failure.
  - b. Initiate alarm event to inform system users of detected component failure.
  - c. Prevent system user log off due to system failure or switchover.
19. Groups and Schedules:
- a. View predefined groups of points with their values updated automatically.
  - b. Schedule Edits: Change start and stop times, add new times, and modify calendars.
20. Web Services:
- a. Installed system to use web services to consume information within NSCs, other controllers, products, and systems. Inability to perform NSC web services will be unacceptable.
  - b. Use SOAP and REST web services to consume data into the system.
21. MQTT (MQ Telemetry Transport, Communications Protocol):
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- a. The BMS System and NSCs will support MQTT Subscribe and Publish capability.
  - 22. Semantic Tagging:
    - a. The BMS will support tagging of data following a globally recognized schema that can be both human and machine interpretable. Tags will be utilizable across the following workflows and efficiencies:
      - 1) For integrators:
        - (a) Ability to model entities using semantics.
        - (b) Ability to build alarm or event views, predefined searchable objects, and reports based on semantics.
        - (c) Ability to use semantic tagging in designing reports.
        - (d) Ability to import or export designed semantic model in to and from the system across the following formats: Turtle ttl - xml file with worldwide web consortium, markup language, and semantic tagging, Excel, CSV, and text.
      - 2) For Operator:
        - (a) Alarm: Generation of context from single datapoint to enable quicker act on anomalies.
        - (b) Alarm Filtering: Alarm-views can be easily filtered based on the semantic tags.
        - (c) Simplified navigation via semantic model such as location, systems, equipment, and points.
        - (d) Ability to navigate, search, and filter based on semantics.
        - (e) Ability to view and navigate through meaningful relationships.
      - 3) For Software Developers:
        - (a) Ability to discover and utilize semantic model via APIs and other interfaces.
        - (b) Ability to export semantic tagging associated data export to external databases.
    - b. The BMS will support BRICK schema.

## 2.6 NSC: NETWORK SERVER CONTROLLERS

- A. The BACnet NSCs will support BACnet SC node, hub and router functions as defined in the Annex AB of ASHRAE Std 135-2020.
- B. Provide sufficient number of NSCs to fully meet specified requirements with associated point list either attached or indicated on drawings.
- C. The NSC is defined as single device that combines network routing, control, and server functions.
- D. Provide each network server-controller factory tested with label showing it as certified by BACnet Testing Laboratory (BTL) as BACnet Building Controller (B-BC). Controllers that support lesser profiles such as B-SA are not acceptable.
- E. Network server-router-controller that will connect directly to workstation(s) over Ethernet at minimum speed of 100 Mbps and provide communication to SDCUs, and other I/O modules.
- F. Controllers that utilize RS-232 serial communications or ARCNET to communicate with OWS will not be accepted.
- G. Provide global supervisory control functions and common interface to linked fieldbus control devices and common LAN/WAN link.
- H. Capable of whitelisting IP addresses to restrict access to predefined list of hosts or devices.
- I. Capable of whitelisting file extensions for documents.

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- J. Encrypted and authenticated communication configurable for non-open protocol communications using TLS 1.3.
  - K. Support Simple Network Management Protocol version 3 (SNMPv3) for monitoring NSCs using Network Management Tool.
  - L. Support remote system logging used by System Information and Event Monitoring (SIEM) software.
  - M. Configured to monitor and control assigned HVAC equipment such as AHU(s) or boiler(s).
  - N. Contain graphics, trends, trend charts, alarm views, and other similar presentation objects that can be served to OWS or WebStation (webOWS) interfaces.
  - O. Capable of executing application control programs to provide:
    - 1. Calendar functions.
    - 2. Scheduling.
    - 3. Trending.
    - 4. Alarm monitoring and routing.
    - 5. Time synchronization by means of an Internet site including automatic synchronization.
    - 6. Native integration of LonWorks controller data and Modbus controller data or BACnet controller data and Modbus controller data.
    - 7. Network Management functions for LonWorks based devices.
  - P. Hardware:
    - 1. Memory:
      - a. Store operating system, application programs, and other portions of configured database in non-volatile flash memory.
      - b. Contain enough memory for loaded applications, history logging, and minimum of 20 percent of selected size for additional free memory.
    - 2. Communication Ports:
      - a. Ethernet:
        - 1) Two 10/100 Mbps ports for communication with other devices and internet.
        - 2) Support active switch, IPv4 or IPv6 addressing, and BACnet/IP or Modbus TCP communication protocols.
        - 3) Port 1: Support static or DHCP client configuration to link other OWS or NSCs.
        - 4) Port 2:
          - (a) Support switch mode or DHCP server to set addressing of DHCP client devices. Port can be disabled.
          - (b) DHCP Server Mode:
            - (1) Support up to 50 BACnet/IP daisy chained SDCUs.
            - (2) Support up to 250 SDCUs when interconnected into five daisy chained sub networks using external switch.
          - (c) RSTP (Rapid Spanning Tree Protocol):
            - (1) Support up to 39 IP devices.
            - (2) Support up to 234 SDCUs when interconnected into six sub networks using external managed switch.
            - (3) External switch to support IEEE 802.1W or IEEE 802.1Q-2014.
      - b. RS-485: Two port software configurable for BACnet/MSTP, Modbus RTU, or Modbus ASCII communication protocols.
      - c. TP/FT: One FFT-10 port for communication to LonWorks devices.
      - d. USB: Two ports, one for device and one for host.
    - 3. External Device or System Integration:
      - a. Integrate using device driver over controller port(s), DDC, or dedicated gateway.
      - b. Convert data from each respective source-generated communications protocol.
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- c. Field coordinate driver(s), data table(s), references, graphic panel(s), and related reference data required to complete intended integration.
  - 4. Footprint: Maximum of 3.94-W by 4.92-H by 2.95-D inch.
- Q. Controller Interconnectivity Requirements:
- 1. Support wired and wireless communication protocols as well as web protocols and services without needing to provide multiple NSCs nor additional software for support.
  - 2. BACnet SC: Comply with ASHRAE Std 135, support BACnet IP controller segments.
  - 3. BACnet IP: Interconnect over IP in compliance with ASHRAE Std 135.
  - 4. BACnet MS/TP:
    - a. Interconnect field devices using MS/TP in compliance with ASHRAE Std 135.
    - b. Support up to 50 devices in daisy-chain topology or 39 when using RSTP topology.
    - c. Segmentation: Maximum capacity expansion of 250 devices spread over 5 segments when using daisy-chain topology or up to 234 devices spread over 6 segments when using RSTP topology.
  - 5. LonWorks IP:
    - a. Comply with LonMark Interoperability Guide and ANSI/CEA-709.1.
    - b. LonTalk packets encapsulated into TCP/IP messages to take advantage of existing infrastructure or to increase network bandwidth where necessary or desired.
    - c. Encapsulation of LonTalk protocol into IP Datagram is to conform to existing LonMark guide functionality lines and based on industry standard protocols.
    - d. Provide LonMark compliant products. If LonMark devices are not available then provide device resource files and external interface definitions for LonMark devices.
  - 6. LonWorks FTT-10A:
    - a. Interconnect field devices using FTT-10A in compliance with LonMark Interoperability Guide and ANSI/CEA-709.1.
    - b. Support up to 32 devices per port at minimum speed of 76.8 kbps for peer-to-peer, event-driven communication with HVAC and lighting control equipment or maximum combined capacity of up to 64 devices when both ports are used.
    - c. Xenta Controllers: Maximum capacity of 30 devices on dedicated port.
    - d. MNL Controllers: Maximum capacity is up to 127 devices.
  - 7. Modbus IP: Support TCP over Ethernet, comply with Modbus (PS) and ANSI/CEA-709.1.
  - 8. Modbus RTU (ASCII and J-bus):
    - a. Interconnect fieldbus devices in compliance with Modbus (PS) and ANSI/CEA-709.1.
    - b. Support up to 100 devices for HVAC and lighting control equipment operation with respective power metering.
    - c. Use RS-485 or RS-232 port with capacity to communicate with up to 31 devices per port for HVAC and lighting control equipment operation with respective power metering. When both ports are used combined capacity will allow up to 62 devices in total.
  - 9. Wi-Fi: Interconnect wireless field devices in compliance with IEEE 802.11.
  - 10. Bluetooth: Interconnect wireless field devices in compliance with Bluetooth CS.
  - 11. EnOcean:
    - a. Interconnect wireless field devices in compliance with ESP3 specification.
    - b. Support SDCU-level EnOcean wireless devices within 315Mhz, 868Mhz, or 902Mhz frequency band using internal antenna or external-mount antenna with RP-SMA connector.
  - 12. ZigBee:
    - a. Interconnect wireless field devices in compliance with IEEE 802.15.4.
    - b. Support SDCU-level ZigBee Pro wireless devices using internal antenna or external-mount antenna with RP-SMA connector.
  - 13. Compliance: UL 864, UL 916, 47 CFR 15 for Class A radiation, and 47 CFR 68.
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- R. Modular I/O Expansion:
1. Provide I/O capacity through plug-in modules of various types as required to meet individual control applications.
  2. Capable of allowing module "hot-change" (hot-swap) while keeping the system on-line without user interventions thus automatically addressing and configuring details.
  3. Protect module addresses If module backplane or connected module(s) were to fail.
  4. Universal Inputs: Support the following thermistors without external converters:
    - a. 10 kohm: Type; I (Continuum), II (I/NET), III (Satchwell), or IV (FD).
    - b. Linearized 10 kohm: Type V (FD w/11k shunt) or type III (Satchwell).
    - c. 1.8 kohm (Xenta).
    - d. 1 kohm (Balco).
    - e. 20 kohm (Honeywell).
    - f. 2.2 kohm (Johnson).
    - g. PT100 (Siemens).
    - h. PT1000 (Sauter).
    - i. Ni1000 (Danfoss).
  5. Analog Inputs: Current at 0 to 20 mA VDC or voltage at 0 to 10 VDC.
  6. Digital Inputs: Dry contacts, pulse accumulators, and voltage sensing.
  7. Digital Outputs: 24 VAC triacs and relays.
  8. Analog Outputs: Current at 0 to 20 mA VDC or voltage at 0 to 10 VDC.
  9. Hardware Output Override Switches:
    - a. Provide integral 3-position manual override switch for each analog and digital output for manual override into On, Off, or Auto output state. Provide controller feedback for override switch position monitoring.
    - b. Provide integral override potentiometer for each analog output for manual adjustment of configured output signal over full range when manual override switch is indexed to On.
- S. Local Status Indicator Lamps:
1. Provide LED indication of CPU status, Ethernet LAN status, and field bus status.
  2. Provide indication of point value such as On or Off for each input and output.
  3. Support software configuration of LED indication lamps to customize specific objects to indicate when On or Off or whether indicating color turns red or green.
- T. Real Time Clock (RTC):
1. Include RTC accurate plus/minus 10 seconds per day and formatted to include time of day, day, month, year, and day of week.
  2. Allows assigned time zone UTC offset to store and apply daylight savings time.
  3. Capable of keeping date and time accurate up to 10 consecutive days without power without the need of batteries for RTC backup.
- U. Power Supply:
1. Provide 24 VDC power supply with 30 watts for interconnected NSC and associated I/O modules. Expand power supply capacity when additional power consuming modules are required.
  2. Include separate terminal base to allow power and communications interconnections between power supply, NSC and I/O modules allowing for ease of replacement without separate or loose wiring.
- V. Software Requirements:
1. Store in non-volatile flash memory executable software applications such as operating system, application programs, and other configured database objects such as graphics, trends, alarms, views, and other definable objects as memory storage capacity allows and without restrictions placed on system application programs types.
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2. Capable of parallel processing, executing each control program simultaneously without affecting the operation of other program unless linked to do so.
  3. Each program will have full access to processor I/O facilities without being interrupted due to normal user communications including interrogation, program entry, program printout for storage, and others.
  4. Provide memory capacity of 4 GB segregated into 2 GB for applications and historical data and 2 GB dedicated for backup storage.
  5. Alarm Management:
    - a. Allow system point alarms configuration based on high or low limits or in comparison to other point values. NSC to test each alarm per scan and display one or more alarm messages or reports for those active.
    - b. Allow unlimited number of alarms for each user configured point and object.
    - c. Alarms can be configured to generate based upon a single system condition or multiple system conditions.
    - d. Generate alarms based on alarm-condition evaluation and present using fully configurable order such as by priority, by time, by category, and others upon system logging regardless of whether the log-in takes place at OWS or WebStation end.
    - e. The alarm management supports configuration of user cause with action note selection for association with an alarm event. Checklists will also be possible in order to present operator with a suggested mode of troubleshooting. When acknowledging an alarm, allow system-user assignment for direct alarm notification and resolution.
    - f. Alarms must be capable of being routed to any BACnet workstation that conforms to the B-OWS device profile and uses the BACnet IP protocol.
  6. Power Failure Mode:
    - a. Restart: Upon restoration of power after an outage, restart automatically and without human intervention, then update monitoring functions, resume halted operations, synchronize time and status, and implement preconfigured start-up strategies as required.
    - b. Data Retention: During a power failure keep objects and data configuration retained including installed programs, trends, and historical data without time restrictions or need for batteries to achieve it.
  7. Floor Zoning, Software-Defined:
    - a. Support synchronized control of lights, blinds, and HVAC across multiple floorplan scenarios.
    - b. Handle multiple synchronized control sequences or scenarios of lights, blinds, and HVAC to accommodate different floor plan scenarios.
    - c. Allow manual or automatic changeover of synchronized lights, blinds, and HVAC control from one floorplan scenario to another.
    - d. Adapt synchronized controls of lights, blinds, and HVAC to different floorplan scenario using other device running standard web browser.
    - e. Allow administrator to manage user and group permissions to view or reconfigure floor plan scenarios.
  8. Energy Management, Executable Routine Requirements:
    - a. Time of day scheduling.
    - b. Calendar based scheduling.
    - c. Holiday scheduling.
    - d. Temporary schedule overrides.
    - e. Timed overrides.
    - f. Optimal start.
    - g. Optimal stop.
    - h. Night setback control.
    - i. Enthalpy switchover (Economizer).
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- j. Peak demand limiting.
  - k. Temperature compensated duty cycling.
  - l. CFM Tracking.
  - m. Heating/Cooling interlock.
  - n. Hot/Cold deck reset.
  - o. Hot water reset.
  - p. Chilled water reset.
  - q. Condenser water reset.
  - r. Chiller sequencing.
  - 9. Embedded Web Server:
    - a. Configured to serve out web pages containing the same information available at system OWS.
    - b. Web page development will not require additional engineering labor over that required to show them at system OWS.
    - c. Configurable to log each Embedded Web Server access attempt.
    - d. Configurable to redirect IP-based HTTP based connections to secure HTTPS connections.
    - e. Authenticate and authorize users and automatically logout after adjustable time period.
  - 10. Data Storage for Trend-logs and History:
    - a. Capable of logging any input, output, calculated value, or other system variable over user defined time intervals ranging from one second to 1440 minutes or based upon user configurable change-of-value(s).
    - b. At a minimum, store 1,000 trend-logs with 100,000 records. Each log can record either instantaneous average, minimum, or maximum point value. Logged data will be downloadable to higher level NSC or server for long term archiving based upon user-defined time intervals or manual command.
    - c. For extended trend logs provide a minimum of 1,500 trend-logs with 600,000 records.
    - d. Allow user curating of meter log data to ensure accuracy upon meter replacements.
    - e. Automatically trend every hardware input and output point hosted within whether directly or using external I/O modules without requiring manual creation. NSC to set automatic trend-logs based upon change-of-value(s) and store at least 500 trend samples before replacing the oldest sample with new data.
    - f. Logged data presentation will be built into NSC server capability. Display data using time stamped text-based list format or chart format using fully configurable pen colors, weights, scales, and time spans.
    - g. Include tooltips visible based on user preference.
    - h. Comments will be visible whenever viewing the trend log list.
    - i. Give indication of memory usage and alert user if too many logs are allocated.
    - j. BMS software and Network Servers will support historical data recording independent of NSC-memory limitations and available for reporting and analysis without additional configurations or actions.
    - k. Allow data access and use from BMS or third-party reporting systems.
  - W. User Programming Language:
    - 1. Provide workstation-loaded software application that includes strategies, sequences of operation, control algorithms, parameters, and setpoints.
    - 2. Programming language will be either script-based structured text or graphical function-block based.
    - 3. Allows configuration of control programs, schedules, alarms, reports, communication links, local displays, mathematical calculations, historical data storage, and user comments anywhere within configured program.
    - 4. The use of "canned" program method(s) will not be accepted.
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5. Pretested Control Algorithms Required:
  - a. Proportional, integral plus derivative control (PID).
  - b. Two-position control.
  - c. Digital filter.
  - d. Ratio calculator.
  - e. Equipment cycling protection.
6. Implement NSC in a containerized software version, deployed as a Docker container that provides server software function without needing hardware controllers and power supplies.
  - a. Runs on any OS with Docker x86\_64 support.
  - b. Multiple instances are supported on same OS.
7. Mathematical Functions:
  - a. Include basic mathematical functions addition, subtraction, multiplication, division, square, square root, exponential, logarithm, boolean logic statements, or combinations of both.
  - b. Include complex logical statements including operators such as greater-than (>), less-than (<), equal (=), and, or, exclusive, and others. Allow statement usage within the same equations with mathematical operators and nested up to five parentheses deep.
- X. Regulatory Certification Compliance:
  1. CE – EN 61000-6-3.
  2. CE – EN 61000-6-2.
  3. CE – EN 61010-1.
  4. CE – EN 61326-1.
  5. FCC CFR 47 Part 15 Class A.
  6. RCM.
  7. RoHS 2011/65/EU.
  8. China RoHS SJ/T 11364-2014.
  9. UL 916 listed for energy management equipment.
- Y. HMI, Tablet Display:
  1. Provide tablet display for industrial-grade Human-Machine Interface (HMI) that can be locked within BMS to create a dedicated tool for local operation and maintenance.
  2. Table display to provide an easy-to-use interface through which users and engineers can locally access both attached and linked NSCs.
  3. Set display to always start in kiosk mode ensuring that end user can only use device with attached NSC.
  4. Require password on start up and after defined period of inactivity.
  5. Support being handheld or control cabinet fitted.
  6. Provide touchscreen system navigation making it easy to operate and maintain.
  7. Include hardware components for wall or panel surface-mounting.
  8. Display: 10.1 by 10.1 inch screen with resolution of 1,280 by 800 pixels, 16:10 aspect ratio, and based on the Android platform.
  9. Enclosure: IP54 rated frame that helps protect against dust and moisture.
  10. Power: 24 VDC through Y-shaped cable.
  11. Communications: BACnet IP over wired built-in USB connection.
  12. Wireless Wi-Fi Communications Module:
    - a. Link tablet display and NCS using wireless access point.
    - b. Provide adhesive-mount Wi-Fi antenna.
    - c. Comply with IEEE 802.11b/g/n.
    - d. Support enhanced wireless security using 64-bit and 128-bit WEP encryption.
  13. Connect using only secure HTTPS connections via NSC WebStation functionality.

14. Connect using specific password-protected user account defined within NSC configuration.

## 2.7 SDCU: CONNECTED ROOM SOLUTIONS

- A. Panel-mount BACnet IP controller with up to four SpaceLogic sensors per room.
- B. Provides communication and power to SpaceLogic sensors using Category 5 or 6 cable.
- C. Fully programmable capable of supporting different local control strategies.
- D. Central repository of common standard applications including:
  1. Occupied state.
  2. Unoccupied state.
  3. Load shed mode.
  4. Daylight harvesting.
  5. Time clock scheduling.
- E. The controller will utilize ASHRAE standards adjust "Minimum Ventilation per Person (CFM)" using people counting sensors.
- F. The controller will take the advantage of saving energy by applying room temperature setback(s) within 3 minutes becoming unoccupied using people counting sensors.
- G. Graphical Interface: Uses floor plan maps allowing user(s) to assign HVAC equipment, lights, blinds, and sensors directly into room spaces or custom defined zones and partition spaces.
- H. Building Automation Devices: Interface up to 256 devices including sensors, pushbuttons, actuators, controllers, components, and other system devices using the KNX open protocol.
- I. Wireless Devices: Communicates with wireless devices such as sensors, power meters, and lighting control gateways using IEEE 802.15.4 ZigBee 3.0. The use of previous ZigBee standards is not acceptable.
- J. Occupancy and Light Levels: Connects and powers up to four advanced occupancy and light level sensors that do not require batteries for operation.
- K. The BACnet IP RP Fieldbus controller supports two RS485 communication ports that connects and supplies power to externally-linked devices over category 5 or category 6 cable(s) using a daisy chain style. Externally-linked devices provides I/O expansion beyond controller capacity and supports:
  1. Temperature, humidity, CO2, or presence detector wall-mount sensors.
  2. Combined temperature, humidity, CO2, or presence detector wall-mount sensors.
  3. Control modules for lights and blinds.
  4. Interfacing open market Modbus RTU devices.
  5. Up to four ceiling-mount intelligent multi-sensors that supports thermal imaging detection.
- L. BACnet IP Room Control; Ceiling-Mount, Intelligent Space Sensors:
  1. Sensor includes two RJ45 communication ports that allows daisy chain style communications between linked sensor(s) and parent BACnet IP RP Fieldbus controller over category 5 or category 6 cable.
  2. Parent BACnet IP RP Fieldbus controller can power up to four intelligent sensors.
  3. Sensor includes built-in thermal Imaging sensing with detection coverage area of up to 516.7 sq ft (22.7 ft x 22.7 ft). Also, sensor technology allows people counting to enable proactive building control based on actual number of occupants instead of by presence, preset value, or hours of operation.
  4. Sensor includes built-in ambient light sensor that supports field-of-view coverage of 35 degrees from vertical plane and 0 to 10,000 luminosity range.
  5. Sensor supports Bluetooth Low Energy (BLE) radio that enables connectivity of mobile applications for controlling room lights, blinds, and temperature by allowed user(s).

6. Sensor's BLE radio supports iBeacon protocol capable of working in conjunction with location-awareness applications.
  7. The ceiling-mounted intelligent space sensor(s) will be Schneider Electric's Insight or an approved equivalent for project use.
- M. Room Integrations:
1. Room Lights Using Built-in DALI Port or Expansion Module:
    - a. Capable of full control of up to 32 individual lighting fixtures interfaced by ballasts or LED drivers which can be combined up to maximum of 16 groups.
    - b. Rated for 10A in total draw or 5A per channel, maximum.
    - c. Certified of full IEC 60929 DALI version-2 (DALI2 or DALI-2) control.
    - d. Support DALI version-1 (DALI1 or DALI-1) control.
    - e. Support discharge lamps, LEDs, and color control (device type 8).
    - f. Support feedback from control gear including lamp failure feedback.
    - g. Support addressing and grouping of control gear.
    - h. Capable of turning on-off, or dim light(s) using 0 to 10 VDC signal.
    - i. During zero light output, shut down ballasts to minimize leakage current.
    - j. Certified for multi-master functionality to interface DALI-devices including pushbuttons, sensors, and dimmers over DALI communication bus.
    - k. Interface and control dimmed lights using phase-cut dimming. Automatically detect appropriate leading or trailing edge control mechanism needed based on load type.
  2. Blinds and Shades:
    - a. Interface and control blind motors using voltage standard motor interface (SMI) open communications protocol.
    - b. Interface and control blind motors using high voltage SMI communications protocol.
    - c. Interface and control blind motors using low voltage (24V) relays.
    - d. Interface and control blind motors using line voltage relays.
  3. Glass Dimmers: Interface with third-party Modbus (PS) devices sensors, pushbuttons, and glass touch panels.
- N. SpaceLogic Living Space Sensors:
1. Temperature:
    - a. Sensing Element: 10k ohm, type 3 thermistor.
    - b. Accuracy: Plus/minus 0.4 degrees F.
    - c. Display Resolution: 0.1 or 1 degrees F.
    - d. Measuring Range: 32 to 122 degrees F.
    - e. Built-in LCD Display.
    - f. Color Display: 2.4 by 2.4 inch, backlit, color, touchscreen to show:
      - 1) Space temperature.
      - 2) Cooling space temperature set point.
      - 3) Heating space temperature set point.
      - 4) Current heating or cooling mode.
      - 5) Current occupancy mode.
      - 6) Fan speed.
      - 7) Current time.
      - 8) Light control.
      - 9) Blind adjustment.
      - 10) Scene selection.
      - 11) Three-button interface for adjust and override control.
  2. Humidity:
    - a. Accuracy: Plus/minus 2 percent RH.
    - b. Measuring Range: 0 to 100 percent RH.
    - c. Display Resolution: 0.1 or 1 percent RH.

- d. Built-in LCD Display.
3. CO2:
  - a. Accuracy: Plus/minus 30 ppm and plus/minus 2 percent of measured value.
  - b. Measuring Range: 0 to 2,000 ppm.
  - c. Operating Elevation: 0 to 16,000 feet.
  - d. Temperature Dependence: 0.11 percent of full scale per degree.
  - e. Stability: Under 2 percent of full scale over sensor life of 15 years.
  - f. Sensing Method: Nondispersive infrared (NDIR), diffusion sampling.
  - g. Built-in LCD with configurable background screen color (green, yellow, red) based on CO2 level.
4. Motion: Include sensor for occupancy detection.
- O. EcoStruxure Engage Mobile App:
  1. Supported across iOS, Android and Windows 10 platforms.
  2. Connects to RP-C Controller for remote control of lights, blinds, and HVAC-related functions such as fan speed and temperature.
  3. Connect room or wall-mounted Bluetooth CS linked devices for remote control.
  4. Integrated mobile-based personal application for user interfacing and control of:
    - a. Room Status: Show light and blind status.
    - b. Room Light Control: Brighten, dim, turn on, or turn off.
    - c. Room Blinds Control: Tilt, raise, or close.
    - d. Room HVAC Control: Change setpoints, schedules, or occupancy mode.
    - e. Graphics Interface: Provide ability to select scenes based on selectable templates.
- P. eCommission SpaceLogic Controller Mobile App:
  1. Mobile-based app for configuration, programming, air balancing, and I/O checkout.
  2. Supported across iOS, Android and Windows 10 platforms.
  3. Downloadable from App Store, Google Store and Windows Store.
  4. Interface other SDCUs using Bluetooth or Wi-Fi access point.
  5. Allow multiple commissioning tools used within network segment.
  6. Functional Requirements:
    - a. SDCU Configuration: Set or edit network configuration.
    - b. SDCU Programming: Load offline engineered applications.
    - c. Air Balancing:
      - 1) Control damper actuator travel such as open or close.
      - 2) Generate air balancing report.
    - d. DALI-Lighting Commissioning:
      - 1) Test operation of DALI control gear.
      - 2) Wink DALI control gear.
      - 3) Indicate DALI control gear status.
    - e. Lighting Commissioning:
      - 1) Test 0 to 10 VDC light operation.
      - 2) Wink 0 to 10 VDC lights.
    - f. Blind and Shade Commissioning:
      - 1) Test blinds and shade operation.
    - g. I/O Checkout:
      - 1) Support outputs and input reading value overrides, light and blind point overriding as well as point configuration edits.
      - 2) Support generation of I/O checkout report(s).

## 2.8 SDCU: BACNET IP CONTROLLERS

- A. Provide enclosed controller with respective I/O expansion modules and accessories to meet mechanical equipment control requirements for equipment including central plant(s), air

handlers, and terminal units.

- B. Configure each SDCU to operate completely stand alone, containing required I/O and programs to control associated equipment or system.
  - C. Communications:
    - 1. Peer-to-peer communications between devices without requiring NSC.
    - 2. Act as master to allow for the exchange and sharing of data variables and messages with other controller(s) connected within same communication cabling. Slave controllers are not acceptable.
    - 3. Equipped with dual 10/100 Mbps, base-T, Ethernet communication ports and internal switch ready to support:
      - a. IPv4 addressing.
      - b. Disabling secondary Ethernet port.
      - c. Static IP setting, DHCP client and Auto-IP address acquisition.
      - d. Configurable to restrict communications to only whitelisted IP addresses.
    - 4. Topology Support:
      - a. Daisy chain topology of up to 50 controllers. Communication disruptions will initiate system alarm to notify assigned NSC and BMS front-end about identified disruption.
      - b. Rapid Spanning Tree Protocol (RSTP) that builds a loop-free logical topology of up to 39 controllers ensuring uninterrupted communication and related alarms broadcasting in case of disruption(s).
  - D. Performance:
    - 1. Listed by BACnet Testing Laboratory (v12 or later) as BACnet Advanced Application Controllers (B-AAC).
    - 2. 22-bit microprocessor operating at 500 MHz that supports BACnet protocol stack in accordance with ASHRAE Std 135 and supported BACnet device profile.
    - 3. Multitasking, real-time digital control processors consisting of communication controllers, controls processing, and power supplies with built-in inputs and outputs.
    - 4. Support upgrade of firmware with no impact to operation.
  - E. Programmability:
    - 1. Support both script and graphical programming languages consistent with the NSC.
    - 2. Control programs to reside within same enclosure as I/O circuitry that reads inputs and controls outputs.
    - 3. Store programmed control sequences in non-volatile memory which is not dependent upon battery power for retaining.
    - 4. Communicate with NSC at minimum baud rate 100 Mbps.
    - 5. Support add-on display for access in real-time for monitoring inputs and overriding of outputs. Feature not available for VAVs.
    - 6. Use dedicated processor for override functionality to assure reliable operation when overriding an output.
    - 7. Include memory capacity to support operating system, databases, and other functions including:
      - a. Control processes.
      - b. Energy management applications.
      - c. Alarm management.
      - d. Historical data and trend data.
      - e. Maintenance support applications.
      - f. Custom processes.
      - g. Manual override monitoring.
    - 8. Support local storage of trend data up to twice built-in I/O capacity and be capable of recording and holding five days worth of data captured at 15 minute intervals minimum.
    - 9. Use 16-bit A/D converter for analog or universal inputs.
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10. Use 10-bit D/A converter for analog or universal outputs.
11. Built-in I/O Support:
  - a. Hardwired Sensor and Device Interface: Minimum of 8 and up to 20 configurable I/O channels to monitor and control listed types of inputs and outputs without adding equipment inside or outside DDC cabinet.
    - 1) Universal Inputs: Support the following thermistors without external converters.
      - (a) 10 kohm: Type; I (Continuum), II (I/NET), III (Satchwell), or IV (FD).
      - (b) Linearized 10 kohm: Type V (FD w/11k shunt) or type III (Satchwell).
      - (c) 1.8 kohm (Xenta).
      - (d) 1 kohm (Balco).
      - (e) 20 kohm (Honeywell).
      - (f) 2.2 kohm (Johnson).
      - (g) PT100 (Siemens).
      - (h) PT1000 (Sauter).
      - (i) Ni1000 (Danfoss).
    - 2) Analog Inputs: Current at 0 to 20 mA VDC or voltage at 0 to 10 VDC.
    - 3) Digital Inputs: Dry contacts, pulse accumulators, and voltage sensing.
    - 4) Digital outputs: Triac or relay contacts.
    - 5) Analog Outputs: Current at 0 to 20 mA VDC or voltage at 0 to 10 VDC.
  - b. Intelligent Sensor Interface:
    - 1) Support dedicated RJ45 port to communicate and power up to four wall-mount sensors without requiring dedicated on-board inputs or outputs.
    - 2) Support configurable selection of supported protocols.
    - 3) Support matching bus-connected room or space sensor(s) that does not utilize controller hardware points. Room sensors can be dedicated or combined type for temperature, humidity, CO2, or presence detector.
    - 4) Support modules for controlling lights and blinds that do not utilize controller hardware points.
    - 5) Support connecting to open market Modbus devices.
    - 6) Allow disabling RJ45 communications port via software configuration.
  - c. HMI: BACnet Operator Display:
    - 1) As minimum, includes capabilities defined in the BACnet B-OD profile.
    - 2) Relies on open industry-standard BACnet IP and supports:
      - (a) IPv4 addressing.
      - (b) Static IP setting and DHCP.
    - 3) Includes single Ethernet port for direct communication with another device or multiple devices through LAN/WAN switch.
    - 4) Uses 24 VDC, plus/minus 20 percent tolerance and 9W maximum.
    - 5) Includes on-board 32-bit microprocessor operating at 800 MHz.
    - 6) Complies with the following regulatory certifications:
      - (a) FCC Rules and Regulations CFR 47, Part 15, Class A.
      - (b) Industry Canada.
      - (c) ICES-003.
      - (d) UL 61010-1 and 61010-2-201.
      - (e) CE - Compliance to European Union (EU).
      - (f) 2014/30/EU Electromagnetic Compatibility Directive.
      - (g) 2014/35/EU Low Voltage Directive.
      - (h) 2011/65/EU Restriction of Hazardous Substances (RoHS) Directive.
      - (i) 2015/863/EU Amending Annex II to Directive 2011/65/EU.
      - (j) EN 61326-1 Product Standard.



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- (k) EN 61131-2 Safety Standard.
    - (l) WEEE - Directive of the European Union (EU).
    - (m) European Union (EU) Directive 2012/19/EU.
  - 7) Receives and initiates system clock synchronization messages over BACnet.
  - 8) Automatically synchronize system clocks daily when set as time master.
  - 9) Adjusts internal clock time automatically according select or different time zones.
  - 10) Panel-mount product with ingress protection rating equal to IP65 (dust-tight and safe from low pressure water jets).
  - 11) Maximum support of up to seven controller devices over network.
  - 12) Allows firmware upgrade using USB-stored image file.
  - 13) Uses LED indicators as alarm-status indicators of connected BACnet devices that indicates active, acknowledged, or non-active alarm event without requiring user logging in.
  - 14) Built-in 7 inch, TFT, LCD color touch-screen display with 800 x 480 pixel resolution, 16:10 aspect ratio, and 50,000 hours LED lifetime, approximate.
  - 15) Supports multiple user management consisting of tier-assigned log-in access:
    - (a) Tier 1: Users can view content, do supported actions, access user management, upload firmware, and apply factory reset.
    - (b) Tier 2: Users can view content and supported actions except user management, upload firmware or apply factory reset.
    - (c) Tier 3: Users can only view content.
  - 16) User tracker that monitors each user log-in access and manual changes.
  - 17) Schedule management utility to create, edit, export, and apply exception events.
  - 18) Includes Configurable Application Menu (CAM) that allows reading CAM objects when defined in supported controller devices.
  - 19) Capable of being reset to factory default state either by Admin user or manually by physically accessing the rear of the product.
  - d. Wireless Communications:
    - 1) Bluetooth:
      - (a) Include on-board Bluetooth low energy radio signal.
      - (b) Support mobile application for controller commissioning.
      - (c) Support mobile applications for building occupants.
      - (d) Support direct connection to external antenna or disabling wireless signal.
    - 2) ZigBee:
      - (a) Include plug-in slot or connector for ZigBee 3.0 radio module.
      - (b) Support up to 16 different sensors and devices for easy commissioning.
      - (c) Support interfacing temperature, humidity, and CO2 sensors holding batteries with 10 years of battery-life.
      - (d) Support interfacing green-powered temperature-humidity sensors holding batteries with 10 years of battery-life.
      - (e) Support of older versions of ZigBee 3.0 are not approved due to lack of security layer.
      - (f) Support external ceiling antenna installation using purpose-designed extension cable, module(s), and housing when radio reception at controller side is compromised.
  - 12. Real Time Clock (RTC):
    - a. Automatically synchronize RTCs daily from an operator-designated controller.
    - b. Automatically adjust for daylight saving time.
    - c. Accuracy: Plus/minus one minute per month.
    - d. RTC Objects: Time of day, day, month, year, and day of week.
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- e. Power Loss: Maintain accuracy up to 7 days from power lost event.
  - F. Spare I/O Capacity: Provide minimum of 10 percent spare capacity for each point type available within controller for future point connection.
  - G. Power Requirements:
    - 1. 24 VDC (21 to 33 VDC) or 24 Vac plus/minus 20 percent from locally placed external transformer feed.
    - 2. Provide 220 VAC line voltage version where required.
    - 3. Meet UL 916 open class standard permitting SDCU installation without secondary enclosure where appropriate.
    - 4. Support power failure recovery within 10 seconds of detected power disruption and resume operation from where the disruption had occurred.
  - H. Smoke Control and Smoke Management Application:
    - 1. CE - EMCD 2014/30/EU.
    - 2. CE LVD 2014/35/EU.
    - 3. FCC CFR 47 Part 15 Class B.
    - 4. RCM.
    - 5. RoHS 2011/65/EU.
    - 6. China RoHS SJ/T 11364-2014.
    - 7. Passive Control: Apply NFPA 90A guidelines to shutdown active fans with simultaneous closing of smoke and fire-smoke dampers.
    - 8. Active Control: Apply NFPA 92 guidelines for HVAC system use to prevent smoke migration from fire area(s) prior to exhaust combustion products including smoke exhaust.
    - 9. UL 2043 listed for plenum space-mounting.
    - 10. UL 916 listed for open-energy management equipment.
    - 11. UL 916 listed for energy management equipment.
  - I. VAV Application:
    - 1. Multipurpose and Room Purpose:
      - a. Include built-in flow-through differential pressure transducer with 0 to 1 in-wc measurement range, accuracy of plus/minus five percent at 0.001 to 1 in-wc, and minimum resolution of 0.001 in-wc to ensure that primary air flow conditions are controlled and maintained within plus/minus five percent of applied setpoint between specified minimum and maximum air flow parameters.
      - b. Support dedicated commissioning tool for air flow balancing.
      - c. Require no programming for air balancing algorithm and allow balancing parameters synchronization from NSC.
    - 2. Room Purpose VAV controllers:
      - a. Room purpose controller expansion modules have the ability to interface with the following sensing elements:
        - 1) People counting.
        - 2) Motion detecting.
        - 3) Luminosity and sound pressure level measurements.
        - 4) Bluetooth Low Energy based applications.
        - 5) Control of electric lights and window blinds.
      - b. Room purpose controller room bus supports up to four connected controller expansion modules with the following restrictions:
        - 1) Maximum of one DALI light module.
        - 2) Maximum of one SMI blind module.
        - 3) Maximum of two Multi-sensor or Insight-Sensor devices.
        - 4) Availability of four or five universal input/output controller models.
        - 5) Support a Modbus RTU subnetwork.
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- J. Remote I/O Controller Expansion:
  - 1. Extend inputs and outputs required for SDCU or NSC.
  - 2. Support daisy and RSTP topologies.
  - 3. Capable of sharing local I/O resources with one or multiple applications distributed across one or multiple SDCUs or NSCs.
  - 4. Support alarm and local trend.
  - 5. Support configurable fallback output value triggered in case of communication disruption.

## 2.9 SDCU: BACNET MS/TP CONTROLLERS

- A. Provide BTL (BACnet Testing Laboratory) certified device for intended application.
- B. Include Modbus RTU communication in addition to BACnet MS/TP and support of wireless communications.
- C. Interconnect wireless field devices in compliance with IEEE 802.15.4 using predefined profiles for door switches, window switches, occupancy sensors, water leakage detectors, CO2 sensors, temperature sensors, and humidity sensors. Capable of hosting minimum of 10 devices.
- D. Include power indicating light. Use local power, link powered devices are not acceptable.
- E. Store application programs using battery backup, flash memory, or other means such that power loss does not result in loss of application program(s) or configuration parameter settings.
- F. Capable of being programmed with customizable scripts using LUA open programming language. Equipped with minimum allocated memory of 256KB of SRAM and 80KB for configurable and reserved for LUA scripting purposes.
- G. Include onboard temperature sensor with option to add humidity and occupancy sensors.
- H. Field Bus Wiring and Termination:
  - 1. Use bus or daisy chain concept with no tees, stubs, or free topology for component wiring.
  - 2. Provide termination resistor at both ends of each fieldbus segment.
  - 3. Repeaters: Provide enclosed repeaters to interconnect two segments and locate within interstitial space.
- I. Local Interface:
  - 1. Support connection to portable interface device such as laptop computer or vendor unique hand-held device.
  - 2. Password protected access to execute other tasks than viewing data. Other tasks include:
    - a. Access to configuration menu parameters.
    - b. Adjust application parameters.
    - c. Execute manual control of input and output points.
    - d. View dynamic data.
- J. Application Specific Controllers (B-ASC):
  - 1. Application specific devices will have fixed function configurable applications.
  - 2. ASC that can be altered by the vendor's application programmable tool are considered an advanced application controller (AAC) and not an application specific device.
  - 3. Applications: Use for control of fan coil units, cooling VVT zones with reheat, fin-tube radiators, cabinet heaters, radiant panel heaters, electric reheat zones, terminal reheats, rooftop units (1H1C, 2H2C, 3H2C, MH2C), or heat pumps.
  - 4. Use for connected room solutions that do not require integrated lighting and blind busses built into singular unit.
- K. Small Building Applications – SSC:

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1. SSC combines communication hub, control functions, and server functions into single unit capable of serving small- to medium-sized buildings.
  2. SSC installation and configuration interface can be applied using a windows-based wizard or full-featured, web-based user interface.
  3. BACnet server is classified as a native BACnet device supporting BACnet Server B-BC profile. Controllers supporting a lesser profile such as B-SA are unacceptable.
  4. SSC supports global supervisory control functions while serving as main interface between LAN and field control devices supporting up to 30 room controller devices.
  5. Configurable, encrypted, and authenticated communication for nonopen protocol communications using TLS 1.3. Server is delivered with default self-signed certificate.
  6. SSC handles graphics, dashboards, trends, trend logs, alarms, and other similar presentation objects served by using web-based interfaces. Supply enough servers to meet the requirements of this specification and attached point list.
  7. SSC is equipped with an LCD with ability to check IP address of server.
  8. SSC is capable of executing application control programs to provide:
    - a. Scheduling.
    - b. Trending.
    - c. Alarm monitoring.
    - d. Time synchronization by means of an Internet site including automatic synchronization.
  9. Hardware Specifications:
    - a. Memory:
      - 1) Operating system of controller, application programs, and all other portions of configuration database are stored in nonvolatile, flash memory. Servers and controllers contain enough memory for current application, plus required history logging, and minimum of 20 percent additional free memory.
    - b. Each SSC provides the following onboard hardware for communication:
      - 1) Two 10/100 Mbps Ethernet for communication to workstations, IP fieldbus controllers, and onto the Internet:
        - (a) The two Ethernet ports support active switch and BACnet/IP communication protocols.
        - (b) Ethernet port 1 dedicated to site network.
        - (c) Ethernet port 2 fully configurable and can extend site network, allowing for a private network.
        - (d) Allow disabling of Ethernet port 2.
      - 2) One RS-485 port for communication to BACnet MSTP bus and room controllers.
      - 3) One device USB port that can install and configure server using configuration wizard.
      - 4) One host USB port.
  10. Universal Input Temperatures:
    - a. Each universal input directly connected to SSC is capable of using the following thermistors for use in system without any external converters needed:
      - 1) 10 kOhm Type I (Continuum).
      - 2) 10 kOhm Type II (I/NET).
      - 3) 10 kOhm Type III (Satchwell).
      - 4) 10 kOhm Type IV (FD).
      - 5) Linearized 10 kOhm Type V (FD with 11kOhm shunt).
      - 6) Linearized 10 kOhm (Satchwell).
      - 7) 1.8 kOhm (Xenta).
      - 8) 1 kOhm (Balco).
      - 9) 20 kOhm (Honeywell).
      - 10) 2.2 kOhm (Johnson).
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11. Local Status Indicator Lamps:
    - a. SSC provides at minimum LED indication of CPU status, Ethernet LAN status, and fieldbus status. For each input or output, provide LED indication of point value, either ON or OFF. On the software side this input and output indication is software selectable to display respective status using ON or OFF text or red and green colors.
  12. RTC:
    - a. Each SSC includes a real-time clock, accurate to plus/minus 52 seconds per month.
    - b. RTC date and time is also accurate, up to 10 days, when SSC is powerless.
  13. Power Supply:
    - a. Includes 24 VAC/DC built-in power supply for SSC.
  - L. Advanced Application (Programmable) Controllers (B-AAC):
    1. General:
      - a. Built-in physical input and output circuits for analog input devices, binary input devices, pulse input devices, analog output devices, and binary output devices. The number and type of input and output devices supported will vary by model.
      - b. Support I/O expansion by adding circuit boards that physically connect to basic controller.
      - c. Support editing of embedded time schedules from OWS with BACnet object support service.
      - d. Support embedded trend log data export to OWS with BACnet object support service.
      - e. Support Embedded Alarm Messaging to:
        - 1) Deliver alarm messages to OWS with BACnet object support service for receiving alarm messages and configured as recipient.
        - 2) Support alarm acknowledgement from OWS with BACnet object support service for executing alarm and event acknowledgement.
      - f. Support analog and binary data reading from OWS with BACnet object support service for reading of data.
      - g. Support control of out-of-service property and assignment of value or state to analog and binary objects from OWS with BACnet object support service.
      - h. Support receipt and response to Time Synchronization commands from BACnet NSC.
      - i. Support the "Who is" and "I am." BACnet services.
      - j. Support the "Who has" and "I have." BACnet services.
    2. Analog Input Circuits:
      - a. Keep A/D chip resolution below 0.01 volts per increment for measurement range of 0 to 10 VDC at 10 bit with resolution of 10/1024 or 0.00976 volts per increment.
      - b. For nonflow sensors, control logic to support calibration offset usage such that raw measured value is added to plus/minus offset to create calibration value for use by control logic and OWS reporting.
      - c. For flow sensors, control logic to support adjustable gain and adjustable offset object usage for execution of two point calibration concept for adjustable low and high range value to match values determined with calibration instrument.
      - d. Provide software support for input signal linearization of nonlinear sensors such as thermistors and flow sensors.
    3. Binary Input Circuits:
      - a. Wire dry contact device or sensor into controller using two-wire circuit without requiring external power supply.
    4. Pulse Input Circuits:
      - a. Wire pulse input device or sensor into controller using two-wire circuit without requiring external power supply.
      - b. The pulse input circuit can process up to 20 pulses per second.
    5. True Analog Output Circuits:
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- a. Logical commands will be processed by digital-to-analog (D/A) converter chip to allow having 0 to 100 percent control signal scalable to full output range of 0 to 10 VDC, 4 to 20 milliamps, 0 to 20 milliamps, or assignable range within full output range (Example: 0 to 100 percent creates 3 to 6 VDC where full output range is 0 to 10 VDC).
- b. Keep D/A chip resolution below 0.04 volts per increment or 0.08 milliamps per increment.
6. Binary Output Circuits:
  - a. Single pole, single throw or single pole, double throw relays with support for up to 230 VAC and maximum current of 2 A.
  - b. Voltage sourcing or externally powered triacs with support for up to 30 VAC and 0.5 A at 24 VAC.
7. Program Execution:
  - a. Process control loops to operate in parallel and not in sequence unless specifically required to operate in sequence by control sequence.
  - b. Adjustable process control loop sample rate down to minimum of one second.
  - c. Adjustable process variable sample rate down to minimum of one second.
  - d. Adjustable algorithm update sample rate down to minimum of one second.
  - e. Capable to detect controller power cycle that can be used via user programming to modify controller sequence upon power cycle detection.

## 2.10 ROOM CONTROLLERS/THERMOSTATS

- A. Controller communicates via user-selectable protocol choices that includes BACnet MS/TP, Modbus RTU, or BACnet IP over WiFi using optional WIFI module.
- B. Controller includes TFT transmissive LED backlit LCD touchscreen (HMI) with at least 12 user-selectable color options, 12 user-selectable HMI button displays, and multiple options for casings and fascias.
- C. Controller is capable of displaying custom messages using minimum of 2 formats that can be statically defined within the controller or dynamically defined via BACnet commands.
  1. Format 1: Displays minimum of 24 character message on default HMI screen which can be scrolled.
  2. Format 2: Displays up to 480 characters with ability to scroll multiple messages. This format allows HMI screen to use up to 12 different colors at any given time per message.
- D. Controller is capable of automating the following equipment applications using simple user selectable configuration menus displayed on built-in HMI:
  1. 2/4-Pipe Fan Coil applications:
    - a. Analog or 1-speed, 2-speed or 3-speed fan control.
    - b. Control valves via analog, 2-position, or floating signal.
  2. RTU, Split System or Heat-Pump:
    - a. 2-stage heating or cooling.
    - b. Analog heating.
    - c. Dehumidification output.
    - d. Analog economizer output.
    - e. Demand based ventilation.
  3. Pressure Dependent and Pressure Independent VAVs or VVTs:
    - a. Single zone; parallel or series fan powered with analog or binary fan speed control.
    - b. Damper and reheat control via analog, 2-position, or floating control.
  4. Other mechanical system applications utilizing similar I/O and strategies mentioned above.
- E. The controller provides the following I/O capabilities:

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1. Seven universal inputs:
    - a. 10K Type II Thermistor.
    - b. 0 to 10 VDC analog.
    - c. Binary.
  2. Five binary outputs configurable as floating or On/Off.
  3. Four universal binary or analog 0 to 10 VDC outputs.
  4. Integrated or Dedicated:
    - a. Space Temperature.
    - b. Space Humidity.
    - c. Passive Infrared Motion Detection (PIR).
    - d. Light Level Sensor.
  5. Up to 20 Zigbee 3.0 Ecco-System and Zigbee Green devices with optional ZigBee Wireless radio, device choices includes:
    - a. Temperature and humidity.
    - b. Temperature, humidity, and co2.
    - c. Door or window contact.
    - d. Wall or ceiling PIR with temperature and humidity.
    - e. Water leak detection.
- F. The controller can be programmed with user customizable script using LUA open programming language within reserved memory space of 8 kb. The LUA programming provides the ability to enhance the controllers inherent control capabilities or create custom control strategies.
- G. The controller includes minimum of two level password protection to prevent unauthorized access where level 1 password is for basic daily user functionality and level 2 for installer or management and configuration.
- 2.11 SDCU: LONWORKS CONTROLLERS
- A. Distinguishable and accessible service pin that will broadcast 48-bit node ID and program ID over the network when pressed.
- B. Include power indicating light. Use local power; link powered devices are not acceptable.
- C. Loss of power will not result application program or configuration parameter settings loss.
- D. Ethernet Network Link:
  1. Connect at 10/100 Mbps for layer 3 routing of ANSI/EIA 709.1B LonTalk field bus packets into IP network in conformance with LonMark Interoperability Guide.
  2. Configurable when linked or unlinked using local cross over cable connection.
  3. Router configurable such that only required field bus data packets that need to travel over ethernet are forwarded.
- E. LonTalk Field Bus:
  1. Communicate over FTT-10A operating at 78 kbps (kilobits per second).
  2. Configure bus or daisy chain riser with no tees, stubs, or free topology.
  3. Provide wire type within maximum length limit in conformance with Echelon's Junction Box and Wiring Guideline for Twisted Pair LonWorks Networks.
  4. Provide termination device at both ends of each field bus segment.
- F. Physical Layer Repeater (PLR):
  1. PLRs are required to connect two segments to create a channel.
  2. Design PLRs in conformance with LonMark Interoperability Guide standards.
  3. LON to LON routers configured as repeaters may be used as PLR.
  4. Provide enclosure for physical layer repeaters and locate within interstitial space.
- G. Programmable Process Controller (PPC):
  1. Key Requirements:
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- a. Physical input and output circuits for connection of analog input devices, binary input devices, pulse input devices, analog output devices, and binary output devices. The number and type of input and output devices supported will vary by model.
- b. Provide support for additional input and output devices beyond number of circuits provided using external board or controller linked over FTT-10A field bus.
- c. Execute programs created using application programming tool.
- d. Support embedded time schedules for stand alone use or allow NSC issued occupancy input command over network when time based control is required.
- e. Support trend data storage for periodical IP-embedded system server uploads, otherwise broadcast trends over field bus to another device that support this function. This support is not required if an NSC is used.
- f. Support alarm message initiation into system server otherwise broadcast binary alarm indication variables over field bus to another device that supports this function. This support is not required if an NSC is used.
2. Analog Input Circuits:
  - a. Incoming electrical signals processed by analog to digital (A/D) converter chip prior to having output mathematically processed to produce controller data with required engineering units.
  - b. Maximum A/D chip resolution will be 0.01 volts per increment. For 0 to 10 VDC measurement range at 0-bit set respective resolution at 10/1024 or 0.00976 volts per increment.
  - c. For nonflow sensors, control logic to support use of field-determined or manufacturer-stated offset data-setpoint such that raw measured value is dynamically adjusted to convert into calibrated measured value. Field-determined offset to include both sensor calibration offset and wire resistance offset.
  - d. For flow sensors, control logic to support use of adjustable gain and adjustable offset data-setpoints to execute two-point calibration concept where low range and high range values are dynamically adjusted to convert into calibrated measured value that matches calibrated instrument readings.
  - e. For nonlinear sensors such as thermistors and flow sensors provide software support to linearized input signal.
3. Binary or Pulse Input Circuits:
  - a. Provide 2-wire cable for dry contact switches or auxiliary outputs from sensors.
  - b. Provide external power supply for sensor with auxiliary outputs.
  - c. For pulse input circuits allow controller to process up to 50 pulses per second.
4. True Analog Output Circuits:
  - a. Process logical commands with digital to analog (D/A) converter chip; 0 to 100 percent control signal scalable to full output range of either 0 to 10 VDC, 4 to 20 mA, 0 to 20 mA or custom range within listed ranges (Example: 0 to 100 percent creates 3 to 6 VDC where out of full output range of 0 to 10 VDC).
  - b. Set maximum D/A chip resolution to 0.04 volts or 0.08 mA per increment.
5. Pulse Width Modulation (PWM) Outputs with Transducers: Generate incremental pulses as small as 0.1 seconds.
6. Binary Output Circuits:
  - a. Single pole single throw (SPST) or single pole double throw (SPDT) relays with support for up to 230 VAC and maximum current of 2 A.
  - b. Voltage sourcing or externally powered triacs with support for up to 30 VAC and maximum current of 0.8 A.
7. Program Execution:
  - a. Operate process control loops in parallel and not in sequence unless specifically required to operate in sequence by control sequence.
  - b. For process control loop allow minimum sample rate of 1 second, adjustable.



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- c. For process variables allow minimum sample rate of 1 second, adjustable.
  - d. For algorithm updates allow minimum sample rate of 1 second, adjustable.
  - e. Controller to include status-point to show last detected power cycle. Programming to allow status-point use to modify control sequence immediately after detected power cycle.
- 8. Local Interface:
    - a. Support connection to portable laptop computer or hand-held device for view only access to dynamic data.
    - b. Support password protected task execution that will include:
      - 1) Adjust application parameters.
      - 2) Edit time schedule parameters when embedded within controller.
      - 3) Execute manual control of input and output points.
      - 4) View alarm messages when messaging is embedded within controller.
  - 9. Network Interface Port: Allows connection of external device into FTT-10A field bus.
- H. Supervisory Logic Controller (SLC):
- 1. Key Requirements:
    - a. Execute programs created using application programming tool.
    - b. Support embedded time schedules for stand alone use or allow NSC issued occupancy input command over network when time based control is required.
    - c. Support trend data storage for periodical IP-embedded system server uploads, otherwise broadcast trends over field bus to another device that supports this function. This support is not required if an NSC is used.
    - d. Support alarm message initiation into system server otherwise broadcast binary alarm indication variables over field bus to another device that supports this function. This support is not required if an NSC is used.
  - 2. Program Execution:
    - a. Operate process control loops in parallel and not in sequence unless specifically required to operate in sequence by control sequence.
    - b. For algorithm updates allow minimum sample rate of 1 second, adjustable.
    - c. Controller to include status-point to show last detected power cycle. Programming to allow status-point use to modify control sequence immediately after detected power cycle.
  - 3. Local Interface:
    - a. Support connection to portable laptop computer or hand-held device for view only access to dynamic data.
    - b. Support password protected task execution that will include:
      - 1) Adjust application parameters.
      - 2) Edit time schedule parameters when embedded within controller.
      - 3) Execute manual control of input and output points.
      - 4) View alarm messages when messaging is embedded within controller.
  - 4. Network Interface Port: Allows connection of external device into FTT-10A field bus.
  - 5. Allow reuse of Programmable Process Controllers (PPCs) with unused I/O as SLCs when device meets listed requirements.
  - 6. At a minimum, support 270 standard network variable types (SNVTs) as follows:
    - a. 200 selectable SNVTs using input network variable type.
    - b. 70 selectable SNVTs using output network variable type.
    - c. Do not limit selected SNVTs for input and output network variables (Example: SNVT\_temp\_p can only be used on 10 input network variables).
- I. Application Specific Devices (ASD):
- 1. Include fixed function configurable application.
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2. Controller is considered programmable if preloaded application can be altered with application programming tool.
  3. Format each input and output network variable as SNVTs.
  4. Format input configuration parameters with SNVTs or SCPTs. If UNVTs or UCPTs are used then provide device resource files that allow reading these parameters.
  5. Apply ASD profile in conformance with LonMark Interoperability Guide standards.
  6. Network Interface Port: Allows connection of external device into FTT-10A field bus.
- J. Portable Operating Terminals (POT): Provide laptop computer meeting listed hardware and software requirements for operator workstation. In addition, provide app-based solution for loading into mobile devices.

## 2.12 I/O: INPUT-OUTPUT DEVICES

- A. Equipment, System, and Field Side: See Section 23 09 13.
- B. Room Side: See Section 23 09 13 except for connected room solution devices.
- C. Pneumatic Controls: See Section 23 09 43.
- D. Plumbing Metering: See Section 22 05 19.
- E. HVAC Water and Steam Metering: See Section 23 05 19.
- F. Refrigerant Detection System: See Section 28 44 00.
- G. Variable Frequency Drives: See Section for 23 09 34 and Section 26 29 23.
- H. Non-DALI Lights or Lighting Control System: See Section 26 09 23.
- I. Electrical Metering: See Section for 26 27 13 and Section 25 36 13 for smart meters.
- J. Electrical Power Monitoring System: See Section 25 36 00.
- K. Fire Alarm and Detection System: See Section 28 46 00.
- L. Security; Access Control System: See Section 28 10 00.
- M. Security; Video Surveillance System: See Section 28 20 00.

## 2.13 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. System Tests:
  1. Test each system point for both hardware and software functionality.
  2. Test each system-linked mechanical and electrical system under control against specified sequence of operation.
  3. Successful completion of system test(s) constitutes warranty period commencement.
  4. Provide Owner with written report as confirmation that installed system functions in accordance with plans and specifications.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions subject to install work and notify Contractor in writing about observed conditions that could be detrimental to proper and timely work completion.
- B. Examine equipment exterior and interior prior to installation. Report damage and do not install equipment that is structurally, moisture, or mildew damaged.

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### 3.2 PREPARATION

- A. Demolition:
  - 1. See Section 02 41 00 - Demolition for additional requirements.
  - 2. Remove controls which do not remain as part of the BMS along with associated wiring, conduit, and pneumatic tubing including those previously abandoned.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer written instructions and Section 25 05 00 where required.
- B. Install equipment in accordance with reviewed product data, final shop drawings, and as indicated on drawings.
- C. Code Compliance: Install wiring in accordance with applicable codes and ordinances.
- D. Interface With Other Work; Provide field supervision to trades installing:
  - 1. Dampers: Automatic control dampers.
  - 2. Blank-off Plates: Required for dampers smaller than duct or opening size.
  - 3. Sheet Metal Baffles Plates: Equipment- or duct-mounted to eliminate stratification.
  - 4. Electrical Power: 120 VAC power feed to actuators, heat trace, control panels, and related control equipment needs.
  - 5. HVAC-equipment installed smoke detectors with respective shutdown relay(s) into building fire alarm system. Then complete this work by providing, installing, terminating, and testing respective fan or equipment shut down interlocking wiring.
  - 6. Electrical Meter or Submeter: Auxiliary contact (pulse initiator) or commutations link for central monitoring of power or load in kW and energy or demand in kWh.
- E. Hardware Installation Practices for Wiring:
  - 1. Controllers: Mounted vertically according to manufacturer's installation documentation.
  - 2. Ethernet or Remote Site Controller Power: Provide dedicated 120 VAC power wiring for each device from separate breaker using respective hot, neutral, and ground wires. Terminate ground wire at breaker panel ground bar.
  - 3. True-Earth Ground: Coordinate required ground connections into building true earth ground. Do not use a corroded or galvanized pipe, or structural steel.
  - 4. Building Attached Wires: Tie to surface-mounted fasteners at regular intervals such that wiring does not droop. Do not attach or support wires using ducts, pipes, conduit, or other hanged items.
  - 5. Conduit in Finished Areas: Conceal in ceiling cavity spaces, plenums, furred spaces, and wall construction. Except metallic surface raceway may be used in finished areas on masonry walls. Surface raceways in finished areas must be color-matched to existing finish within standard manufactured color limitations.
  - 6. Conduit in Unfinished Areas: Conceal in ceiling cavity spaces, plenums, furred spaces, and wall construction. Have exposed conduit run parallel to or at right angles of building structure.
  - 7. Wire to Utility Spacing: Keep wires a minimum of 3 inches from hot water, steam, or condensate piping.
  - 8. Sensor Wires: Protect with plastic inserts where sensor wires leave conduit system.
  - 9. Telephone Equipment Areas: Do not run wires across these areas.
  - 10. Fire-Rated Penetrations: Provide fire caulking to seal used openings.
- F. Installation Practices for Field Devices:
  - 1. Well-Mounted Sensors: Include thermal conducting compound within well to ensure good heat transfer to sensor.

2. Actuators: Mount firmly to give positive movement, then adjust linkage to give smooth, continuous movement throughout 100 percent of selected stroke.
  3. Relay Outputs: Include coil transient suppression across selected to limit transients up to 150 percent of rated coil voltage.
  4. Water-Mounted Sensors: Ensure mounting hardware allows device removal without shutting down the system in which they are installed.
  5. Duct-Mounted Static-Pressure Sensors: Connect high pressure port into metal static-pressure probe inserted at upstream side and leave low pressure port open to plenum area at the point where high pressure port is tapped into ductwork.
  6. Building Static-Pressure Sensors: Insert high pressure port into corresponding space using metal tube then pipe low pressure port to building exterior.
- G. Wiring, Conduit, and Cable:
1. Compliance: NFPA 70, National Electrical Code.
  2. Wire and Cable: Use copper wires with listed minimum wire size and insulation class.
    - a. Class One: 14 gauge, 0.0641 inch, 600 volt maximum.
    - b. Class Two: 16 gauge, 0.0508 inch, 300 volt maximum.
    - c. Class Three: 18 gauge, 0.0403 inch, 300 volt maximum.
    - d. Communications: Manufacturer recommended.
  3. Power and Class One wiring may be run within same conduit. Class two, class three, and communications wiring may be run within same conduit.
  4. Where different wiring classes terminate within same enclosure, maintain clearances and install barriers in accordance with National Electrical Code.
  5. Use galvanized EMT when wiring is required to run inside conduit with minimum size of 1/2 inch. Set-screw fittings are acceptable for dry interior locations. Use watertight compression fittings for exteriors and interior locations subject to moisture. Provide conduit seal-off fitting where exterior conduits enter the building or between areas of high temperature and moisture differential.
  6. Use flexible metallic conduit for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment, 3 feet maximum. Use liquid-tight flexible conduit in exteriors and interior locations subject to moisture.
  7. Provide junction boxes for cable splices, equipment termination, and EMT to flexible conduit transitions. Use junction boxes with blank cover of galvanized pressed steel, 4 sq in for dry interior locations. Use cast alloy junction boxes with threaded hubs and gasketed covers for damp locations.
  8. Use plenum-rated wiring for spaces above used as supply or return air plenums. Teflon wiring can be run without conduit above suspended ceilings. Exception: Use conduit for wires run within suspended ceilings to control outside air dampers or fire management system interfacing.
  9. Use multimode glass fiber optic cable with 50/125, 62.5/125, or 100/140 microns in diameter. Plastic fiber cables are not acceptable.
- H. Enclosures:
1. Provide an enclosure to protect each field device from dust, moisture, moving parts, and to conceal integral wiring. Where practical, mount within FIP.
  2. Installed FIPs to contain power supplies for sensors, interface relays, contactors, and safety circuits.
  3. Provide NEMA 250 Type 1 rated FIP enclosures of steel construction with baked enamel finish, hinged door, and keyed lock. Ensure that enclosure size includes 20 percent spare mounting space internally with identically keyed locks.
  4. Provide FIP-mounted screw type terminals to terminate field wires. The use of wire nuts within FIP is prohibited. Analog or communications wiring may use FIP as raceway without terminating.

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5. Provide NEMA 250 Type 4 rated enclosures for outdoors.
  6. Use plastic track for wiring runs within enclosures then wrapped and secured within controllers.
- I. Identification:
    1. Identify each control wire with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
    2. Identify each field-enclosure other than controllers with Bakelite nameplate using white lettering against black or blue background.
    3. Mark junction-box covers to indicate that they are part of BMS system.
    4. Identify with nameplates each I/O field-device except space sensors or FIP-mounted devices except as indicated on drawings.
    5. Label I/O field devices inside FIPs.
  - J. Existing Controls:
    1. When existing controls are reused then test and calibrate for proper operation. Replace each existing control found defective after Owner handles additional material and labor costs associated with specific repairs or replacements.
  - K. Location of Field-Mounted Products:
    1. Install sensors as indicated on drawings unless directed otherwise.
    2. Mount space-installed sensors away from heat-generating machinery, direct sunlight, and supply-diffuser air streams.
    3. Mount outdoor air temperature sensor(s) on the north building face. Install sensors such that the effects of heat radiated from the building or sunlight is minimized.
    4. Locate field-enclosures immediately adjacent to control panel(s) where connected.
  - L. Software Installation:
    1. Provide technician(s) to install, initialize, start-up, and debug installed software including hosting operating-system or other third-party software necessary for successful system operation.
    2. Sequences of Operation: Apply specifics as indicated on drawings.
  - M. Database Configuration:
    1. Provide labor to configure database portions required by points list and sequence of operation.
  - N. Color Graphic Panels:
    1. Unless otherwise directed, provide color graphic-panel displays as depicted in mechanical drawings for each system and floor plan containing associated points identified on point list with controls to allow issuing of setpoint changes and commands.
  - O. Reports: At a minimum, provide four reports configured to include:
    1. System user data.
    2. Trend comparison data.
    3. Energy consumption data.
    4. Alarm status and prevalence information.
- 3.4 FIELD QUALITY CONTROL
- A. See Section 01 40 00 - Quality Requirements for additional requirements.
  - B. Manufacturer Services: Provide services of manufacturer field representative to inspect installed system and components.
  - C. Coordination of Other Tests and Inspections:
    1. Provide technician for five days for manpower and engineering services required to assist both HVAC and TAB contractors to test, adjust, and balance related building systems.
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2. Coordinate with TAB contractor to provide complete air balance report; see Section 23 05 93.
  3. Provide access to accommodate tests and inspections by independent testing agency employed by Owner.
- D. Point to Point Checkout:
1. Inspect and verify each I/O device for proper installation and functionality. Fill-out dated DDC-associated checkout sheet itemizing each device then submit for Project Manager review and approval prior to inclusion into final report.
  2. In case of wireless devices, record device signal strength noted during device checkout.
- E. Controller and Workstation Checkout:
1. Conduct field checkout of controllers and front end equipment including computers, printers, and related devices to verify proper operation of both hardware and software.
  2. Fill-out dated checkout sheet itemizing each device with description of associated tests applied for inclusion into the final report.
- F. System Acceptance Testing:
1. Verify and compare loaded application software against approved sequences of operation.
  2. Control loops will be exercised by inducing a setpoint shift of at least 10 percent and observing whether system successfully returns process variable to setpoint. Record results for final report inclusion.
  3. Test each alarm within system and validate system generates appropriate alarm message, appears at prescribed destinations mainly workstations or printers, and other related actions occur as defined such as graphic-panels invoked, reports generated, and field actions. Record results for final report inclusion.
  4. Test each graphic-panel display, operation, and navigation; verify appearance, content, and controls are correct and work as intended. Record results for final report inclusion.
  5. Execute Operational Testing:
    - a. Verify and test that each point is properly polled, associated alarm is configured and operates accordingly, linked to associated graphic-panel(s), and trend-data captures are included within configured reports.
    - b. Test each third party communications-link interface prior to testing each individual polled point. When interface involves Ethernet file transfer then test associated logic that controls intended file transmission and verify specified information content.
- 3.5 SYSTEM STARTUP
- A. Manufacturer Services: Provide services of manufacturer field representative to perform systems startup.
- B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.
- C. Installed Product Testing:
1. Execute both startup and performance verification tests, upon completion have assigned technician to initiate and date accordingly.
  2. Provide respective startup performance verification test reports upon their completion.
- D. Startup Test Checklist Requirements:
1. Measurement of primary and secondary voltage sources.
  2. Verification of proper controller power wiring.
  3. Verification of component inventory against submittal(s).
  4. Verification of labeling on components and wiring.
  5. Verification of connection integrity and quality (loose strands and tight connections).
  6. Verification of bus topology, grounding of shields and installation of termination devices.
-

7. Verification of point checkout.
  8. Verify that each I/O device is landed according to approved submittal and functions per sequence of control.
  9. Verify that analog sensors are properly scaled with values correctly reported.
  10. Verify that binary sensors are properly configured with states correctly reported.
  11. Verify that analog outputs are properly configured and move full stroke when commanded.
  12. Verify that binary outputs are properly configured and respond appropriately to respective energize and de-energize commands.
  13. Document noted analog sensor calibration in terms of measured value, reported value, and calculated offset.
  14. Document control loop tuning in terms of sample rate, gain, and integral time constant.
- E. Performance Verification Test Checklist Requirements:
1. Execute and complete written tests allowing operator system interaction.
  2. Develop detailed checklist to test and verify operator system interaction tasks including, but not limited to the following:
    - a. Graphics navigation.
    - b. Trend data collection and presentation.
    - c. Alarm handling, acknowledgement, and routing.
    - d. Time schedule editing.
    - e. Application parameter adjustment.
    - f. Manual control.
    - g. Report execution.
    - h. Automatic backups.
    - i. Web Client access.
- F. Control System Switchover:
1. Demolition of existing control system will occur after system is in place with respective sensors and field interface devices.
  2. Switchover from existing control system to new system will be fully coordinated. Coordinate with Owner or representative on site during switchover.
  3. Minimize system downtime during switchover. Have sufficient installation mechanics on site so that entire switchover can be accomplished within reasonable time frame.
- 3.6 CLEANING
- A. See Section 01 74 19 - Construction Waste Management and Disposal for additional requirements.
  - B. Upon work completion, check and thoroughly clean each equipment pertinent to this project, and other areas where products were installed.
- 3.7 COMMISSIONING
- A. See Section 01 91 13 - General Commissioning Requirements for additional requirements.
  - B. HVAC Cx Tests: See Section 23 08 00 to coordinate with CxA requirements.
  - C. iBMS Cx Tests: See Section 25 08 00 to coordinate with CxA requirements.
  - D. Functional Tests: Commission and set in operating condition interfaced equipment and systems such as chilled water plant, hot water plant, and air handling systems in the presence of respective equipment and system manufacturer's representatives, Owner, and Architect or their representatives as applicable.
  - E. Analytics: When provided use AFDD or CCDT to generate analytics to help with system Cx otherwise use of system data logging feature to generate this data.

3.8 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals for additional submittals.
- B. See Section 01 79 00 - Demonstration and Training for additional requirements.
- C. Demonstrate proper operation of equipment to Owner designated representative.
- D. Training: Train Owner personnel on operation and maintenance of system.
  - 1. Accommodate up to 10 attendees.
  - 2. Training Reference: Operation and maintenance manual and additional training materials as required.
  - 3. Provide minimum of 40 hours of training.
  - 4. Instructor: Manufacturer training personnel.
  - 5. Location: Coordinate for on-site and classroom.
    - a. OWS and EWS Use and Programming: Include three days.
    - b. System Engineering and DDC Programming: Include two to three weeks.
    - c. Include listed training for 3 persons excluding travel, lodging, and daily expenses.
  - 6. Minimum Training Curriculum Topics:
    - a. System overview.
    - b. System software and operation.
    - c. System access.
    - d. Software features overview.
    - e. Changing setpoints and other attributes.
    - f. Scheduling.
    - g. Editing programmed variables.
    - h. Displaying color graphics.
    - i. Running reports.
    - j. OWS and EWS maintenance.
    - k. Viewing application programming.
    - l. Operational sequences including start-up, shutdown, adjusting, and balancing.

3.9 PROTECTION

- A. See Section 01 76 10 - Temporary Protective Coverings for additional requirements.
- B. Protection of In-Place Conditions: Protect and maintain in-place conditions acceptable to ensure that equipment is undamaged at time of Substantial Completion.

3.10 MAINTENANCE

- A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
- B. Provide separate maintenance contract for service and maintenance of \_\_\_\_\_ for \_\_\_\_\_ years from Date of Substantial Completion.

**END OF SECTION**



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**SECTION 23 31 00**  
**HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Metal ducts.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 01 30.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.  
B. Section 23 33 00 - Air Duct Accessories.  
C. Section 23 33 19 - Duct Silencers.  
D. Section 23 36 00 - Air Terminal Units.  
E. Section 23 37 00 - Air Outlets and Inlets: Fabric air distribution devices.

**1.3 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.  
B. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.  
C. ASHRAE Std 90.1 I-P-2019 - Energy Standard for Buildings Except Low-Rise Residential Buildings; 2019, with Errata and Addenda (2021).  
D. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.  
E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.  
F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.  
G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.  
H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.  
I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.  
J. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.  
K. ICC (IMC) - International Mechanical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.  
L. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).  
M. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).  
N. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).  
O. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.  
P. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

- Q. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2020.
- R. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- S. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.
- T. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- U. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all duct systems. Provide drawings in 1/4" per foot scale or larger.
- D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

#### 1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
  2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

#### 1.6 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct as indicated.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 33 19.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
  1. Round: Plus or minus 3 in-wc of galvanized steel.
- E. Duct Sealing and Leakage in accordance with Static Pressure Class:
  1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 1/2 in-wc pressure class, galvanized steel.
    - b. Return and Relief Air: 1/2 in-wc pressure class, galvanized steel.
    - c. General Exhaust Air: 3 in-wc pressure class, galvanized steel.
- F. Duct Fabrication Requirements:
  1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.

2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

## 2.2 METAL DUCTS

- A. Material Requirements:
  1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Round Metal Ducts:
  1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
  2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
- C. Connectors, Fittings, Sealants, and Miscellaneous:
  1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
  2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
  3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
    - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
    - b. VOC Content: Not more than 250 g/L, excluding water.
    - c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
  4. Gasket Tape:
    - a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
  5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Comply with safety standards NFPA 90A and NFPA 90B.
- C. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

- 
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
  - E. Duct sizes indicated are inside clear dimensions.
  - F. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal cap with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.
  - G. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
  - H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
  - I. Use double nuts and lock washers on threaded rod supports.
  - J. Connect terminal units to supply ducts with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
  - K. Louver Fit-out:
    - 1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
    - 2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.
  - L. Duct Accessories, Terminal Units, Inlets, and Outlets: Interconnect as indicated in Sections 23 33 00, 23 36 00, and 23 37 00.
- 3.2 CLEANING
- A. Clean thoroughly each duct system. See Section 23 01 30.51.
  - B. Clean duct system by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.
  - C. Clean duct systems with high-power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access to the ductwork for cleaning purposes.

**END OF SECTION**

**SECTION 23 33 00  
AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Duct access doors.
- B. Flexible duct connectors.
- C. Smoke dampers.
- D. Volume control dampers.

**1.2 REFERENCE STANDARDS**

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2022).
- C. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata and Amendments (2022).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- F. NFPA 92 - Standard for Smoke Control Systems; 2021.
- G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- I. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- J. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- K. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

**1.3 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.

**1.4 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.1 DUCT ACCESS DOORS**

**2.2 FLEXIBLE DUCT CONNECTORS**

- A. Manufacturers:
  - 1. Ductmate Industries, Inc, a DMI Company; \_\_\_\_\_: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
  - 2. Elgen Manufacturing, Inc.
  - 3. Ventfabrics, Inc.
  - 4. Ward Industries; a brand of Hart & Cooley, Inc.

- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. 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.
- D. Maximum Installed Length: 14 inch.

### 2.3 MANUAL VOLUME DAMPERS

- A. Manufacturers, Standard Leakage Rating, Steel:
  - 1. Louvers & Dampers, Inc, a brand of Mestek, Inc.
  - 2. MKT Metal Manufacturing; \_\_\_\_\_: [www.mktduct.com/#sle](http://www.mktduct.com/#sle).
  - 3. Flexmaster U.S.A., Inc.
  - 4. McGill AirFlow LLC.
  - 5. Nailor Industries, Inc.
  - 6. Pottorff.
  - 7. Ruskin Company, a brand of Johnson Controls.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Single Blade Dampers:
  - 1. Fabricate for duct sizes up to 6 by 30 inch.
  - 2. Blade: 24 gauge, 0.0239 inch, minimum.

## 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 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.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Demonstrate re-setting of fire dampers to Owner's representative.
- E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- G. 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.
- H. Use turning vanes only where indicated.

- I. 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**

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**SECTION 23 34 16**  
**CENTRIFUGAL HVAC FANS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Mixflow inlinefans.
- B. Bearings and drives.

**1.2 REFERENCE STANDARDS**

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).
- B. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- C. AMCA 99 - Standards Handbook; 2016.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- F. NEMA MG 1 - Motors and Generators; 2021.
- G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

**1.3 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- D. Manufacturer's Instructions: Include complete installation instructions.
- E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements for additional provisions.
  - 2. Extra Fan Belts: One set for each individual fan.

**1.4 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.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Protect motors, shafts, and bearings from weather and construction dust.

**1.6 FIELD CONDITIONS**

- A. Permanent fans may not be used for ventilation during construction.



## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Loren Cook Company: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).
- B. PennBarry, Division of Air System Components: [www.pennbarry.com/#sle](http://www.pennbarry.com/#sle).
- C. Greenheck.

### 2.2 PERFORMANCE REQUIREMENTS

- A. See Schedule on plans

### 2.3 WHEEL AND INLET

- A. Radial: Steel construction with inlet flange, heavy reinforced back plate, plate blades with reinforcing gussets welded or riveted to back plate and flange; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

### 2.4 BEARINGS AND DRIVES

- A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.
- B. Shafts: Hot rolled steel, ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.
- C. Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under, selected so required rpm is obtained with sheaves set at mid Fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
- D. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible connections between fan inlet and discharge ductwork; see Section 23 33 00. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- C. Provide fixed sheaves required for final air balance.
- D. Provide motorized backdraft dampers on exhaust fans located at discharge side; see Section 23 33 00.

### END OF SECTION

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**SECTION 23 34 19**  
**SMOKE CONTROL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Smoke control systems.
- B. Ductwork.

**1.2 RELATED REQUIREMENTS**

- A. Section 23 31 00 - HVAC Ducts and Casings.
- B. Section 23 34 16 - Centrifugal HVAC Fans.
- C. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

**1.3 REFERENCE STANDARDS**

- A. ISO 6944-1 - Fire Containment -- Elements of Building Construction -- Part 1: Ventilation Ducts; 2008, with Amendment (2015).
- B. NEMA MG 1 - Motors and Generators; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 82 - Standard on Incinerators and Waste and Linen Handling Systems and Equipment; 2019.
- E. NFPA 92 - Standard for Smoke Control Systems; 2021.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- G. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Conduct preinstallation meeting one week prior to start of work of this section; require attendance by installers.
- B. Sequencing: Ensure that utility connections are achieved in orderly and expeditious manner.
- C. comply and test per Texas Commission on Jail Standards (TCJS)

**1.5 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating system components such as clothes dryer boosters, supply fans, dampers, controls, and factory-built chimneys. Also include installation details of components and flue caps, dimensions, weights, electrical characteristics, and connection requirements.
- C. Shop Drawings: Indicate general construction, dimensions, weights, support, and layout of breechings and ductwork. Submit layout drawings indicating plan view and elevations where factory-built units are used.
- D. Manufacturer's Instructions: Include installation instructions and indicate assembly, support details, wiring diagrams, and connection requirements.

- E. Installer's qualification statement.

#### 1.6 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide two-year manufacturer warranty for \_\_\_\_\_. Complete forms in Owner's name and register with manufacturer.
- C. Installer Warranty: Provide two-year warranty for \_\_\_\_\_ commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

### PART 2 PRODUCTS

#### 2.1 APPLICATIONS

- A. This system provides negative air pressure to cell dayrooms to prevent smoke spread outside area of incident.

#### 2.2 SMOKE CONTROL SYSTEMS

- A. Centrifugal Supply Fan: See Section 23 34 16.
- B. Comply with NFPA 92.
- C. Accessories:
  - 1. Modulating outside air damper.
  - 2. Modulating Exhaust air Dampers.

#### 2.3 DUCTWORK

- A. Field Fabricated Ductwork: See Section 23 31 00.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions and conform to applicable state and local codes.
- B. Install shafts and ductwork with minimum number of joints. Align accurately at connections with smooth internal surfaces.
- C. Upblast, termination fans with impeller guards or screens are not permitted.
- D. Coordinate installation of dampers and fans;
- E. Coordinate with building management system and fire protection controls and devices.
- F. Maintain UL-listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.
- G. Test system per, and witnessed by TCJS representative.

**END OF SECTION**

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**SECTION 23 36 00  
AIR TERMINAL UNITS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Single-duct terminal units.
  - 1. Variable-volume 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 880 (I-P) - Performance Rating of Air Terminals; 2017.
- B. ASHRAE Std 130 - Laboratory Methods of Testing Air Terminal Units; 2016.
- C. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. 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.
- B. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
- C. Project Record Documents: Record actual locations of units and locations of access doors required for access of valving.

**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.

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- 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. 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 250, 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.
- G. Electrical Requirements:
1. Single-point power connection.
  2. Equipment wiring to comply with requirements of NFPA 70.
-

- H. Controls:
  - 1. Terminal Unit Controls:
    - a. Provide accessories for field interfaced controller including ball valve and thermostat.
    - b. Factory ship DDC controller including airflow sensor, integral airflow transmitter, integral damper actuator, and duct-mounted temperature sensor.
    - c. Sequence of Operation: Zone temperature control with airflow and coil discharge monitoring.

### 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 40 00  
HVAC AIR CLEANING DEVICES**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Activated carbon filters.
- B. Filter frames and housings.

**1.2 REFERENCE STANDARDS**

- A. AHRI 850 (I-P) - Performance Rating of Commercial and Industrial Air Filter Equipment; 2013.
- B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2017, with Addendum (2022).

**1.3 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

**PART 2 PRODUCTS**

**2.1 FILTER MANUFACTURERS**

- A. AAF International/American Air Filter
- B. The Camfil Group
- C. Or Approved Equal.

**2.2 PERFORMANCE REQUIREMENTS**

- A. Comply with the rating requirements in AHRI 850 (I-P).

**2.3 ACTIVATED CARBON FILTERS**

- A. Media:
  - 1. Activated Carbon Density: 34 lb/cu ft, pelletized or granular to 6 by 10 Tyler mesh screen.
  - 2. Carbon Tetrachloride Activity: Minimum 60 percent; in thin bed.
  - 3. Nominal size 24 by 24 by 2 inches thick.
  - 4. Nominal size 24 by 12 by 2 inches thick.
  - 5. Carbon: 1.42 cu ft per 1000 CFM nominal air flow capacity.
- B. Rating: 500 fpm face velocity, 0.45 in-wc resistance.

**2.4 FILTER FRAMES AND HOUSINGS**

- A. General: Fabricate filter frames and supporting structures of 16 gauge, 0.0598 inch galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.
- B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 by 24 inches and 24 by 12 inches filter media, minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for downstream mounting of panel filters.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

**END OF SECTION**



**SECTION 23 82 00  
CONVECTION HEATING AND COOLING UNITS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Electric unit heaters.

**1.2 REFERENCE STANDARDS**

**1.3 SUBMITTALS**

- A. Product Data: Provide typical catalog of information including arrangements.
- B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

**PART 2 PRODUCTS**

**2.1 ELECTRIC UNIT HEATERS**

- A. Manufacturers:
  - 1. Berko; Marley Engineered Products.
  - 2. Chromolox, Inc.
  - 3. INDEECO (Industrial Engineering and Equipment Company).
  - 4. QMark; Marley Engineered Products.
  - 5. Trane, a brand of Ingersoll Rand.
- B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
- C. Heating Element Assembly:
  - 1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.
  - 2. Horizontal Projection Units:
    - a. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
- D. Housing:
  - 1. Suitable for ceiling or high altitude mount using provided hardware appendages.
  - 2. Horizontal Projection Units:
    - a. Construction materials to consist of heavy gage steel with high gloss baked enamel finish.
    - b. Provisions for access to internal components for maintenance, adjustments, and repair.
- E. Fan: Factory balanced, direct drive, axial type with fan guard.
- F. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.
- G. Controls:
  - 1. Built-in line-voltage thermostat.
- H. Electrical Characteristics: As indicated on the construction documents.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that surfaces are suitable for installation.
- B. Verify that field measurements are as indicated on drawings.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's recommendations.
- B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.
- C. Do not damage equipment or finishes.
- D. Unit Heaters:
  - 1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
  - 2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- E. Fan-Coil Units:
  - 1. Install as indicated.
  - 2. Coordinate to ensure correct recess size for recessed units.
- F. Units with Hydronic Coils:
  - 1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
- G. Units with Cooling Coils: Connect drain pan to condensate drain.
- H. Units with Electric Heating Elements:
  - 1. Install as indicated including electrical devices furnished by manufacturer but not factory installed.

#### 3.3 CLEANING

- A. After construction and painting is completed, clean exposed surfaces of units.
- B. Install new filters.

#### 3.4 PROTECTION

- A. Provide finished cabinet units with protective covers during the balance of construction.

**END OF SECTION**

## SECTION 26 05 19

### LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 1.1 GENERAL REQUIREMENTS

- A. This section includes conductors for power circuits, including terminations and connectors.

##### 1.2 SUBMITTALS

- A. Submittals required in this section shall conform to and be submitted in accordance with the General Conditions, Division 01, and Division 26.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Conductors shall be manufactured in the United States. Acceptable manufacturers are:
  - 1. Alan Wire, Cerrowire, Encore Wire, General Cable, and Southwire

##### 2.2 MATERIALS

- A. All feeders to be soft-drawn annealed copper.
- B. All branch circuit conductors shall be soft-drawn annealed copper.
- C. Aluminum is permissible ONLY where specifically indicated on the Drawings. Aluminum used shall be AA-8xxx rated and compact stranding is preferred.

##### 2.3 MANUFACTURED UNITS

- A. Manufactured Power Circuit Conductors:
  - 1. Conductors shall be rated for at least 600 volts and 90°C. No exceptions.
  - 2. Conductor insulation shall be type THHN / THWN-2 or XHHW-2.
  - 3. Conductors shall be #12 AWG or larger.
  - 4. Conductors that are #8 AWG and larger shall be stranded. Conductors that are #12 AWG and #10 AWG may be stranded if crimp on fork terminals are used for device terminations. Otherwise, #12 AWG and #10 AWG shall be solid conductors. Never place bare stranded conductors directly under device screws.
- B. MC Cable: Unless otherwise noted on the Drawings, MC cable is allowed ONLY for luminaire whips. Total length not to exceed six (6) feet. MC cable must meet all requirements listed in this section including (but not limited to) separate full-size neutrals, conductor material, isolated ground, installation per NEC, etc.
  - 1. Conductor Insulation: The insulation over the conductors shall be type THHN 90°C dry with an extruded polypropylene protective covering.
  - 2. Armor: A zinc coated galvanized steel armor shall be applied over the cabled wire assembly with an interlock in compliance with UL 1569 Section 13. Armor shall be colored to identify the voltage and number of conductors.
  - 3. Fittings: Fittings shall be listed and identified as MCI-A for such use with metal clad interlocking armor ground. Connectors shall be of steel or malleable iron and shall have saddle clamp to insure a tight termination of MC or MCI-A cable to box.
- C. Manufactured Conductor Terminations and Connectors:
  - 1. All accessory materials such as connectors, splice and tap fittings, and terminations shall be of a type designed or intended and suitable for the use. They shall be compatible with the conductor

### LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

- material. Both compression (crimp) and mechanical (screw set) connections are acceptable. Installation, compression, and torque settings shall be per manufacturer's recommendations.
2. Only connection devices that require the complete removal of the conductor jacket or insulation and result in a connection to the complete conductor surface area are suitable for use. Insulation piercing type connectors, press in type connectors or Wago style connectors shall NOT be used.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. More than one conductor shall not be installed in any termination unless the termination is marked as suitable for more than one conductor.
- B. Wire Sizing: Provide conductors sized as indicated on Drawings unless modified as described below. Where conductor sizes have been omitted from Drawings, bid shall include conductors with ampacity as least as large as the overcurrent protection device protecting the conductors, or at least as large as the amp rating of the load being served, whichever is greater. In such cases, notify the Engineer before installation for size verification.
- C. Voltage Drop: The intent of the drawings is to limit the voltage drop from the service entrance conductors to each branch circuit to less than 5%. The electrician is responsible to ensure proper voltage drop values are maintained as mentioned here and as required per the NEC.
- D. Neutral Conductors: Provide a separate neutral conductor for each feeder or branch circuit. Multiple circuits shall not share a common neutral. Neutral conductors shall be sized as large as the phase conductors. Neutral conductors shall not be of a reduced size.
- E. Equipment Grounding Conductors: Provide equipment grounding conductors in accordance with Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- F. Number of Current Carrying Conductors (CCC) per conduit:
  1. When more than three (3) CCCs are in a single conduit, the electrician is responsible for derating the available ampacity to current carrying conductors per NEC requirements and provide calculations to the Engineer, when requested.
- G. Installation in Raceways:
  1. All conductors shall be installed in a raceway.
- H. Terminations:
  1. Use compression (crimp) or mechanical (screw set) type lugs or connectors for all terminations or splices of stranded conductors. See 26 05 26 Grounding and Bonding where thermal welding may be used.
  2. Use ring tongue type terminators on all control wiring.
  3. Conductive antioxidant shall be applied on all connections per manufacturer's instructions, regardless of conductor material.
- I. Splices:
  1. Where splices are required, they shall be in a box or enclosure. Splices within a conduit run are not acceptable.
- J. Color Coding:
  1. Provide factory colored insulated conductors for #6 AWG and smaller.
  2. If existing wiring in renovation or addition work has a consistent color coding, then match the existing and note in record documents. Otherwise, colors shall be as follows:

Line	208/120V	240/208V 1ph	240/120V	480/277V
A	Black	Black	Black	BROWN
B	Red	n/a	Orange	ORANGE
C	Blue	Red	Blue	Yellow
Neutral	White	White	White	Gray

Line	208/120V	240/208V 1ph	240/120V	480/277V
Ground	Green	Green	Green	Green
Isol Grnd	Green +Yellow	Green + Yellow	Green + Yellow	Green + Yellow

- K. Identification: All conductors in a panelboard shall be identified by means of tags or tape.
- L. MC Cable: Where allowed, install MC cable to meet all NEC requirements.
1. Support: All MC cable shall be supported by dedicated J-cable hangers or cable tray. Where suspended from the ceiling or roof structure, use split-ring hangers or wrought-iron hanger rods.

### 3.2 SITE TESTS

- A. Perform in accordance with manufacturer's printed testing procedures, applicable industry standards, ANSI standards, IEEE standards, and NEMA standards. Provide calibrated testing equipment in good working order and which complies with the above requirements. The below test shall be performed after the conductors have been pulled into the conduit and after terminations have been added, but before final connections are made. Document all readings and testing and make documentation available to Owner upon request.
- B. Feeder Insulation Test: The insulation of new service entrance conductors and each new feeder run shall be tested using a megger. Readings must indicate not less than one (1) megohm to be acceptable.
- C. Branch Circuit Insulation Test: The insulation of each new branch circuit shall be tested using an ohm meter. Readings must indicate not less than one (1) megohm to be acceptable.

### END OF SECTION

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.1 GENERAL REQUIREMENTS

- A. Grounding and bonding shall include the solid grounding of the various electrical systems and equipment and the proper bonding of all electrical system components and equipment to meet NEC 250 and all other applicable NEC sections, codes, and ordinances. These systems shall be provided for the proper protection of life, equipment, circuits, and systems.
- B. Permanently ground entire lighting and power systems in accordance with the latest adopted version of the NEC, including service equipment, distribution, panelboards, switch and starter enclosures, motor frames, devices, transformers, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- C. Grounding and bonding requirements specified in this section may be supplemented in other sections of these Specifications.

##### 1.2 COORDINATION

- A. Complete grounding and bonding of building reinforcing steel (rebar) to the satisfaction of the local AHJ prior to concrete placement.

#### PART 2 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Apache Grounding, Copperweld, Inc., ILSCO Corporation, nVENT (Cadweld, Critec, Erico), Thermoweld, and Thomas & Betts (T&B)

##### 2.2 PERFORMANCE REQUIREMENTS

- A. General:
  - 1. All grounding and bonding shall be in strict accordance with NEC 250, 517, etc.
  - 2. Grounding electrode system shall have a resistance to earth of five (5) ohms or less. Where this cannot be met, provide two additional ground rods to form a "triple ground rod" installation. Under no conditions shall the system have a resistance greater than twenty-five (25) ohms to ground, per NEC 250, at any location in the system.
- B. Ground Rods:
  - 1. Copper cladding permanently bonded to a high-strength steel core.
  - 2. 3/4 inch by 10 feet (19mm by 3m) straight, conform to UL 467.
- C. Conductors:
  - 1. Grounding Conductor: Copper, insulated (green) where required or uninsulated where allowed in the Specifications or by code, sized per drawings or NEC Table 250.95.
  - 2. Bonding Jumpers - Insulated conductor, sized to be minimum cross-sectional area greater than or equal to that of the equivalent grounding conductor as determined from NEC Table 250.95.
  - 3. Grounding Ring around a building - #2 AWG uninsulated copper, otherwise sized per NEC.
  - 4. Grounding Ring around a utility transformer - #2 AWG uninsulated copper (unless sized per drawings), otherwise sized per NEC or by utility requirements.
- D. Connections:
  - 1. General: All connectors shall be listed and labeled as grounding connectors for the materials used.

2. Welded Bond - Exothermic welded connection or bond such as "Cadweld". No phosphorous or any other caustic, toxic or explosive substance may be used.
    - a. Provide exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.
  3. Clamps - Listed bronze connectors, suitable for grounding and bonding applications, in configurations required for a particular installation.
- E. Buss Bars:
1. Bare annealed copper bars, 1/4" x 4" x 20" unless otherwise noted on the drawings.

### **PART 3 - EXECUTION**

#### **3.1 APPLICATION**

- A. Unless otherwise indicated, the below list of connection styles shall be followed.
- B. Outdoor Below Grade Grounding Connections:
1. Welded bond only, no exception.
- C. Outdoor Above Grade Grounding Connections:
1. Clamps may be used. Use welded bond where clamping is not accessible or practical.
- D. Indoor Grounding and Power Connections:
1. Clamps may be used. Use low-smoke/low emission welded bond where clamping is not accessible or practical.

#### **3.2 INSTALLATION**

- A. General:
1. Where the Drawings or Specifications exceed NEC requirements, then follow the Drawings or Specifications.
  2. Bond all ground electrodes together to form the grounding electrode system including metal underground water pipe, metal frame of the building or structure, concrete encased electrodes, ground ring, rod and pipe electrodes and plate electrodes.
  3. At all electrical system components, assemblies, circuits, etc. that are over 120v to ground, provide locknuts and / or listed fittings per NEC 250.97 for bonding of metal raceways. In case of oversized, concentric or eccentric knockouts, comply with NEC 250.92(B). The use of snap-in, wedge-type, or pivot-type connectors is prohibited.
  4. Refer to Drawings for additional special grounding systems or grounding requirements not mentioned here.
- B. Concrete Encased Electrode:
1. Fabricate with twenty (20) feet (6m) of conductor laid lengthwise in excavation for foundation or footings. Install so conductor is within two (2) inches (50mm) of the bottom of the concrete. Where base of foundation is less than twenty (20) feet (6m) in length, coil excess conductor at base of foundation. Bond conductor to reinforcing steel at four (4) locations, minimum. Extend conductor below grade and connect to building grounding electrode.
- C. Main Electrode:
1. Provide a building ground rod and bond it to the grounding electrode system. Where ohmic values exceed 5 ohms to ground, the building ground rod shall consist of three ground rods, arranged in an equilateral triangular pattern located at least five (5) feet outside an exterior building wall or as otherwise directed. Space fifteen (15) feet apart and drive into the earth to a point two (2) feet below finished grade to top of rods. Grounding electrode conductor shall form a continuous loop around rods, and conductor shall be properly bonded to each rod by a fusion weld similar to "Cadweld".
  2. Extend grounding electrode conductor from this ground rod(s) to the grounded service conductor (neutral) in the building main switchboard at an accessible point on the ground bus per NEC 250.24.

- D. Main Bonding Jumper: Shall be sized in accordance with NEC 250.66, if not indicated on the Drawings, and installed within the same enclosure as the point of bonding of the system neutral service entrance.
- E. Water Pipe Electrode: A ten (10) foot minimum length of electrically-continuous underground metal water pipe. Bond around insulating joints or sections, insulating pipe, and water meters to make pipe electrically continuous.
- F. Fuel Gas Piping:
  - 1. Each above ground portion of a gas piping system upstream from the equipment shutoff valve shall be made electrical continuous and bonded to the building grounding electrode system, as required in NFPA 54.
  - 2. Gas piping shall not be used as a grounding electrode.
- G. Transformers: Ground as a separately derived source.
  - 1. Where transformer secondary includes a neutral, the neutral shall be bonded to the equipment enclosure and connected to the system ground conductor.
  - 2. Size bonding jumper per NEC Table 250.66.
  - 3. Grounding conductor shall be in raceway and shall be bonded to nearest available point of interior metal water piping system.
- H. Equipment Grounding Conductor (EGC):
  - 1. Comply with NEC 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.
  - 2. All power circuits shall be provided with a separate copper insulated EGC run in the raceway with the power conductors. The conduit shall not be used as the sole means of grounding. The insulation of the EGC shall be green.
  - 3. Bonding to the EGC shall be provided at each end of metallic conduit runs and at all boxes and enclosures.
  - 4. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
- I. Isolated Ground (IG) Equipment Grounding Conductor:
  - 1. All branch circuits and feeders that require an IG equipment grounding conductor shall be provided with a separate copper insulated IG equipment grounding conductor run in the raceway with the power conductors. The IG equipment grounding conductor shall be provided in addition to the normal EGC. The insulation of the IG equipment grounding conductor shall be green with a yellow stripe.
  - 2. Conduits and boxes of IG circuits shall be bonded to the normal EGC as stated above. At outlet locations, the IG equipment grounding conductor shall connect only to the isolated ground terminal of an isolated ground outlet. There shall be no connection, either directly or indirectly, between the normal EGC and the IG equipment grounding conductor at any point other than at the source of a separately derived system (transformer) or at the service entrance.
  - 3. The following circuits shall be provided with an IG equipment grounding conductor:
    - a. Feeders providing power to panels equipped with an IG buss.
    - b. All branch circuits originating at a panel with an IG buss.
- J. Exterior Lighting:
  - 1. All metallic outdoor poles and luminaries on metallic or non-metallic lighting poles shall be grounded by bonding in an approved manner to the circuit grounding conductor. In addition to this, bond pole to a #6 AWG bare copper wire which shall also be bonded to a ground rod. Install the ground rod adjacent to the pole base with the top driven at least two (2) feet below grade.
- K. Grounding Busses:
  - 1. Provide a copper buss bar where indicated on Drawings or in rooms containing any of the below list. Provide a #2 AWG insulated grounding electrode conductor from the grounding electrode system to each grounding buss.
  - 2. Provide in each IDF and MDF room.
  - 3. Provide at each CATV / MATV head-end mounting board.
  - 4. Provide at each building communications rack.
  - 5. Provide at each sound reinforcement equipment rack.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS



- L. Communications Systems:
  - 1. Bond each server, patch panel, data and other communications equipment ground (buss type or grounding conductor type) at each piece of equipment and each equipment rack back to the copper grounding buss installed in the room with a bare #6 AWG ground wire.
- M. Engine Generator Neutral:
  - 1. Ground the generator neutral as a separately derived system per NEC 250.20(D), unless noted otherwise on Drawings.
- N. Lightning Protection System:
  - 1. Bond grounding conductors or grounding conductor conduits to lightning protection down conductors or grounding conductors in compliance with NFPA 78.
  - 2. Bond electric power system ground directly to lightning protection system grounding conductor at closest point to electric service grounding electrode. Use bonding conductor sized same as system ground conductor and installed in conduit.
- O. Other Grounding Systems:
  - 1. Other buildings served from common service:
    - a. The main building service is the source for electric service.
    - b. Bond grounding conductor of building main feeder to grounding electrode system.

### 3.3 CONNECTIONS

- A. General:
  - 1. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 2. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps. Aluminum to galvanized steel connections will be with tin-plated copper jumpers and mechanical clamps.
  - 3. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Exothermic Welded Connections:
  - 1. Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
  - 2. Terminate insulated EGCs for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground buss in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushing and bare grounding conductors.
- C. Compression Type Connections:
  - 1. Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- D. Moisture Protection:
  - 1. Where insulated ground conductors are connected to ground rods or ground busses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

### 3.4 SITE TESTING

- A. Testing:
  - 1. Test the electrical system after installation is complete. Inspect and test for stray currents, unintended ground shorts, and proper physical condition of grounding system. Correct any

deficiencies and re-test to verify satisfactory installation.

2. Document all readings and testing and make documentation available to Owner upon request.
3. Perform ground resistance and continuity testing in accordance with IEEE 142.
4. Perform leakage current tests in accordance with NFPA 99.

**END OF SECTION**

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**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.

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- 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.
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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

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**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; 2018.
- 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); 2017.
- 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.

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## 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.

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- 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.
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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.
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- R. Provide grounding and bonding in accordance with Section 26 05 26.

**END OF SECTION**



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**SECTION 26 05 33.16**  
**BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C. Floor boxes.

**1.2 RELATED REQUIREMENTS**

- A. Section 07 84 00 - Firestopping.
- B. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- 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 33.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- F. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Poke-through assemblies.
- G. Section 26 28 13 - Fuses: Spare fuse cabinets.

**1.3 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
-

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and 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. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. 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 cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- 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.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### 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 BOXES

- A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

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5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  12. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
  13. Wall Plates: Comply with Section 26 27 26.
  14. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation.
    - b. Hubbell Incorporated; Bell Products.
    - c. Hubbell Incorporated; RACO Products.
    - d. O-Z/Gedney, a brand of Emerson Electric Co.
    - e. Thomas & Betts Corporation.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
- D. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
  2. Use cast iron floor boxes within slab on grade.
  3. Use sheet-steel or cast iron floor boxes within slab above grade.
  4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
  5. Manufacturer: Same as manufacturer of floor box service fittings.
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## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
  - 4. Locate boxes so that wall plates do not cross masonry joints.
  - 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  - 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  - 7. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
  - 8. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- H. Box Supports:
  - 1. Secure and support boxes 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 except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- I. Install boxes plumb and level.
- J. Flush-Mounted Boxes:
  - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at

the edge of the box.

- K. Install boxes as required to preserve insulation integrity.
- L. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. 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. 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.

**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.

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## 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.
2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
3. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
5. 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.
6. 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.
7. 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".
8. 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".
9. 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.

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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.
- 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.
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3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

## 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 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.

## 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. Interior Components: Legible from the point of access.
  - 6. Conduits: Legible from the floor.
  - 7. Boxes: Outside face of cover.
  - 8. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- E. Secure rigid signs using stainless steel screws.
- F. Mark all handwritten text, where permitted, to be neat and legible.

### END OF SECTION

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**SECTION 26 28 13  
FUSES****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Fuses.
- B. Spare fuse cabinet.

**1.2 RELATED REQUIREMENTS**

- A. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 24 13 - Switchboards: Fusible switches.
- C. Section 26 24 16 - Panelboards: Fusible switches.
- D. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

**1.3 REFERENCE STANDARDS**

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.
- E. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.
- F. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

**1.4 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
  - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment 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 data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
  - 1. Spare Fuse Cabinet: Include dimensions.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fuses: One set(s) of three for each type and size installed.
  - 3. Fuse Pullers: One set(s) compatible with each type and size installed.

4. Spare Fuse Cabinet Keys: Two.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation.
- B. Littelfuse, Inc.
- C. Mersen.

### 2.2 APPLICATIONS

- A. Service Entrance:
  1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
  2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- B. Feeders:
  1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
  2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.
- C. General Purpose Branch Circuits: Class RK1, time-delay.
- D. Individual Motor Branch Circuits: Class RK1, time-delay.
- E. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.
- F. Primary Protection for Control Transformers: Class CC, time-delay.

### 2.3 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.
- H. Class L Fuses: Comply with UL 248-10.
- I. Class CC Fuses: Comply with UL 248-4.

### 2.4 SPARE FUSE CABINET

- A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.
- B. Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet where indicated.

**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 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- 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 250, and list and label as complying with UL 50 and UL 50E.
  1. Environment Type per NEMA 250: 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 KS 1.
  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

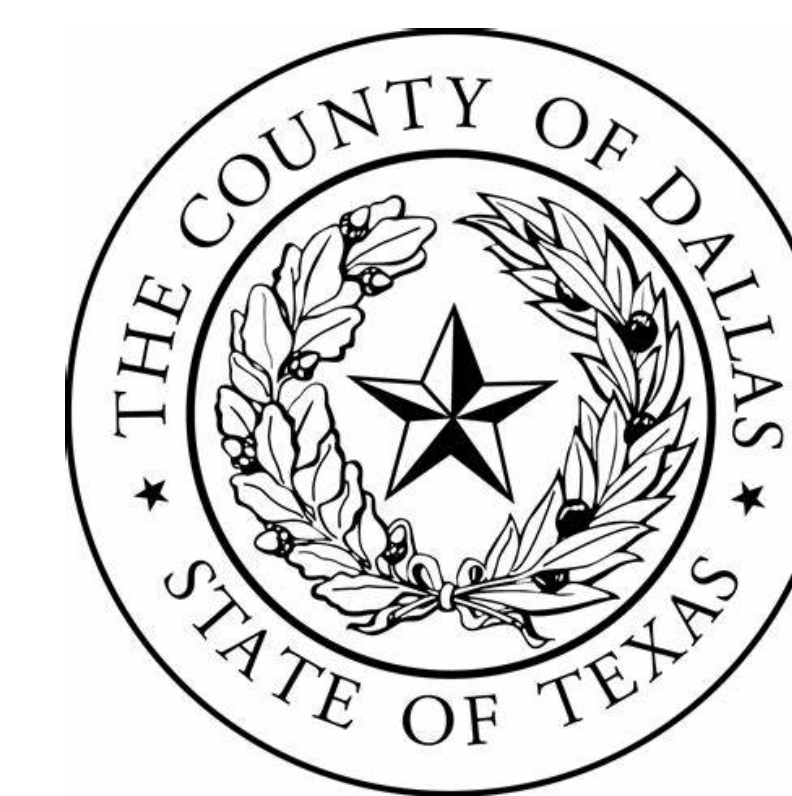
- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance 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 Facilities Management



## Lew Sterrett Justice Center West Tower First Floor Smoke Evacuation System Upgrade

111 W Commerce St.  
Dallas, Texas 75202

### Issue for Construction

01.21.2025

# HED

2023-DC048-002



GENERAL NOTES

- 10

THE CONSTRUCTION CONTRACT IS FOR A COMPLETE AND FULLY FUNCTIONING INSTALLATION. THESE DOCUMENTS DESCRIBE THE DESIGN INTENT AND SPECIFIC REQUIREMENTS OF THE INSTALLATION. THE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED TO BE SHOWN AS BIDDING AS IF REQUIRED BY ALL. THESE DOCUMENTS ARE NOT MEANT TO SHOW EVERY ITEM REQUIRED TO CONSTRUCT THE WORK. ITEMS SUCH AS, BUT NOT LIMITED TO, FASTENERS, CONNECTORS, FILLERS, MISCELLANEOUS CLOSURE ELEMENTS, ANCILLARY CONTROL WIRING AND POWER WHERE REQUIRED FOR THE CONTROL OR OPERATION OF THE PROVIDED EQUIPMENT, ETC. ARE NOT ALWAYS SHOWN BUT ARE CONSIDERED TO BE INCLUDED IN THE SCOPE OF THE WORK. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE A FULLY FUNCTIONING INSTALLATION WHICH MEETS THE DESIGN INTENT, INCLUDING BUT NOT LIMITED TO THE SPECIFIC REQUIREMENTS IN THESE DOCUMENTS.
- 10

THESE DOCUMENTS DESCRIBE WORK UNDER A SINGLE CONSTRUCTION CONTRACT. THE USE OF SUB-CONTRACTORS IS THE ELECTION OF THE GENERAL CONTRACTOR. IT IS NOT THE INTENT OF THE DOCUMENTS TO DIVIDE THE WORK AMONG SUB-CONTRACTORS. WHERE THE DOCUMENTS IDENTIFY WORK WITH SUCH NOTES AS "NOT IN MECHANICAL WORK" OR "NOT IN ELECTRICAL WORK" OR "SEE STRUCTURAL DRAWINGS," IT MEANS THAT THE WORK IS NOT FURTHER DESCRIBED OR SPECIFIED ON THE DRAWING WHERE SUCH NOTES APPEAR. IT DOES NOT PRECLUDE THE CONTRACTOR FROM DELEGATING THE WORK TO ENTITIES OF HIS ELECTION. IN ADDITION, THE DIVISION OF THE CONTRACT DOCUMENTS INTO ARCHITECTURAL, STRUCTURAL, ELECTRICAL AND MECHANICAL OR OTHER DESIGN DISCIPLINES IS FOR CONVENIENCE ONLY, AND IS NOT INTENDED TO DIVIDE THE WORK AMONG VARIOUS SUB-CONTRACTORS, OR IMPLY THAT ALL OF THE WORK FOR A PARTICULAR TRADE IS SHOWN ONLY IN THOSE DRAWINGS OR SPECIFICATIONS.
- 10

REFERENCE TO "CONTRACTOR" IN THESE DOCUMENTS SHALL BE INTERPRETED AS REFERRING TO THE GENERAL CONTRACTOR OR TO ANY SUB-CONTRACTOR TO THE GENERAL CONTRACTOR, COLLECTIVELY OR AS INDIVIDUAL ENTITIES. FURTHER, REFERENCE TO A PARTICULAR SUB-CONTRACTOR IS FOR CONVENIENCE ONLY, AND IS NOT INTENDED TO LIMIT THE SCOPE OF THE WORK TO THAT TRADE OR LIMIT THE RESPONSIBILITIES OF THE GENERAL CONTRACTOR TO COORDINATE THE WORK OF ALL TRADES AS DEFINED BY THE OWNER/CONTRACTOR AGREEMENT.
- 10

THE DRAWINGS AND PROJECT MANUAL ESTABLISH DETAILED MINIMUM REQUIREMENTS FOR THE DESIGN AND CONSTRUCTION OF THE PROJECT. PARTIAL OR OUTDATED SETS OF CONTRACT DOCUMENTS SHOULD NOT BE DISTRIBUTED OR UTILIZED.
- 60

WORK IS TO COMPLY WITH APPLICABLE FEDERAL, STATE AND LOCAL CODES AND REGULATIONS IN FORCE AT THE TIME OF CONSTRUCTION.
- 60

CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FEES FOR PERMITS PRIOR TO STARTING CONSTRUCTION. PERMITS ARE TO BE POSTED IN A CONSPICUOUS PLACE ON THE PROJECT SITE AS REQUIRED BY AUTHORITY HAVING JURISDICTION.
- 60

UNLESS SPECIFICALLY NOTED AS BEING RE-USED, MATERIALS FURNISHED AT THE JOB SITE SHALL BE NEW AND FREE FROM DEFECTS, AND SHALL BE STORED AT THE SITE IN SUCH A MANNER AS TO PROTECT THEM FROM DAMAGE. ALL WORK SHALL BE BEST PRACTICE OF EACH TRADE.
- 60

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COMPLETELY COORDINATE WORK AS REQUIRED TO MEET THE DESIGN INTENT AS DEFINED BY THE DOCUMENTS. THE CONTRACTOR SHALL LAY OUT AND SEQUENCE THE INSTALLATION OF WORK SO THAT THE DIFFERENT SYSTEMS DO NOT OBSTRUCT INSTALLATION OF SUBSEQUENT WORK. IN GENERAL, SYSTEMS INSTALLED FIRST SHOULD BE AS HIGH AND AS TIGHT TO THE STRUCTURE AS POSSIBLE TO ALLOW SPACE FOR SYSTEMS WHICH FOLLOW.
- 60

IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND SUB-CONTRACTORS TO REVIEW DRAWINGS, PROJECT MANUAL, ADDENDA, BULLETINS, ETC. IN ORDER TO ENSURE COMPLETE COORDINATION OF WORK. FAILURE TO REVIEW AND COORDINATE ALL CONTRACT DOCUMENTS BY THE GENERAL CONTRACTOR WITH THE SUB-CONTRACTORS FOR APPLICABLE PORTIONS OF THE WORK DOES NOT RELIEVE ANY PARTY FROM PROVIDING MATERIALS AND WORK REQUIRED FOR A COMPLETE INSTALLATION.
- 100

THE PROJECT MANUAL, WHICH INCLUDES THE GENERAL CONDITIONS, SUPPLEMENTAL CONDITIONS, AND TECHNICAL SPECIFICATIONS, AND THE DRAWINGS, ARE COMPLEMENTARY AND TOGETHER DESCRIBE THE PROJECT REQUIREMENTS. WHERE THERE ARE DISCREPANCIES BETWEEN THE PROJECT MANUAL AND THE DRAWINGS, THE CONTRACTOR SHALL ADVISE THE ARCHITECT OF SUCH AND REQUEST CLARIFICATION. IN GENERAL, THE PROJECT MANUAL TAKES PRECEDENCE OVER DRAWINGS. LARGE SCALE DETAILS TAKE PRECEDENCE OVER SMALL SCALE DETAILS.
- 100

THE GENERAL CONTRACTOR AND SUB-CONTRACTORS SHALL VISIT THE SITE PRIOR TO BIDDING IN ORDER TO FAMILIARIZE THEMSELVES WITH THE EXISTING CONDITIONS AND THE IMPACT OF THE BID WORK INDICATED ON THE DRAWINGS AND SPECIFICATIONS. ON THESE CONDITIONS, ANY QUESTIONS REGARDING THE COORDINATION OF NEW WORK WITH EXISTING CONDITIONS MUST BE SUBMITTED TO THE ARCHITECT IN WRITING PRIOR TO THE BID SUBMISSION AND WITH ADEQUATE TIME FOR RESPONSE TO ALL BIDDERS. THE ARCHITECT WILL RESPOND TO TIMELY QUESTIONS WITH A WRITTEN RESPONSE TO ALL BIDDERS.
- 100

ALL WORK NOTED "NIC" IS NOT IN CONTRACT. CONTRACTOR SHALL COORDINATE WITH OTHER CONTRACTORS ON SITE PER REQUIREMENT ESTABLISHED BY OWNER.
- 100

EXISTING DIMENSIONS AND CONDITIONS INDICATED IN THESE DOCUMENTS ARE FROM ELECTRONIC CAD INFORMATION PROVIDED BY THE OWNER AND ARE ASSUMED TO BE ACCURATE AS SHOWN. THE CONTRACTOR SHALL VERIFY THE ACCURACY OF SUCH INFORMATION PRIOR TO THE START OF CONSTRUCTION, AND ADVISE THE ARCHITECT OF ANY DEVIATIONS OR CONFLICTS WITH THE INFORMATION SHOWN ON THE DRAWINGS.
- 100

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR SHALL REFER TO THE DIMENSIONS INDICATED OR THE ACTUAL SIZES OF CONSTRUCTION ITEMS, WHERE NO DIMENSION OR METHODS OF DETERMINING A LOCATION EXISTS, VERIFY DIMENSION WITH ARCHITECT PRIOR TO LAYOUT AND INSTALLATION.
- 100

THE DRAWINGS AND REFERENCED DETAILS HAVE BEEN DIMENSIONED IN ORDER TO ESTABLISH THE CONTROL AND GUIDELINES FOR FIELD LAYOUT. WHERE DISCREPANCIES EXIST BETWEEN THE DRAWINGS AND FIELD CONDITIONS THE CONTRACTOR SHALL NOTIFY THE ARCHITECT OF SUCH PRIOR TO START OF WORK.
- 100

DIMENSIONS ON DOCUMENTS ARE TO FACE OF FINISH MATERIALS UNLESS OTHERWISE INDICATED.
- 100

WHERE DIMENSIONS INDICATED ARE NOTED AS VERIFY IN FIELD (VIF) THE DIMENSION SHOWN IS THE BASIS OF DESIGN, BUT MAY DIFFER FROM ACTUAL CONDITIONS. CONTRACTOR SHALL VERIFY THESE DIMENSIONS WHILE LAYING OUT THE WORK AND REPORT ANY DISCREPANCIES TO THE ARCHITECT PRIOR TO PROCEEDING. WHERE DIMENSIONS ARE NOTED AS "+/-" FIELD DIMENSIONS MAY VARY FROM THE NOTED DIMENSIONS BY MINOR AMOUNTS. DISCREPANCIES OF MORE THAN 1" SHOULD BE BROUGHT TO THE ATTENTION OF THE ARCHITECT FOR CONFIRMATION. DIMENSIONS NOTED AS "HOLD" OR "CLEAR" ARE TO BE ACCURATE TO WITHIN 1/4".
- 100

DETAILS ARE KEYED TO THE PLANS AT TYPICAL LOCATIONS. TYPICAL DETAILS APPLY TO ALL LOCATIONS WHICH ARE SIMILAR BUT ARE NOT NECESSARILY KEYED TO EVERY LOCATION TO WHICH THEY APPLY. CONTRACTOR IS RESPONSIBLE TO COORDINATE THE LOCATION OF ALL TYPICAL DETAILS AND INSTALL THE WORK INDICATED. FEATURES NOT SHOWN IN THEIR ENTIRETY SHALL BE COMPLETELY PROVIDED AS IF SHOWN IN FULL. IF DISCREPANCIES EXIST, CONTRACTOR IS TO REQUEST CLARIFICATION BY THE ARCHITECT OF SUCH CONDITIONS.
- 100

FINISH FLOOR ELEVATIONS REFER TO TOP OF CONCRETE SLAB, UNLESS NOTED OTHERWISE. WHERE CONCRETE SLAB IS DEPRESSED TO ACCOMMODATE SETTING BEDS, RAISED ACCESS FLOOR, OR OTHER SIMILAR FLOOR ASSEMBLIES, FINISH FLOOR ELEVATIONS ARE TO TOP OF FINISH FLOOR ASSEMBLY INDICATED.
- 100

FIRE RATING "TAPES" INDICATED ON FLOOR PLANS SHOW EXTENT OF FIRE RATED PARTITIONS, BARRIERS AND FIRE WALLS. RATING IN A PARTITION SHALL BE CONTINUOUS AND SHALL CONTINUE OVER DOORS AND OVER AND BELOW WINDOWS WHETHER OR NOT THEY ARE SHOWN AS SUCH ON THE PLANS. REFER TO PARTITION DETAILS FOR REQUIREMENTS OF THE RATED ASSEMBLIES.
- 100

VERIFY AND COORDINATE SIZES, LOCATION AND MOUNTING REQUIREMENTS OF ALL EQUIPMENT AND FIXTURES. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE REQUIRED BLOCKING, BACKING, SLEEVES, ETC. FOR A COMPLETE, NEAT INSTALLATION. COORDINATE INSTALLATION OF ALL SLEEVES AND OPENINGS AS REQUIRED THROUGH ALL EXISTING OR NEW CONSTRUCTION.
- 22

DETAILS INDICATE DESIGN INTENT OF WORK IN PLACE. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB CONDITIONS OR DIMENSIONS AND ARE TO BE INCLUDED AS PART OF THE WORK.

23

PROVIDE PROTECTION FOR PEDESTRIANS OR OCCUPANTS OF ADJACENT AREAS OF THE BUILDING AS NECESSARY AND AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION.

24

MAINTAIN THE PREMISES CLEAN AND FREE OF TRASH AND DEBRIS. PROTECT PROJECT, THE SITE, AND PERSONAL PROPERTY FROM DAMAGE.

25

PROTECT WORK AREAS AND EXISTING ADJACENT AREAS, INCLUDING EXISTING UTILITIES, FROM DAMAGE. REPAIR, REPLACE, OR PATCH ANY DAMAGE DUE TO CONSTRUCTION. REPAIRED CONSTRUCTION IS SUBJECT TO REVIEW AND ACCEPTANCE BY ARCHITECT.

26

PROVIDE REQUIRED TEMPORARY UTILITIES, BRACING, SUPPORTS, SHORING, ETC. CONTRACTOR SHALL BE RESPONSIBLE FOR DESIGN ADEQUACY AND SAFETY OF ERECTION.

27

CONTRACTOR SHALL MAINTAIN CURRENT UPDATED RECORD DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES.

28

CONTRACTOR IS RESPONSIBLE FOR MEANS AND METHODS OF CONSTRUCTION, INCLUDING BUT NOT LIMITED TO SITE SAFETY AND SECURITY FOR WORKERS AND GENERAL MEMBERS OF THE PUBLIC.

29

METAL FABRICATIONS AND SUPPORT ASSEMBLIES WHETHER SHOWN OR NOT SHALL BE PROVIDED FOR THE STRUCTURAL SUPPORT OF MISCELLANEOUS ELEMENTS. GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING ENGINEERED STRUCTURAL ASSEMBLIES AND CALCULATIONS SHOWING COMPLIANCE WITH CODE REQUIREMENTS AND ACCOUNTING FOR STATIC AND DYNAMIC LOADS INCLUDING ANY WIND OR SEISMIC LOADS, THERMAL MOVEMENT OF SUPPORTING STRUCTURE AND DIMENSIONAL TOLERANCES OF THE BUILDING.

30

THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL STIFFENERS, BRACING, BACK-UP PLATES AND SUPPORTING BRACKETS REQUIRED FOR APPROPRIATE INSTALLATION OF ALL WALL MOUNTED OR SUSPENDED MECHANICAL, ELECTRICAL OR MISCELLANEOUS EQUIPMENT.

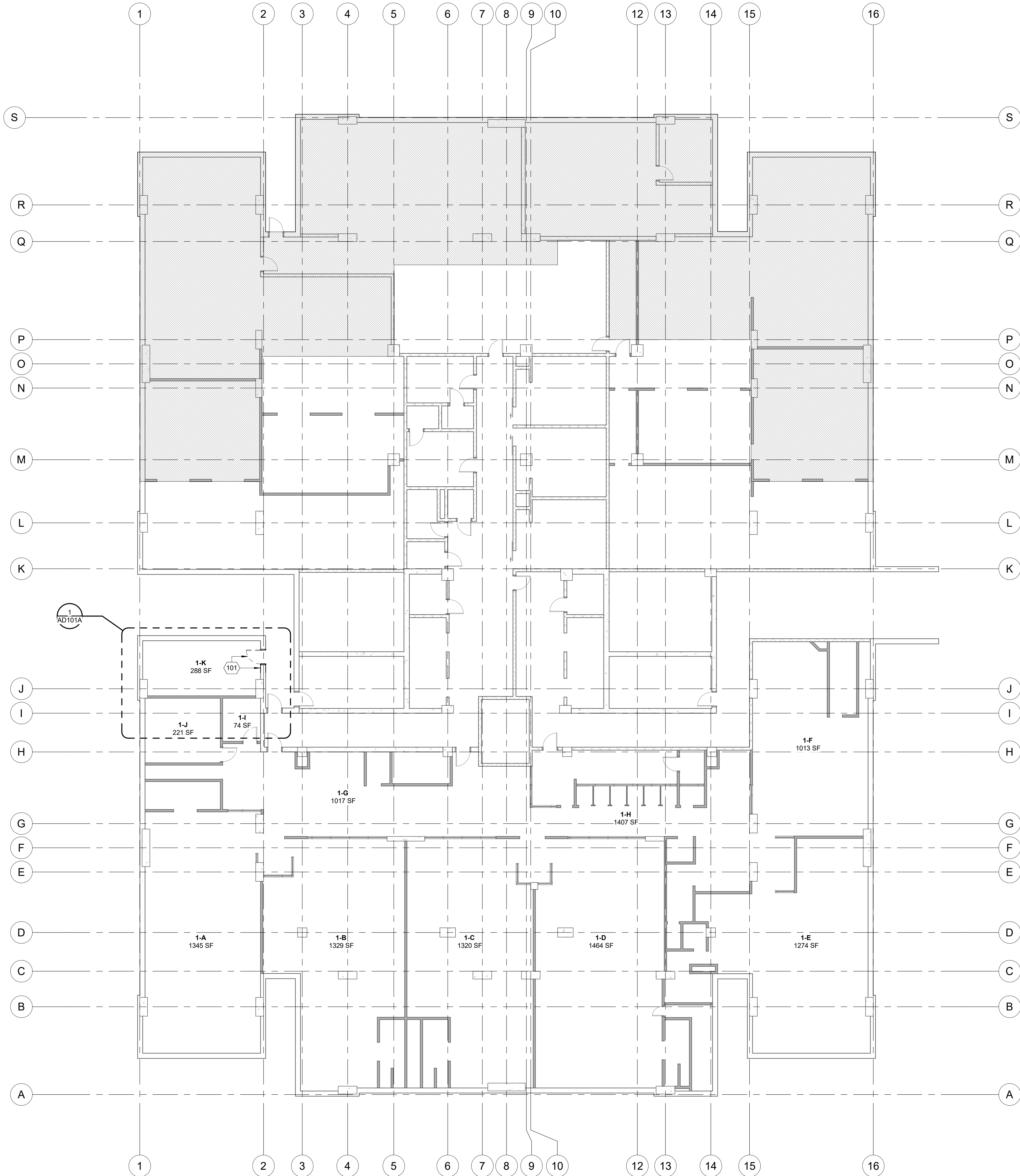
31

PIPE SLEEVES IN MECHANICAL EQUIPMENT ROOMS EXTEND 2" ABOVE THE FLOOR LINE, FILL THE ANNULAR SPACES OF PIPE SLEEVES THROUGH THE FLOOR OR THROUGH RATED WALLS WITH FIRE SAFING AND SMOKE SEAL COMPOUND AS INDICATED ON THE SPECIFICATION, AND AS APPROVED BY THE AUTHORITY HAVING JURISDICTION.

32

PROVIDE ACCESS PANELS FOR MECHANICAL AND ELECTRICAL EQUIPMENT AS REQUIRED BY APPLICABLE CODES. ALL ACCESS PANELS IN GYP BOARD SHALL BE CONCEALED, MUD-IN TYPE. ELECTRICAL J-BOXES, PLUMBING CLEANOUTS, FIRE DAMPERS AND OTHER SIMILAR ITEMS REQUIRING ACCESS ARE NOT TO BE LOCATED ABOVE GYPSUM BOARD OR SIMILAR NON-ACCESSIBLE CEILING.
- ABBREVIATIONS
- |        |                                      |
|--------|--------------------------------------|
| ADJ    | ADJACENT, ADJUSTABLE                 |
| AFF    | ABOVE FINISHED FLOOR                 |
| ALT    | ALTERNATE                            |
| BLDG   | BUILDING                             |
| CIP    | CAST-IN-PLACE                        |
| CJ     | CONSTRUCTION JOINT, CONTROL JOINT    |
| CL     | CENTERLINE                           |
| CLG    | CEILING                              |
| CLR    | CLEAR, CLEARANCE                     |
| CMU    | CONCRETE MASONRY UNIT(S)             |
| COL    | COLUMN                               |
| CONC   | CONCRETE                             |
| DET    | DETAIL                               |
| DF     | DRINKING FOUNTAIN                    |
| DIA    | DIAMETER                             |
| DIM    | DIMENSION                            |
| DN     | DOWN                                 |
| DWG    | DRAWING                              |
| EA     | EACH                                 |
| EF     | EXHAUST FAN                          |
| EJ     | EXPANSION JOINT                      |
| EL     | ELEVATION (GRADE)                    |
| EW     | ELECTRIC WATER COOLER                |
| EXIST  | EXISTING                             |
| EXP    | EXPOSED                              |
| EXT    | EXTERIOR                             |
| FD     | FLOOR DRAIN                          |
| FE     | FIRE EXTINGUISHER                    |
| FEC    | FIRE EXTINGUISHER CABINET            |
| FFE    | FURNITURE, FIXTURES & EQUIPMENT      |
| FIN    | FINISH, FINISHED                     |
| FR     | FIRE RATED, FIRE RETARDANT           |
| FRTW   | FIRE RETARDANT TREATED WOOD          |
| GA     | GAUGE                                |
| GALV   | GALVANIZED                           |
| GYP BD | GYPSUM BOARD                         |
| HM     | HOLLOW METAL                         |
| HORIZ  | HORIZONTAL                           |
| INT    | INTERIOR                             |
| MAX    | MAXIMUM                              |
| MFR    | MANUFACTURER                         |
| MIN    | MINIMUM                              |
| MO     | MASONRY OPENING                      |
| NIC    | NOT IN CONTRACT                      |
| NOM    | NOMINAL                              |
| NTS    | NOT TO SCALE                         |
| OC     | ON CENTER                            |
| OFCI   | OWNER FURNISHED CONTRACTOR INSTALLED |
| OFOI   | OWNER FURNISHED OWNER INSTALLED      |
| OP     | OPPOSITE                             |
| OPP    | OPPOSITE HAND                        |
| PL     | PROPERTY LINE                        |
| PPT    | PRESERVATIVE PRESSURE TREATED        |
| PR     | PAIR                                 |
| PSF    | PER SQUARE FOOT                      |
| RD     | ROOF DRAIN                           |
| SF     | SQUARE FOOT                          |
| SIM    | SIMILAR                              |
| SPEC   | SPECIFICATIONS                       |
| TYP    | TYPICAL                              |
| UL     | UNDERWRITER'S LABORATORIES           |
| UCON   | UNLESS OTHERWISE NOTED               |
| VERT   | VERTICAL                             |
| VIF    | VERIFY IN FIELD                      |
| W/     | WITH                                 |
| W/O    | WITHOUT                              |
- | SHEET INDEX   |  |                       |
|---------------|--|-----------------------|
| SHEET NUMBER  | SHEET NAME                                     | CURRENT REVISION DATE |
| GENERAL       |  |                       |
| G-000         | Coversheet                                     | 01.21.2025            |
| G-001         | Architectural General Notes & Abbreviations    | 01.21.2025            |
| ARCHITECTURAL |  |                       |
| AD101         | Level 1 Demo Plan - Overall                    | 01.21.2025            |
| AD101A        | Level 1 Demo Plan - Sector A - Alternate No. 1 | 01.21.2025            |
| A-101         | Level 1 Plan - Overall                         | 01.21.2025            |
| A-101A        | Level 1 Plan - Sector A - Alternate No. 1      | 01.21.2025            |
| A-121         | Level 1 Ceiling Plan - Overall                 | 01.21.2025            |
| MECHANICAL    |  |                       |
| M-0.01        | Mechanical Symbol Legend                       | 01.21.2025            |
| M-0.02        | Mechanical General Notes                       | 01.21.2025            |
| MD3.01        | Mechanical-Electrical Demo Floor Plan          | 01.21.2025            |
| MD4.01        | Mechanical-Electrical New Floor Plan           | 01.21.2025            |
| M-7.00        | Mechanical Schedules                           | 01.21.2025            |
| M-8.00        | Mechanical-Electrical Details                  | 01.21.2025            |
| M-9.00        | Mechanical Controls                            | 01.21.2025            |
| M-9.01        | Smoke Control Requirements                     | 01.21.2025            |
- ALTERNATES:  
ALTERNATE NO. 1: INSTALL NEW INLINE SEF-1-2 AND SEF-1-3 (REF MEP); REMOVE EXISTING DOOR AT ROOM 1-K AND ADJACENT CMU-BRICK WALL TO FACILITATE BRINGING NEW EQUIPMENT IN TO ROOM; REPLACE CMU-BRICK WALL. INSTALL NEW FRAME AND RE-INSTALL SALVAGED DOOR AND HARDWARE.
- 
- Dallas County Facilities Management
- 600 Commerce St.
- Dallas, TX 75202
- Low Sterrett Justice Center West Tower First Floor Smoke Evacuation System Upgrade
- 111 W Commerce St.  
Dallas, Texas 75202
- Date Issued For  
01.21.2025 Issue for Construction
- VICINITY MAP
- 
- HED
- 15301 Spectrum Dr.  
Suite 450  
Addison, Texas  
75001 USA
- (972) 934-8888
- WWW.HED.DESIGN
- 
- ©2025
- 2023-DC048-002
- Architectural General Notes & Abbreviations
- G-001





KEYNOTES	
Key Value	Keynote Text
101	ALTERNATE NO. 1 EXISTING DOOR, DOOR FRAME AND 24" OF CMU TO BE DEMOLISHED.

DEMOLITION PLAN NOTES

1. THE ARCHITECT HAS NO RESPONSIBILITY FOR THE DISCOVERY, PRESENCE, HANDLING, REMOVAL, OR DISPOSAL OF, OR EXPOSURE OF PERSONS TO, HAZARDOUS MATERIALS OR TOXIC SUBSTANCES IN ANY FORM AT THE PROJECT SITE, INCLUDING BUT NOT LIMITED TO, ASBESTOS, ASBESTOS PRODUCTS, POLYCHLORINATED BIPHENYL (PCB), LEAD PAINT OR OTHER TOXIC SUBSTANCES. THE FACT THAT THESE DOCUMENTS DO NOT INDICATE THE PRESENCE OF OR REMOVAL OR CONTAINMENT OF THE FOREGOING IS NOT INTENDED TO INDICATE THAT THESE MATERIALS OR SUBSTANCES, AMONG OTHERS, ARE NOT PRESENT AND ARE NOT REQUIRED TO BE REMOVED OR CONTAINED IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.
2. PORTIONS OF THE BUILDING IMMEDIATELY ADJACENT TO THE PROJECT AREA WILL BE OCCUPIED DURING SELECTIVE DEMOLITION. WORK SHALL NOT DISTURB NORMAL OPERATIONS ADJACENT TO AREAS IDENTIFIED FOR SELECTIVE DEMOLITION WITHOUT THE EXPRESS CONSENT OF PARTIES AFFECTED. DISTURBANCE MAY INCLUDE, WITHOUT LIMITATION, DUST, DIRT, DEBRIS, NOISE, ODORS, ETC.
3. CONDUCT WORK IN MANNER THAT WILL MINIMIZE NEED FOR DISRUPTION OF NORMAL OPERATIONS. PROVIDE MINIMUM 72 HOURS ADVANCE NOTICE OF DEMOLITION ACTIVITIES DISRUPTING OPERATIONS IN AREAS AROUND THE WORK, INCLUDING ON LEVELS ABOVE OR BELOW AS APPLICABLE.
4. PROVIDE TEMPORARY BARRICADES AND OTHER FORMS OF PROTECTION TO PROTECT STAFF PERSONNEL AND GENERAL PUBLIC FROM INJURY DURING SELECTIVE DEMOLITION WORK.
5. CONTRACTOR SHALL VERIFY EXISTING BUILDING DIMENSIONS, PARTITION AND WALL LOCATIONS AND FLOOR ELEVATIONS IN FIELD AND NOTIFY THE ARCHITECT OF DISCREPANCIES PRIOR TO START OF WORK.
6. CONTRACTOR TO DOCUMENT EXISTING CONDITIONS PRIOR TO START OF WORK USING PHOTOGRAPHS, VIDEOS, OR OTHER MEANS WHICH CAN BE READILY SHARED. SUCH DOCUMENTATION WILL BE MADE AVAILABLE TO ARCHITECT AS REQUIRED BELOW.
7. PROTECT FROM DAMAGE EXISTING FINISH WORK THAT IS TO REMAIN IN PLACE AND IS EXPOSED DURING DEMOLITION OPERATIONS. RESTORE ANY DAMAGED FINISHES TO CONDITION PRIOR TO START OF WORK.
8. PROTECT FLOORS WITH SUITABLE COVERING WHEN NECESSARY.
9. COVER AND PROTECT FURNITURE, EQUIPMENT, AND FIXTURES FROM SOILING OR DAMAGE WHEN DEMOLITION WORK IS PERFORMED IN AREAS WHERE SUCH ITEMS HAVE NOT BEEN REMOVED. RESTORE ANY SUCH ELEMENTS THAT ARE DAMAGED TO CONDITION PRIOR TO DEMOLITION WORK.
10. PRIOR TO CUTTING EXISTING CONSTRUCTION, LOCATE AND VISIBLY MARK SERVICES TO REMAIN IN OPERATION, INCLUDING FLOOR PENETRATIONS, UNDOCUMENTED CONDITIONS, UTILITY RISERS, ETC., AND WALLS THAT CONTAIN VERTICAL RISERS THAT REMAIN IN OPERATION DURING THE DEMOLITION WORK.
11. IF UNANTICIPATED MECHANICAL, ELECTRICAL, OR STRUCTURAL ELEMENTS THAT CONFLICT WITH INTENDED FUNCTION OF DESIGN ARE ENCOUNTERED, INVESTIGATE, MEASURE AND DOCUMENT NATURE AND EXTENT OF CONFLICT AND NOTIFY ARCHITECT BEFORE PROCEEDING.
12. MAINTAIN EXISTING UTILITIES INDICATED TO REMAIN IN SERVICE AND PROTECT THEM AGAINST DAMAGE DURING DEMOLITION OPERATIONS. DO NOT INTERRUPT UTILITIES SERVING FUNCTIONING FACILITIES, EXCEPT WHEN AUTHORIZED IN WRITING BY AUTHORITIES HAVING JURISDICTION. PROVIDE TEMPORARY SERVICES ACCEPTABLE TO GOVERNING AUTHORITIES DURING INTERRUPTIONS TO EXISTING UTILITIES.
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16. IF ROOFING, GLAZING, FLASHING, COPING OR PORTIONS OF EXTERIOR WALLS ARE REMOVED OR OPENED, SUITABLE THERMAL AND/OR MOISTURE OR VAPOR PROTECTION SHALL BE PROVIDED AND MAINTAINED FOR THE DURATION SUCH ELEMENTS OR PORTIONS OF THE BUILDING ARE OPEN TO WEATHER.
17. ERECT AND MAINTAIN 1 HOUR FIRE RESISTANCE RATED TEMPORARY PARTITIONS WHERE REQUIRED OR AS DIRECTED BY THE AHJ TO PROTECT EXISTING CONSTRUCTION AND ADJACENT OPERATIONS.
18. REMOVAL OF ITEMS NOTED INCLUDES REMOVAL OF ASSOCIATED ANCHORS, ADHESIVES, HARDWARE, CONDUIT, WIRE, PIPING, FASTENERS, BRACKETS, SUPPORTS, ETC., TO BARE EXISTING STRUCTURE.
19. NEW CEILING INSTALLATIONS ARE NOT TO REUSE COMPONENTS OF OLD OR REMOVED CEILING SYSTEMS, WHERE EXISTING CEILINGS ARE INDICATED TO BE DEMOLISHED, COMPLETELY REMOVE EXISTING CEILING AND SUSPENSION SYSTEM COMPONENTS, INCLUDING BRACKETS, SUPPORT WIRES, SPLY WIRES, COMPRESSION STRUTS, AND ATTACHMENTS TO STRUCTURE.
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21. REFER TO FINISH PLANS/SCHEDULES FOR SELECTIVE DEMOLITION OF EXISTING FINISHES THAT MAY BE REQUIRED IN AREAS NOT INDICATED ON THESE DRAWINGS.
22. SELECTIVE LIMITED DEMOLITION OF CEILINGS ON LEVEL BELOW (NOT SHOWN) MAY BE REQUIRED TO ACCOMMODATE INSTALLATION OF NEW STRUCTURAL, MECHANICAL, PLUMBING OR ELECTRICAL WORK. RESTORE CEILINGS TO CONDITION PRIOR TO DEMOLITION.
23. REMOVE WALL COVERING AND BASE AT EXISTING WALLS SCHEDULED TO RECEIVE NEW FINISHES. PREP WALL TO RECEIVE SCHEDULED FINISH. REFER TO FINISH PLANS/SCHEDULES FOR EXTENT OF DEMOLITION.
24. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

DEMOLITION LEGEND

- EXISTING TO BE REMOVED
- EXISTING TO REMAIN
- N.I.C.



Dallas County  
Facilities  
Management

600 Commerce St.

Dallas, TX 75202

Low Sterrett  
Justice Center  
West Tower First  
Floor Smoke  
Evacuation System  
Upgrade

111 W Commerce St.

Dallas, Texas 75202

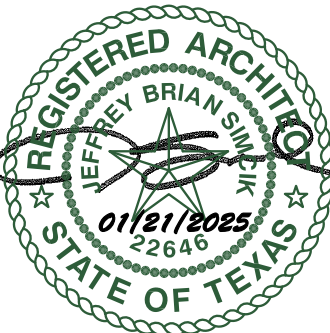
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Level 1 Demo  
Plan - Overall

AD101



KEYNOTES		
Key Value	Keynote Text	
101	ALTERNATE NO. 1 EXISTING DOOR, DOOR FRAME AND 24" OF CMU TO BE DEMOLISHED.	

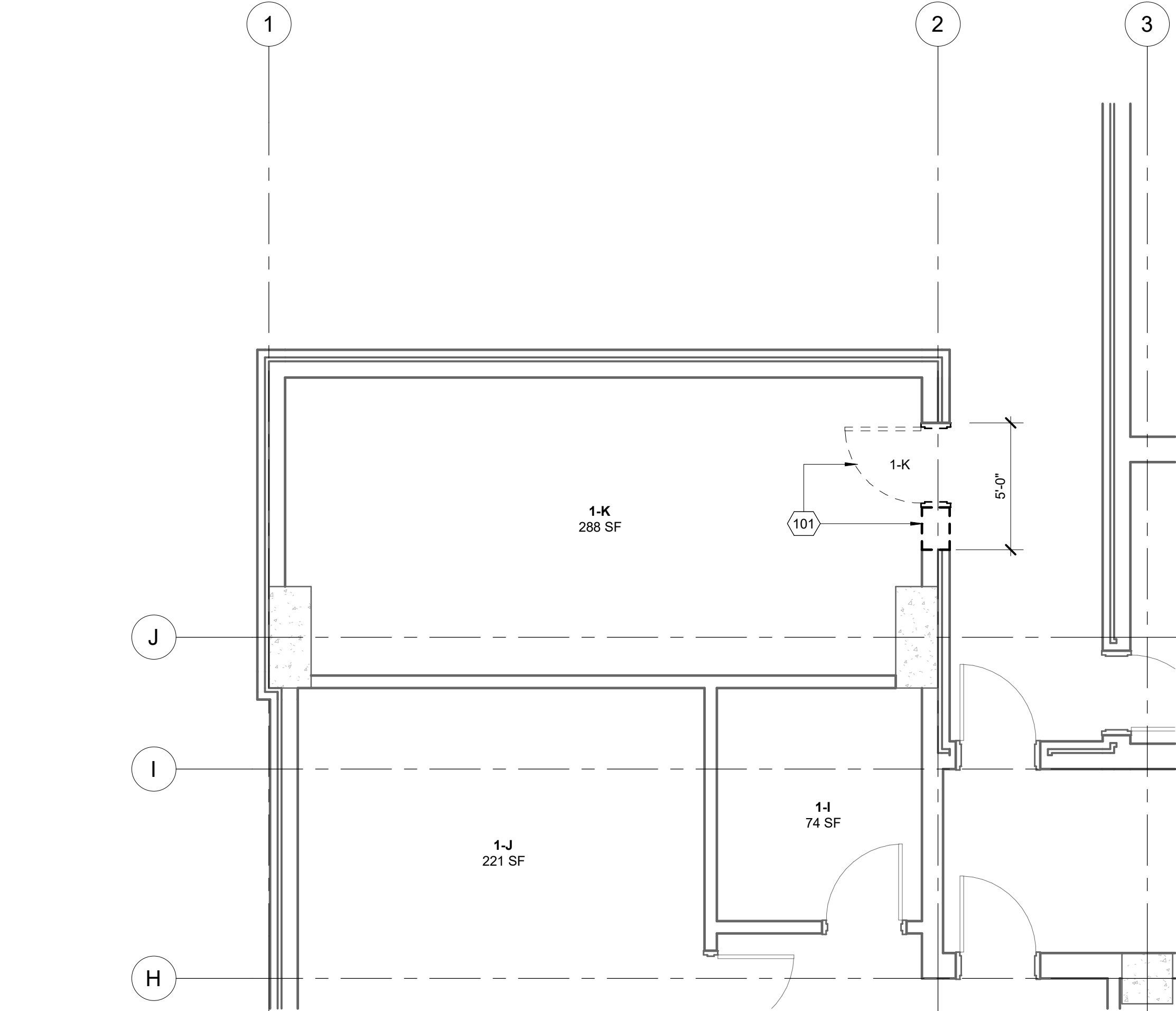
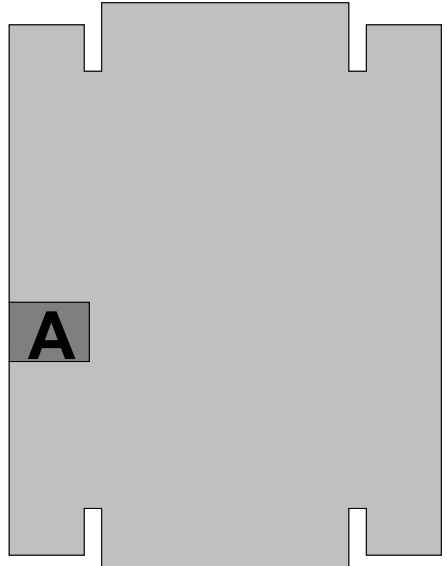
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24. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

DEMOLITION LEGEND

- EXISTING TO BE REMOVED
- EXISTING TO REMAIN
- N.I.C.

KEY PLAN



  LEVEL 1 DEMO PLAN - SECTOR A  
1/4" = 1'-0"



Dallas County  
Facilities  
Management

600 Commerce St.  
Dallas, TX 75202

Low Sterrett  
Justice Center  
West Tower First  
Floor Smoke  
Evacuation System  
Upgrade

111 W Commerce St.  
Dallas, Texas 75202

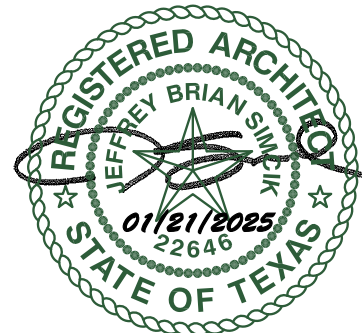
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75001 USA

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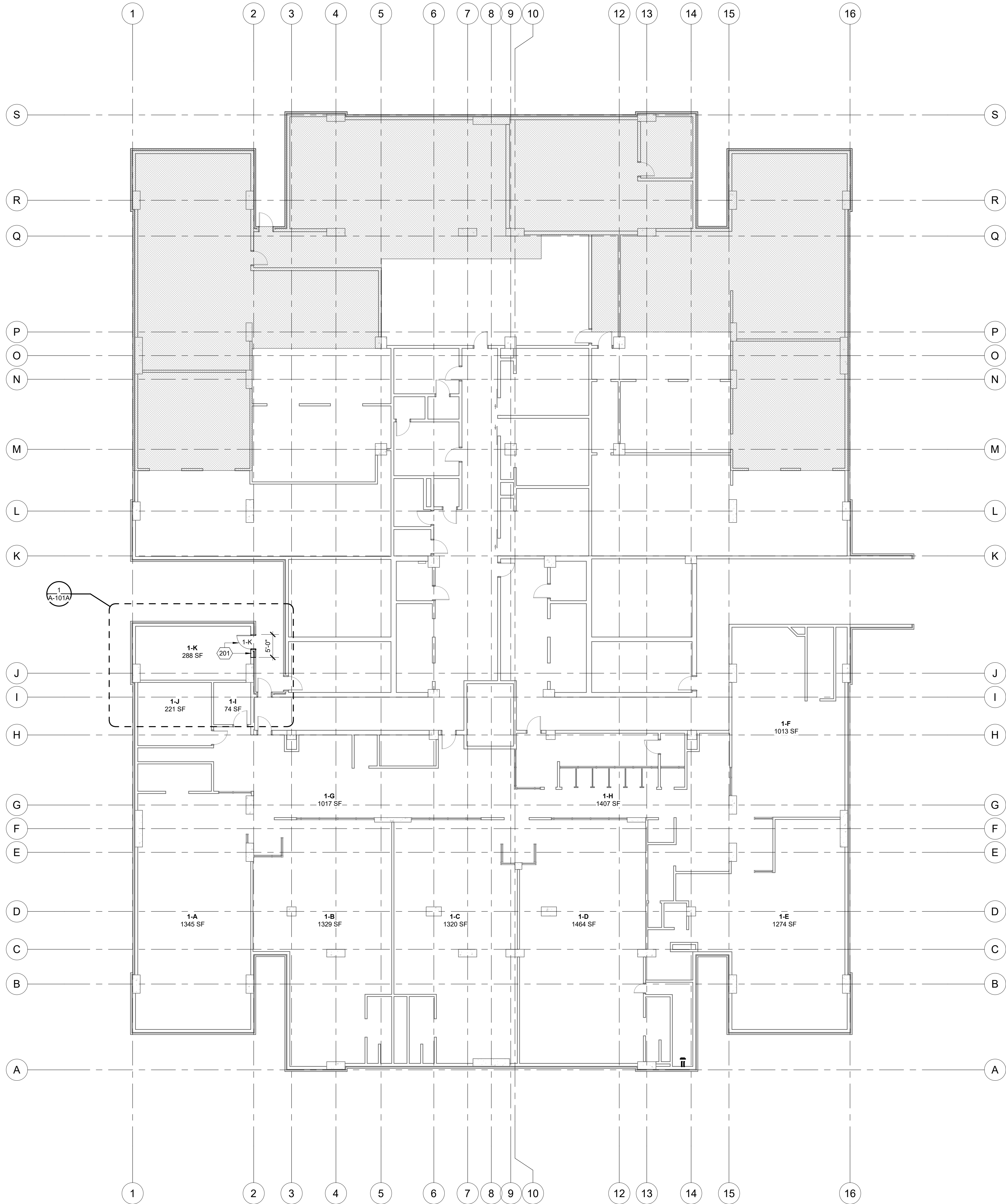
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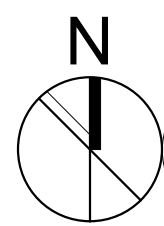
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Level 1 Demo  
Plan - Sector A -  
Alternate No. 1

AD101A





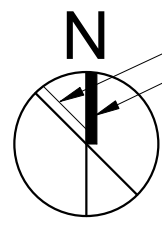


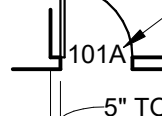






 **1** LEVEL 1 PLAN - OVERALL  
3/32" = 1'-0"

KEYNOTES	
Key Value	Keynote Text
201	ALTERNATE NO. 1 REINSTALL DOOR, DOOR FRAME AND EXTERIOR WALL (TYP.), PAINT TO MATCH EXISTING.

FLOOR PLAN NOTES

- CONTRACTOR TO COORDINATE AND PROVIDE BACKING FOR ALL ITEMS IN CONTRACT, AS WELL AS ITEMS NOTED WHICH ARE IDENTIFIED AS NOT IN CONTRACT (NIC) OR ITEMS WHICH ARE OWNER-PROVIDED OR VENDOR-PROVIDED. SUCH ITEMS MAY INCLUDE, BUT ARE NOT LIMITED TO, SIGNAGE, VISUAL BOARD UNITS, CONFERENCEING 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.
- DO NOT SCALE DRAWINGS. USE DIMENSIONS INDICATED.
- CONTRACTOR SHALL VERIFY BUILDING DIMENSIONS, PARTITION AND WALL LOCATIONS, AND FLOOR ELEVATIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES PRIOR TO START OF WORK.
- 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.
- 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.
- COORDINATE SIZE AND LOCATION OF ALL ACCESS PANELS WITH APPROPRIATE TRADES.
- ALL DIMENSIONS ARE TO FACE OF GYPSUM BOARD, NOMINAL FINISH FACE OF CONCRETE, OR NOMINAL FACE OF MASONRY UNLESS OTHERWISE NOTED.
- PROVIDE FIREPROOFING CONTINUITY WITH EXISTING CONDITIONS, USING LIKE SYSTEMS AS EXISTING. WHERE REQUIRED, VERIFY CONSTRUCTION OF EXISTING ELEMENTS IDENTIFIED AS FIRE RATED AND REPORT CONDITIONS NEGATIVELY IMPACTING RATING OF ELEMENT TO ARCHITECT.
- PATCH AND REPAIR EXISTING PARTITIONS AND AT NEW DOOR OPENINGS.
- PATCH AND REPAIR EXISTING CONCRETE SLAB AND/OR DECK AT REMOVED FLOOR DRAINS, WATER CLOSETS, DUCT PENETRATIONS AND OTHER REMOVED UTILITIES. PROVIDE CONCRETE IN THICKNESS REQUIRED TO MAINTAIN FIRE RATING OF FLOOR SLAB. REFER TO STRUCTURAL DRAWINGS FOR REQUIRED REINFORCEMENT OR ANCHORING. REPAIR OR INSTALL FIREPROOFING UNDER SLAB AS REQUIRED TO MATCH EXISTING CONSTRUCTION OR AS REQUIRED BY AHJ.

FLOOR PLAN LEGEND

-  TRUE NORTH  
PROJECT NORTH
-  NEW STRUCTURAL GRID LINE
-  EXISTING STRUCTURAL GRID LINE
-  DOOR MARK  
NEW DOOR  
5" TO DOOR OPENING - TYP (UON)
-  EXISTING DOOR TO REMAIN
-  PARTITION TYPE  
(SEE PARTITION TYPES SHEET)
-  ROOM NAME  
101
-  FLOOR DRAIN (FD)
-  TRENCH DRAIN (TD)
-  FIRE EXTINGUISHER CABINET



Dallas County  
Facilities  
Management

600 Commerce St.

Dallas, TX 75202

Low Sterrett  
Justice Center  
West Tower First  
Floor Smoke  
Evacuation System  
Upgrade

111 W Commerce St.  
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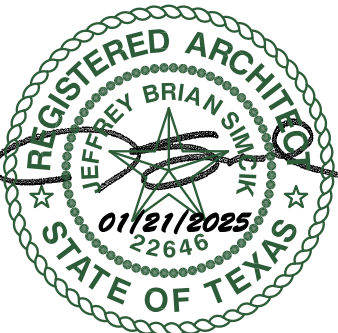
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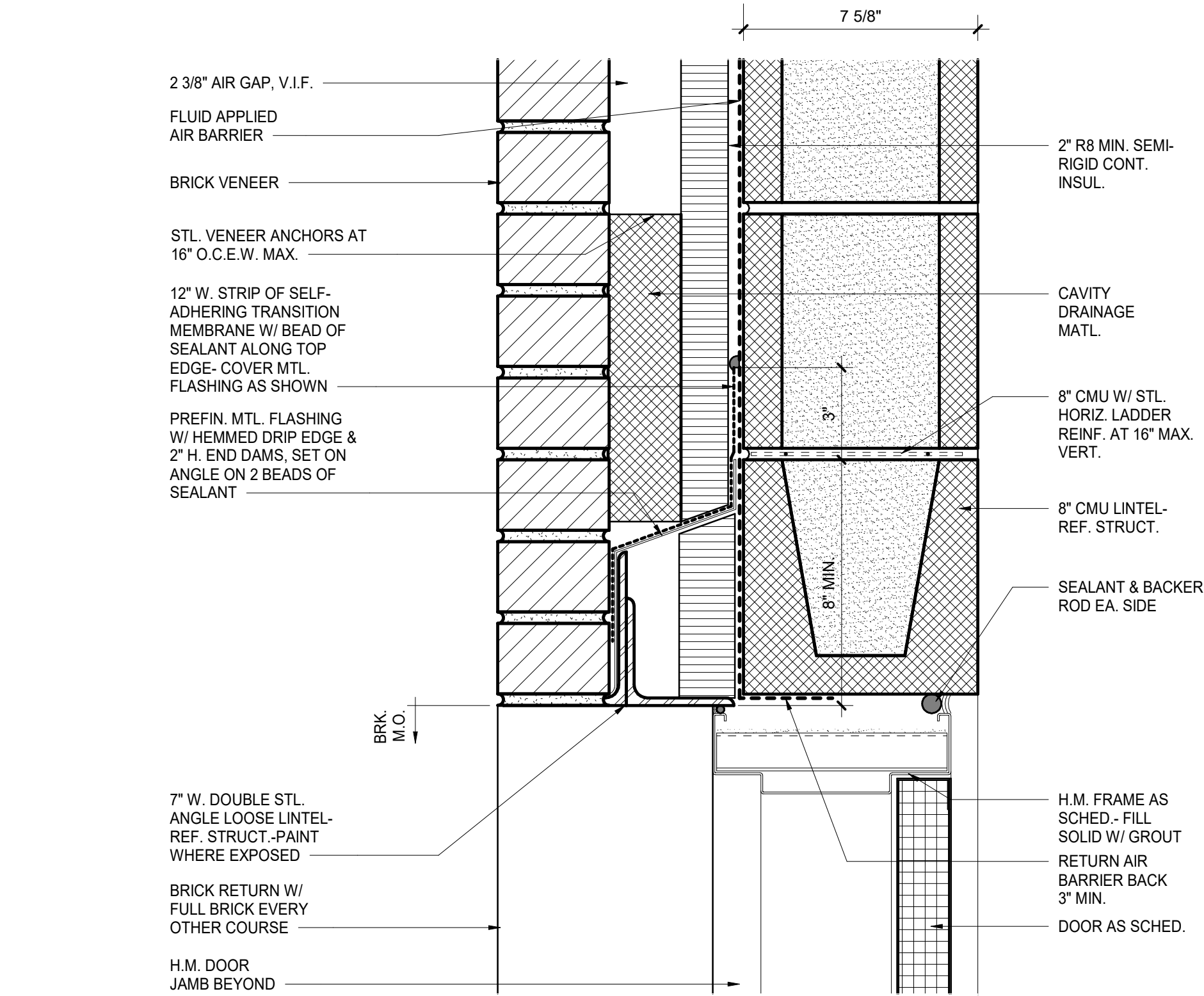
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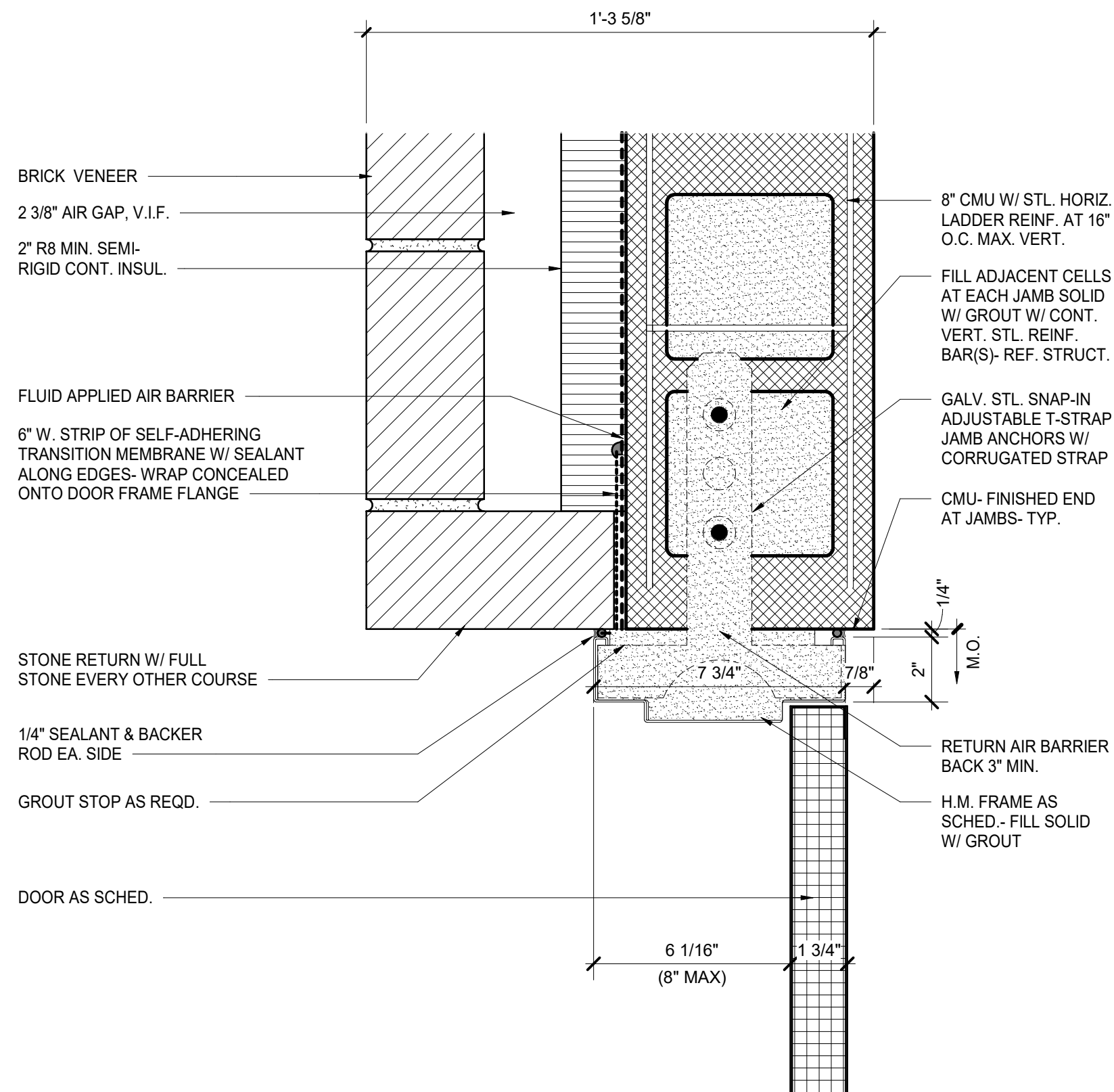
Level 1 Plan -  
Overall

A-101

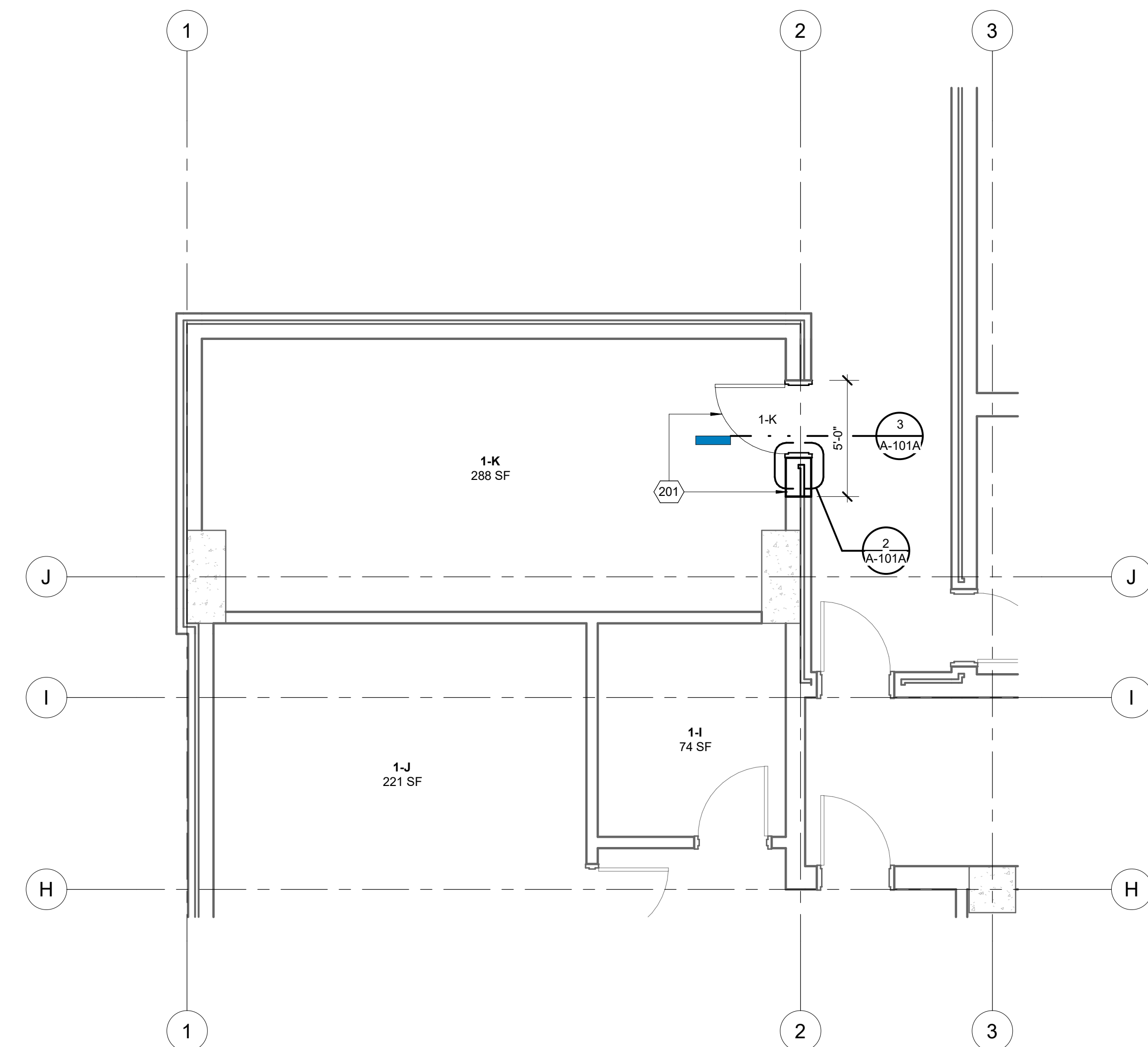




3 H.M. DOOR HEAD AT BRICK VENEER & 8" CMU  
3" = 1'-0"



2 HM DOOR FRAME JAMB DETAIL  
3" = 1'-0"



LEVEL 1 PLAN - SECTOR A  
1/4" = 1'-0"

KEYNOTES	
Key Value	Keynote Text
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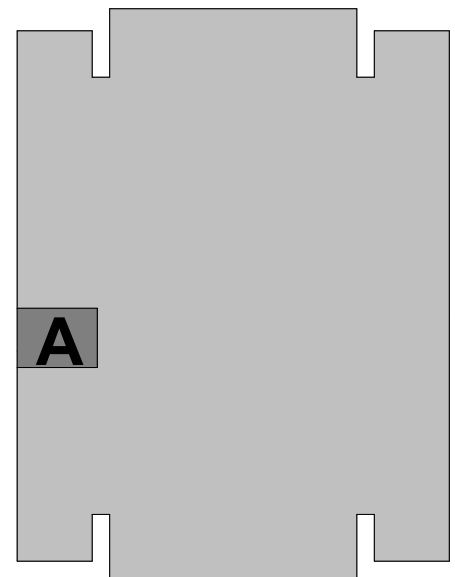
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## FLOOR PLAN LEGEND

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PROJECT NORTH
- COL** NEW STRUCTURAL GRID LINE
- COL** EXISTING STRUCTURAL GRID LINE
- 101A** DOOR MARK  
NEW DOOR  
5" TO DOOR OPENING - TYP (JON)
- EXISTING DOOR TO REMAIN**
- HWSA** PARTITION TYPE  
(SEE PARTITION TYPES SHEET)
- ROOM NAME** ROOM NAME & NUMBER  
101
- FLOOR DRAIN (FD)**
- TRENCH DRAIN (TD)**
- F.E.C.** FIRE EXTINGUISHER CABINET

## KEY PLAN



Dallas County  
Facilities  
Management

600 Commerce St.  
Dallas, TX 75202

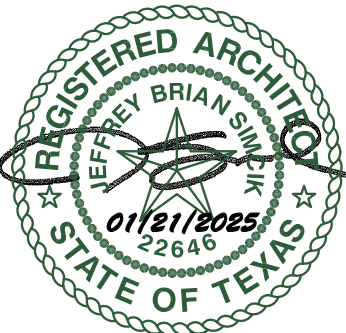
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75001 USA  
(972) 934-8888  
WWW.HED.DESIGN

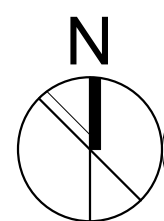
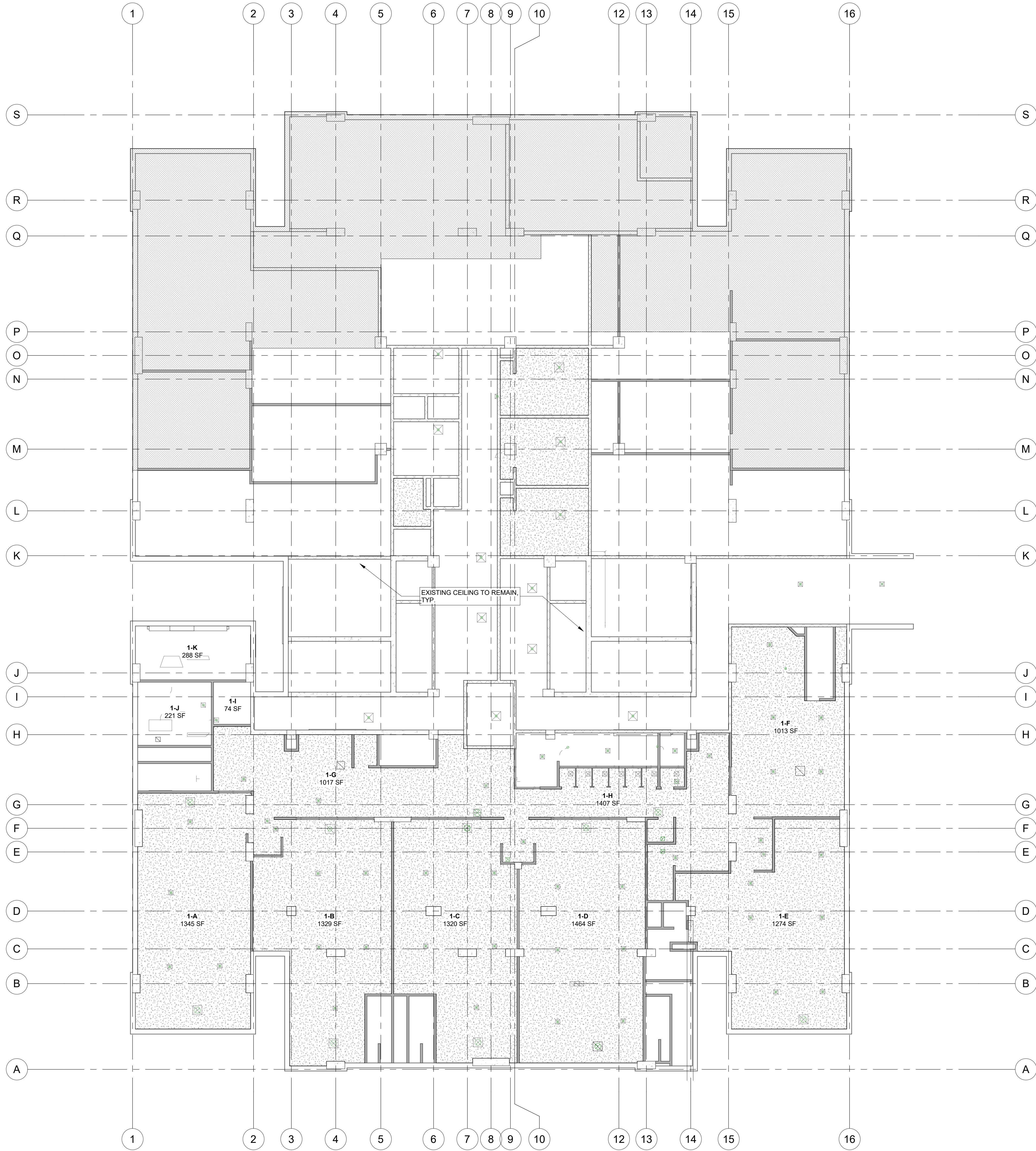


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2023-DC048-002

Level 1 Plan -  
Sector A -  
Alternate No. 1

A-101A





1 LEVEL 1 CEILING PLAN - OVERALL (FOR REFERENCE)

CEILING NOTES

1. RCP IS INCLUDED FOR REFERENCE.
2. ALL ABOVE CEILING WORK IS TO OCCUR IN EXISTING PLENUM SPACE. ACCESS TO PLENUM IS THROUGH CHASES. CONTRACTOR TO VERIFY/CONFIRM.
3. ANY DAMAGE TO CEILING DURING WORK TO BE PATCHED AND REPAIRED TO PRE-CONSTRUCTION CONDITIONS INCLUDING STRUCTURAL INTEGRITY AND FINISH.

CEILING PLAN LEGEND

- EXISTING GYP MEMBRANE CEILING
- EXISTING HARD SECURITY CEILING TO REMAIN
- N.I.C.
- DOWN LIGHTS
- SMOKE DETECTORS
- SPEAKER (GRILLE)
- LIGHT FIXTURE (REFER ELEC. DWGS)
- EXIT SIGN
- SUPPLY AIR DIFFUSER
- RETURN AIR DIFFUSER
- LINEAR DIFFUSER
- JUNCTION BOX
- LIGHT SENSOR
- 2'-0" X 2'-0" FRAMELESS ACCESS PANEL



Dallas County  
Facilities  
Management

600 Commerce St.  
Dallas, TX 75202

Low Sterrett  
Justice Center  
West Tower First  
Floor Smoke  
Evacuation System  
Upgrade

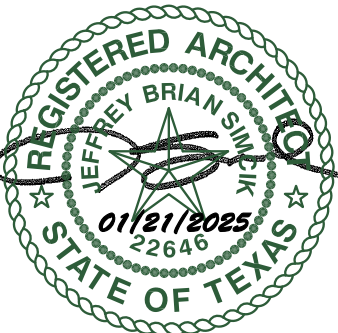
111 W Commerce St.  
Dallas, Texas 75202

Date Issued For  
01.21.2025 Issue for Construction

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15301 Spectrum Dr.  
Suite 450  
Addison, Texas  
75001 USA

(972) 934-8888  
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2023-DC048-002

Level 1 Ceiling  
Plan - Overall










A-121



# Dallas County Facilities

**LEW STERRETT  
JUSTICE CENTER  
WEST TOWER FIRST  
FLOOR SMOKE  
EVACUATION  
SYSTEM UPGRADE**

△	Date	Issued For
	01/21/2025	Issue For Construction

	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

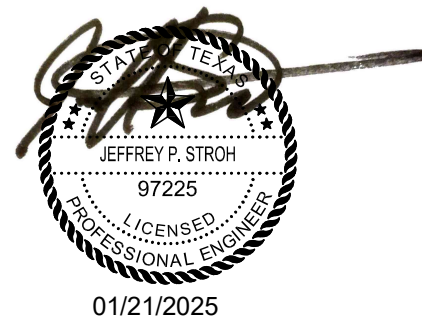
**CAMPOS**  
**ENGINEERING**  
1331 River Bend Drive  
Dallas, Texas 75247  
(214) 696-6291  
campos@camposengineering.com  
Registration No: F-001731  
Project Number: D24-3623.00

**HED**

15301 Spectrum Dr.  
Suite 450  
Addison, Texas  
75001 USA

(972) 934-8888

[WWW.HED.DESIGN](http://WWW.HED.DESIGN)

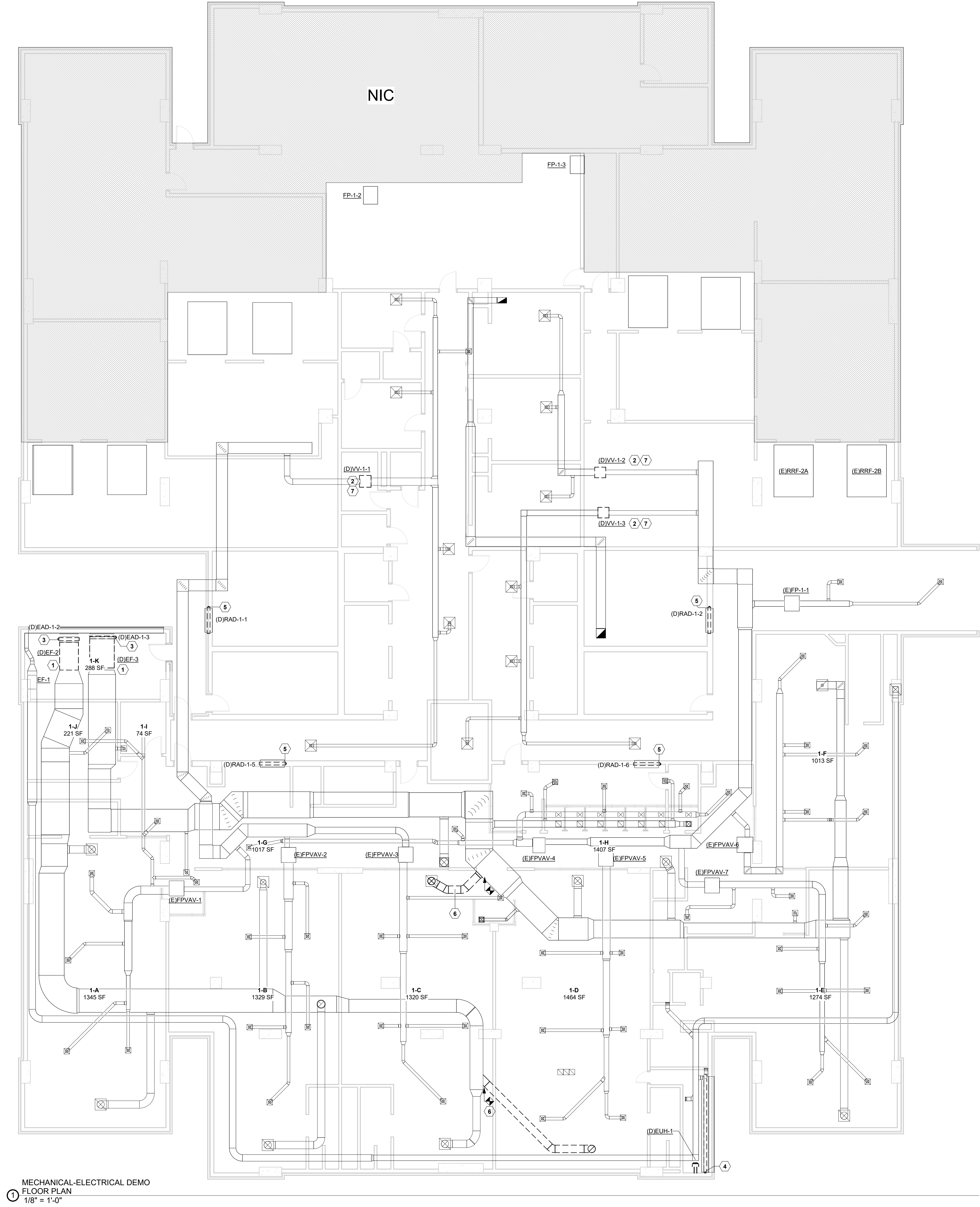




ABBREVIATIONS									
A (0.5)	COMPRESSED AIR (WORKING PRESS.)	FCU	FAN COIL UNIT	POS	POSITIVE				
AAV	AUTOMATIC AIR VENT	FD	FLOOR DRAIN	PR	PUMPED RETURN				
ABV	ABOVE	°F	FAHRENHEIT [DEGREES]	PG	PRESSURE GAUGE				
AC	ALTERNATING CURRENT	FLA	FULL LOAD AMPS	PH	PHASE				
A/C	AIR CONDITIONING	FLG	FLANGE	PHC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

MECHANICAL GENERAL NOTES	
1.	ISOLATION VALVES SHALL BE PROVIDED IN ALL BRANCH PIPING AND AT EQUIPMENT CONNECTIONS.
2.	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.
3.	INSTALL MANUAL AIR VENTS AT THE HIGH POINTS OF THE PIPING SYSTEMS.
4.	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 UON. GROUP PIPING AT COMMON BOP ELEVATIONS WHENEVER PRACTICAL. PIPES LOCATED IN CONCEALED SPACES SHALL BE ROUTED CLOSE TO BUILDING STRUCTURE UON.
5.	INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE OR EQUIPMENT CONNECTED.
6.	INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.
7.	INSTALL VALVES AND EQUIPMENT IN ACCESSIBLE LOCATIONS. INSTALL ACCESS DOORS IN PARTITIONS OR CEILINGS WHERE VALVES AND EQUIPMENT WOULD OTHERWISE BE INACCESSIBLE.
8.	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.
9.	IDENTIFY EACH PIPE WITH LABELING AS REQUIRED BY SPECIFICATIONS.
10.	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.
11.	SLEEVE ALL PIPING THAT PENETRATES EXTERIOR BUILDING WALLS AND GRADE BEAMS. SEAL PENETRATIONS WATERTIGHT.
12.	COORDINATE WITH OTHER TRADES BEFORE FABRICATION OR INSTALLATION OF ANY SYSTEMS.
13.	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.
14.	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 CONTRACT.
15.	ALL NEW DUCTWORK SHALL BE EXTERNALLY INSULATED AS SPECIFIED.
16.	WHERE REMOVAL OF EXISTING DUCTWORK OR PORTIONS OF ANY AIR SYSTEM IS NECESSARY, THE DUCT SHALL BE PATCHED AND SEALED AIRTIGHT 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.
17.	COORDINATE ALL REMODEL WORK WITH NEW CONSTRUCTION AND OTHER TRADES.
18.	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.
19.	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.
20.	ANY ITEMS DAMAGED DURING DEMOLITION SHALL BE REPLACED WITH NEW MATERIALS TO MATCH EXISTING.
21.	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.
22.	REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR LOCATIONS OF CEILING-MOUNTED HVAC DEVICES AND EQUIPMENT.
23.	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.
24.	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.
25.	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. 96A. FULLY-OPEN DAMPERS SHALL NOT HAVE ANY PROJECTIONS INTO THE AIRSTREAM.
26.	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.
27.	NEW HOLES THROUGH EXISTING FLOORS SHALL BE CORE DRILLED. ALL CORES SHALL BE X-RAYED PRIOR TO CORING.
28.	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.
29.	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.
30.	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.
31.	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.
32.	EXCEPT WHERE REQUIRED AT EQUIPMENT NOZZLES, FLANGES SHALL BE RAISED FACE WELD-NECK.
33.	INSTALL DIELECTRIC FITTINGS AT ALL FERROUS PIPE CONNECTIONS TO NON-FERROUS METALLIC PIPE OR EQUIPMENT.
34.	BULLHEAD TEES SHALL NOT BE USED TO JOIN CONVERGING (RETURN) FLOWS, REGARDLESS OF ARRANGEMENT SHOWN ON PLANS.
35.	PROVIDE ESCUTCHEON PLATES WHERE PIPES EXPOSED TO VIEW PENETRATE FINISHED WALLS, FLOORS AND CEILINGS. SPLIT-RING ESCUTCHEON PLATES SHALL NOT BE USED UON.
36.	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.
37.	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.





MECHANICAL-ELECTRICAL DEMO  
FLOOR PLAN  
1/8" = 1'-0"

MECHANICAL DEMOLITION SHEET NOTES	
A	REFER TO SYMBOL LEGEND AND GENERAL NOTES FOR ADDITIONAL INFORMATION.
B	REFER TO SPECIFICATIONS FOR ADDITIONAL INFORMATION.
C	EXISTING HVAC SYSTEMS, DUCTWORK, PIPING, ETC. ARE APPROXIMATE SIZES AND LOCATIONS BASED ON LIMITED AS-BUILTS AND FIELD OBSERVATIONS. CONTRACTOR IS RESPONSIBLE TO VERIFY ALL DIMENSIONS, SIZES, LOCATIONS, AND CONDITIONS BEFORE BEGINNING WORK. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/ENGINEER OF RECORD IN WRITING OF ANY DISCREPANCIES, OMISSIONS, AND/OR CONFLICTS BEFORE COMMENCEMENT OF WORK INTENDED IN THESE CONTRACT DOCUMENTS. COMMENCEMENT OF WORK SHALL CONSTITUTE THE ACCEPTANCE OF COMPATIBILITY OF ALL NEW OR EXISTING CONDITIONS. CONTRACTOR IS RESPONSIBLE TO PERFORM ALL WORK IN ACCORDANCE WITH ALL APPLICABLE CODES, ORDINANCES, REGULATORY AGENCIES, AND STANDARD INDUSTRY TRADE PRACTICES.

KEYNOTES	
1	(ADD ALTERNATE #1) DEMOLISH EXHAUST FAN. TEMPORARY CAP FOR NEW CONNECTION. DEMOLISH EXISTING CIRCUITS RE.M.400 FOR ADDITIONAL INFORMATION.
2	DEMOLISH EXISTING SINGLE DUCT VAV BOX AND ASSOCIATED CONTROLS. REUSE HANGERS, SUPPORTS, AND DUCTWORK. PROVIDE A TEMPORARY GAP ON LOW PRESSURE AND MEDIUM PRESSURE DUCTWORK DURING CONSTRUCTION.
3	DEMOLISH EXHAUST AIR DAMPER/ACTUATOR AND PREPARE FOR NEW CONNECTION.
4	DEMOLISH MAKEUP AIR DAMPER/ACTUATOR AND PREPARE FOR NEW CONNECTION.
5	DEMOLISH RETURN AIR DAMPER/ACTUATOR AND PREPARE FOR NEW CONNECTION.
6	REMOVE EXISTING DUCTWORK AS INDICATED.
7	CONTRACTOR TO DISCONNECT EXISTING VAV BOX, EXISTING CIRCUIT TO REMAIN FOR FUTURE USE.

Dallas County  
Facilities

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FLOOR SMOKE  
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Δ **Date** **Issued For**  
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**CAMPOS**  
**ENGINEERING**  
1331 River Bend Drive  
Dallas, Texas 75247  
(214) 696-6291  
campos@camposengineering.com  
Registration No: F-001131  
Project Number: D24-3623.00

**HED**  
15301 Spectrum Dr.  
Suite 450  
Addicks, Texas  
75001 USA  
(972) 934-8888  
WWW.HED.DESIGN

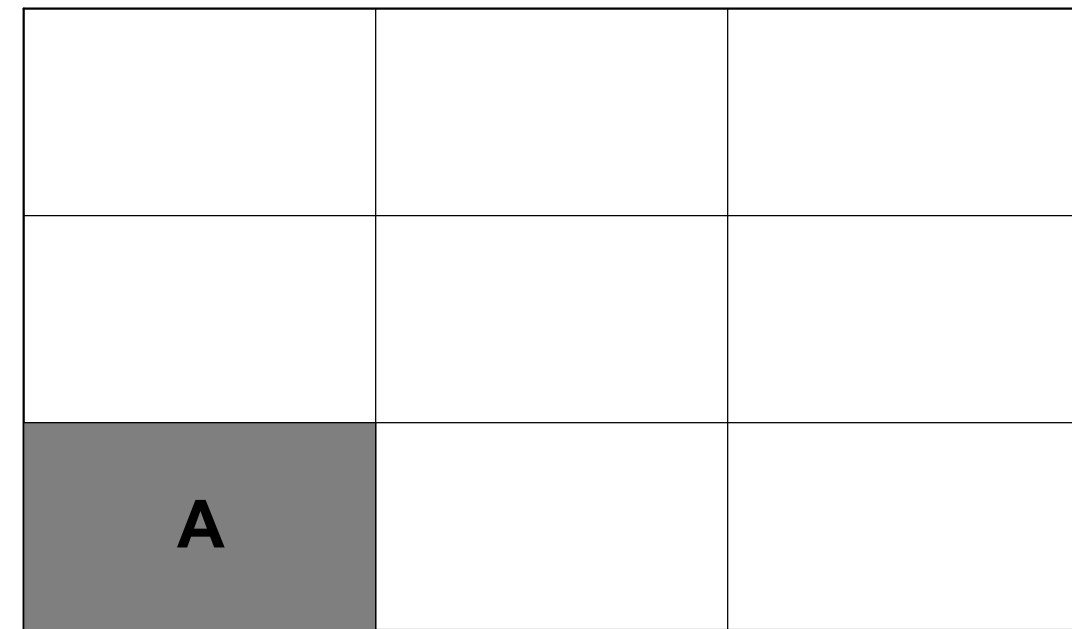
JEFFREY P. STRICK  
192225  
LICENSED MECHANICAL ENGINEER  
STATE OF TEXAS  
01/21/2025

2023-DC048-002

Mechanical-Electrical  
Demo Floor Plan

**MD3.01**


KEY PLAN








**LEGEND**

 Existing

 New Construction

KEY PLAN		
<b>A</b>		

△	Date	Issued For
	01/21/2025	Issue For Construction

01/21/2025



FAN SCHEDULE (ADD ALTERNATE #1)												
MARK SEF.	LOCATION	CFM	EXT. SP IN. W.G.	MOTOR DATA			DRIVE	MAX. SONES	CONTROL	MANUFACTURER AND MODEL NUMBER	WEIGHT (LBS.)	REMARKS
				HP/(WATTS)	V	PH						
1-2	MECH ROOM	14,320	2.5	10	460	3	BELT	25.0	SMOKE CONTROL	GREENHECK QEI	1100	ALL
1-3	MECH ROOM	17,560	2.5	15	460	3	BELT	25.0	SMOKE CONTROL	GREENHECK QEI	1100	ALL

1. OR APPROVED EQUAL.
2. PROVIDE OSHA APPROVED MOTOR AND FAN GUARDS.
3. RATED AND CERTIFIED FOR EMERGENCY SMOKE CONTROL.
4. PROVIDE A UL555S MOTORIZED DAMPER.
5. SUSPEND FROM STRUCTURE ABOVE, USE FAN MANUFACTURER'S HANGING VIBRATION ISOLATOR KIT.
6. PROVIDE MOTOR GUARD.
7. FAN CONTROL UL 864 LISTED.

SINGLE DUCT VAV BOX WITH ELECTRIC HEATING SCHEDULE												
MARK VV.	SERVES		INLET SIZE	AIR VALVE		ELECTRIC HEATING			POWER CONN.		MANUFACTURER MAKE AND MODEL	REMARKS
				DESIGN CFM	MIN CFM	EAT D.B.	LAT D.B.	KW	V	PH		
1-1	SECURITY VERSTIBULE/CORRIDOR/SHIFT SUPV/ REC DIR		12	1,455	440	55	95	5.6	277	1	ENVIRO-TEC SDR	ALL
1-2	HOLDING CELLS		10	785	240	55	95	3.0	277	1	ENVIRO-TEC SDR	ALL
1-3	CONTROL/CORRIDOR		10	1,010	310	55	95	3.9	277	1	ENVIRO-TEC SDR	ALL

1. PROVIDE WITH CONTROL TRANSFORMER.
2. PROVIDE 1" MATT-FACED INSULATION ON ALL INTERIOR SURFACES.
3. PROVIDE LEFT OR RIGHT HAND CONFIGURATIONS AS NECESSARY FOR ACCESSIBILITY.
4. PROVIDE RECOMMENDED MAINTENANCE CLEARANCES. PROVIDE ACCESS PANELS IN WALLS/CEILINGS AS REQUIRED.
5. PROVIDE CONTROLS PER SEQUENCE OF OPERATION AND SPECIFICATIONS.
6. HEATING COIL IS MOUNTED AT THE BOX DISCHARGE.
7. PROVIDE WITH SCR ELECTRIC HEATING.
8. PROVIDE WITH MODULATING HOT WATER CONTROL VALVE.
9. BOX SELECTION SHALL BE BASED ON 80 PERCENT OF MANUFACTURER'S LISTED MAXIMUM ALLOWABLE CFM.
10. CFM MIN/MAX VALUES REFER TO THE RANGE OF CAPABILITY FOR THIS AIR VALVE SIZE. IT IS NOT A MINIMUM/MAXIMUM SETTING.
11. PROVIDE WITH INTEGRAL DISCONNECT SWITCH.

ELECTRIC UNIT HEATER SCHEDULE												
MARK EUH.	TYPE	CFM	CAPACITY		POWER CONN.			MOTOR DATA			MANUFACTURER AND MODEL NUMBER	REMARKS
			KW	MBH	V.	Ph.	M.C.A.	H.P.	VOLTS	PH		
1	FAN	350	5.0	17	277	1	18	1/100	277	1	QMARK MUH05-71	1,2,3

1. PROVIDE INTEGRAL THERMOSTAT WITH LOCKING COVER.
2. OR APPROVED EQUAL.
3. PROVIDE MOUNTING HARDWARE, MOUNT AT SAME HIGHT AS EXISTING UNIT.

Dallas County  
Facilities

LEW STERRETT  
JUSTICE CENTER  
WEST TOWER FIRST  
FLOOR SMOKE  
EVACUATION  
SYSTEM UPGRADE

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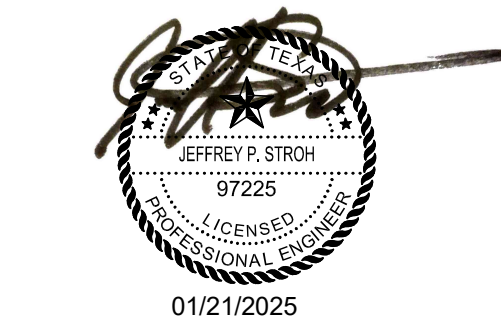
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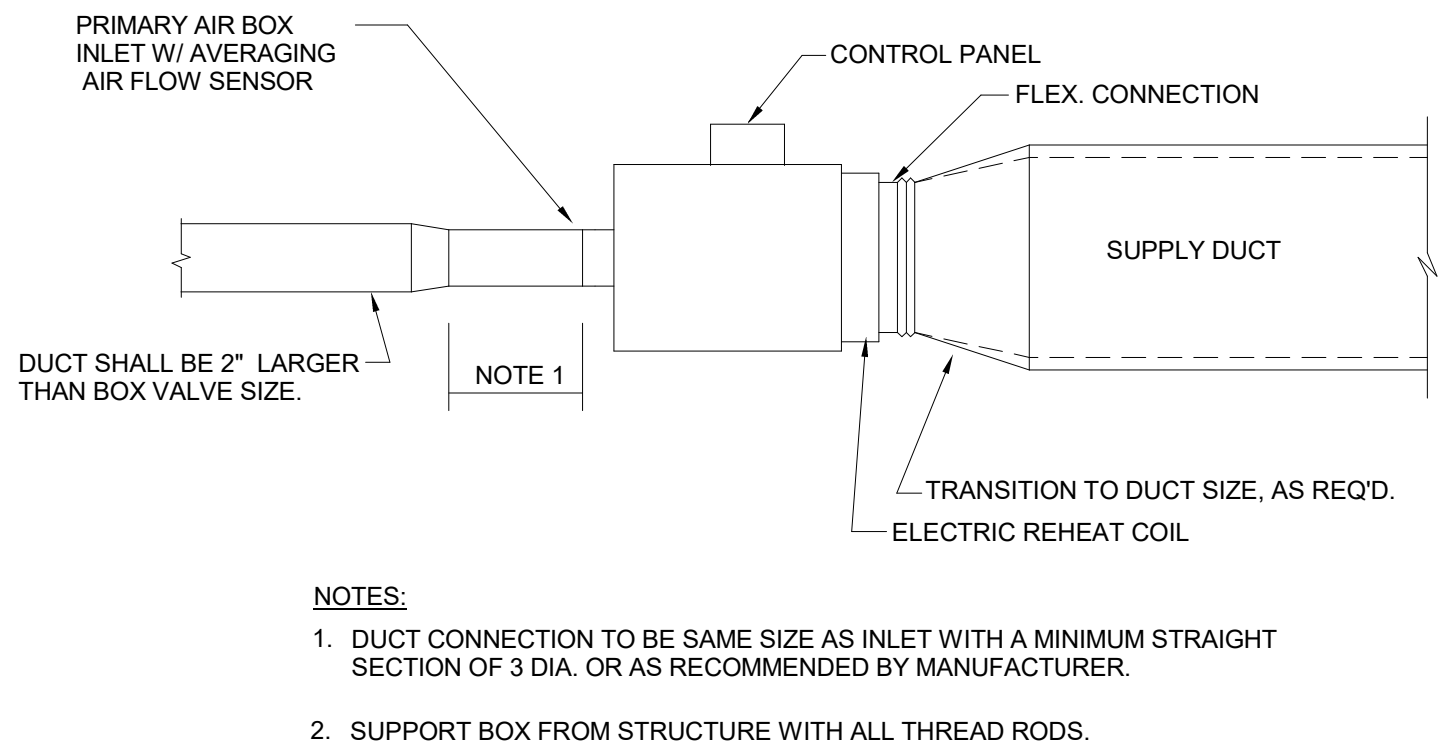
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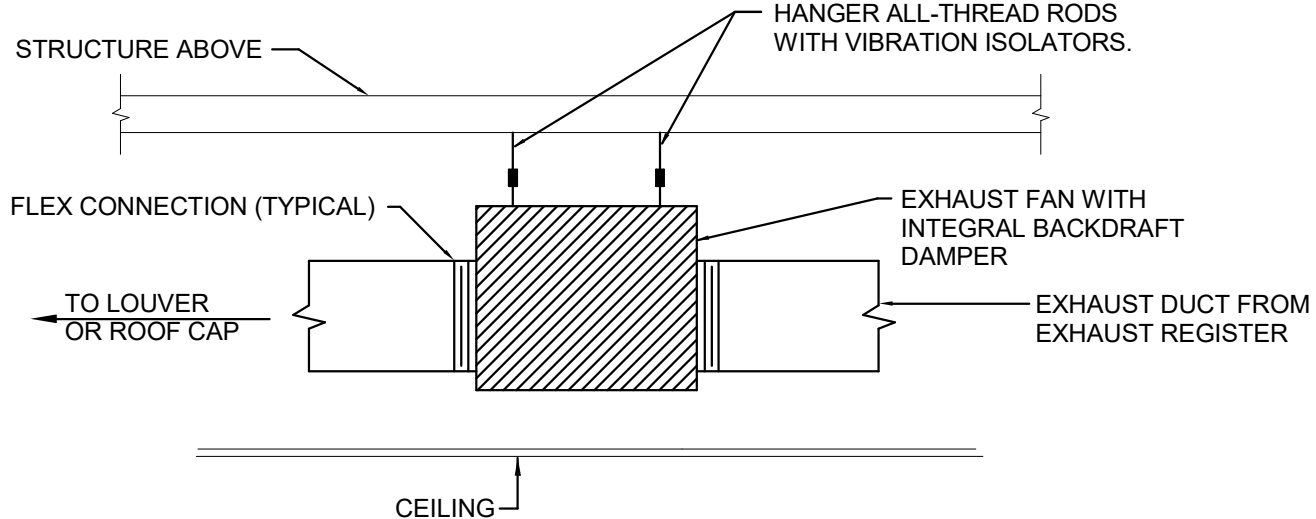
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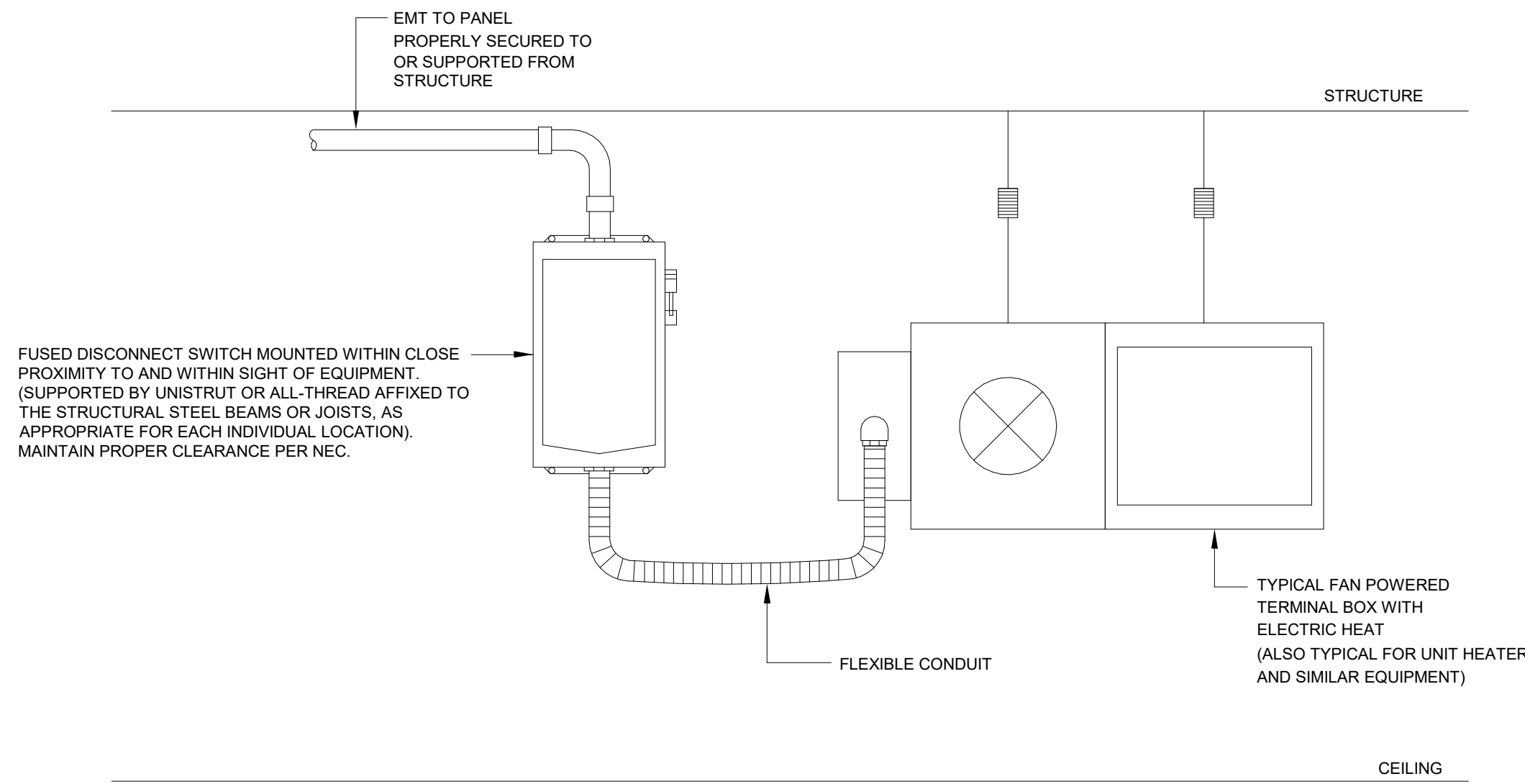
1 VAV BOX DETAIL

SCALE: NONE



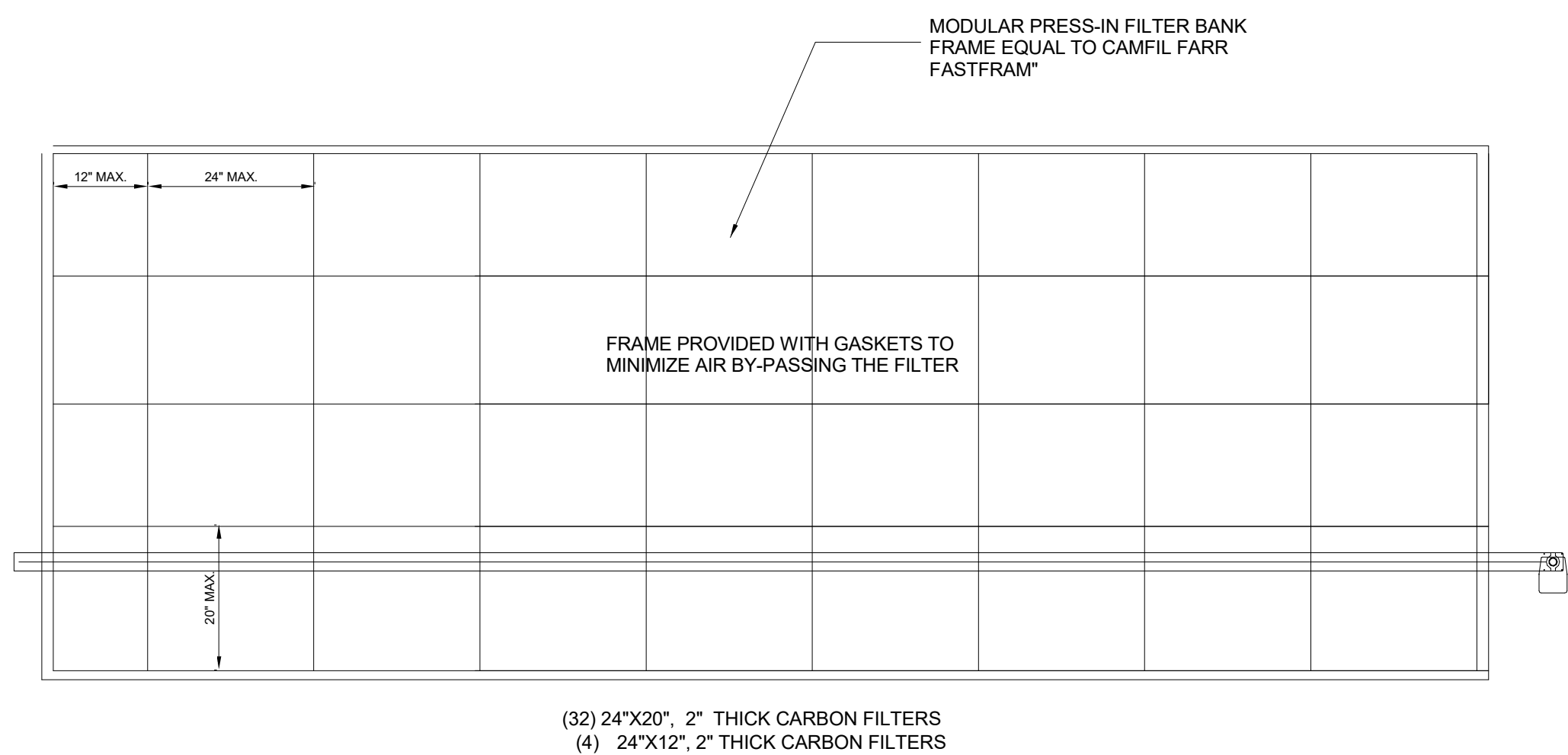
2 TYPICAL SUSPENDED INLINE EXHAUST FAN DETAIL

SCALE: NONE



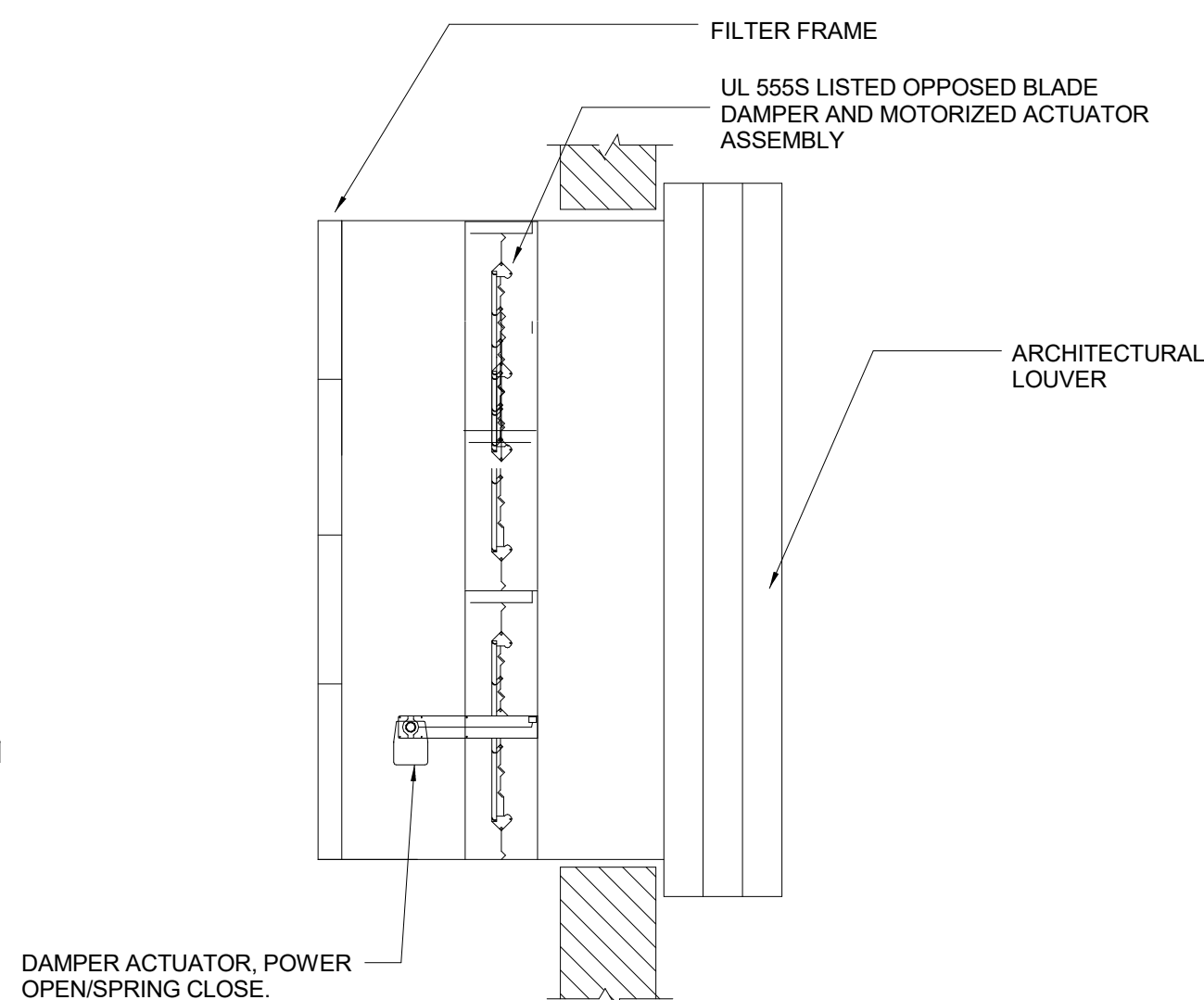
3 TYPICAL FAN POWER DISCONNECT BOX

SCALE: NONE



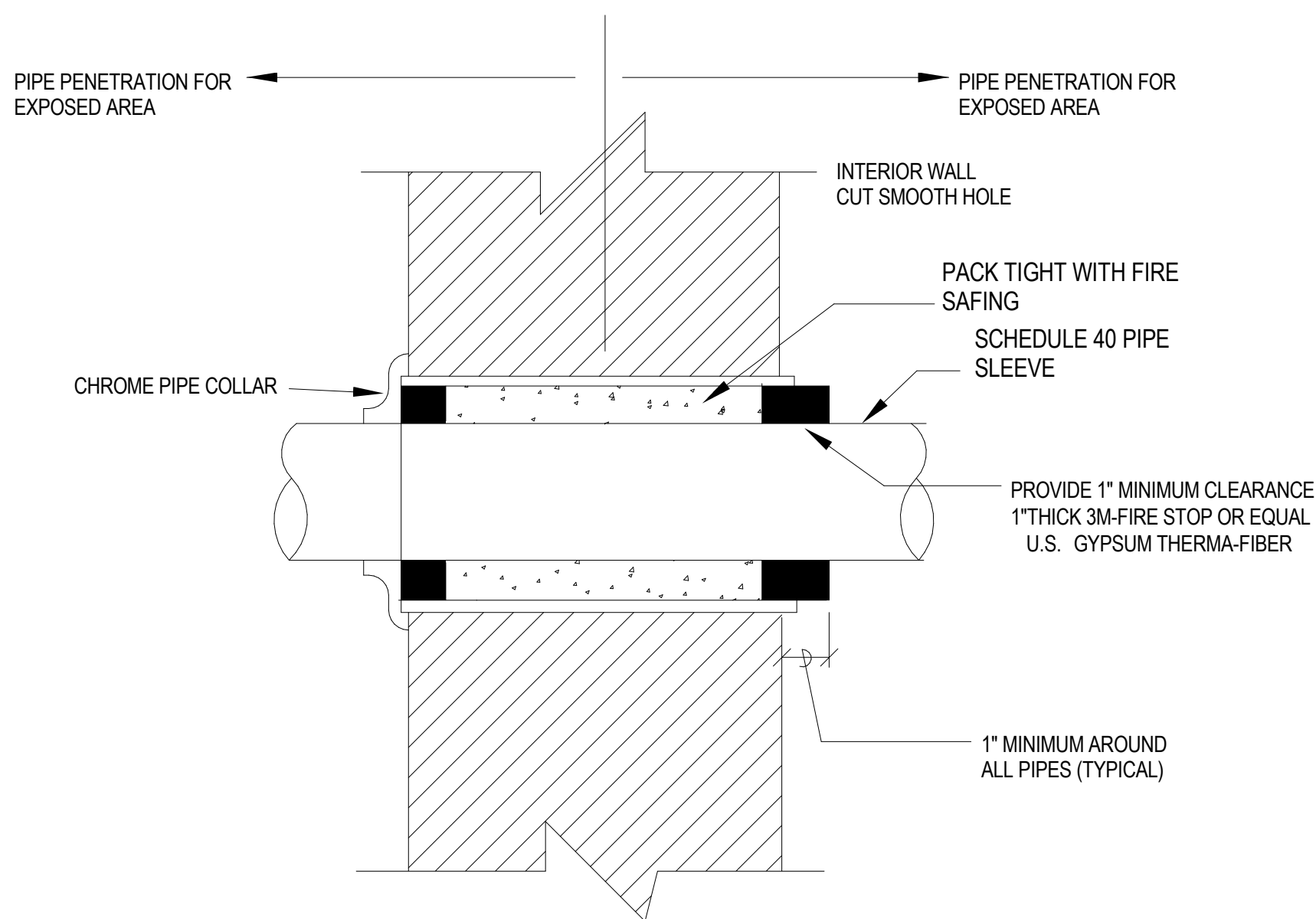
4 LOUVER-DAMPER FILTER ASSEMBLY DETAIL

SCALE: NONE



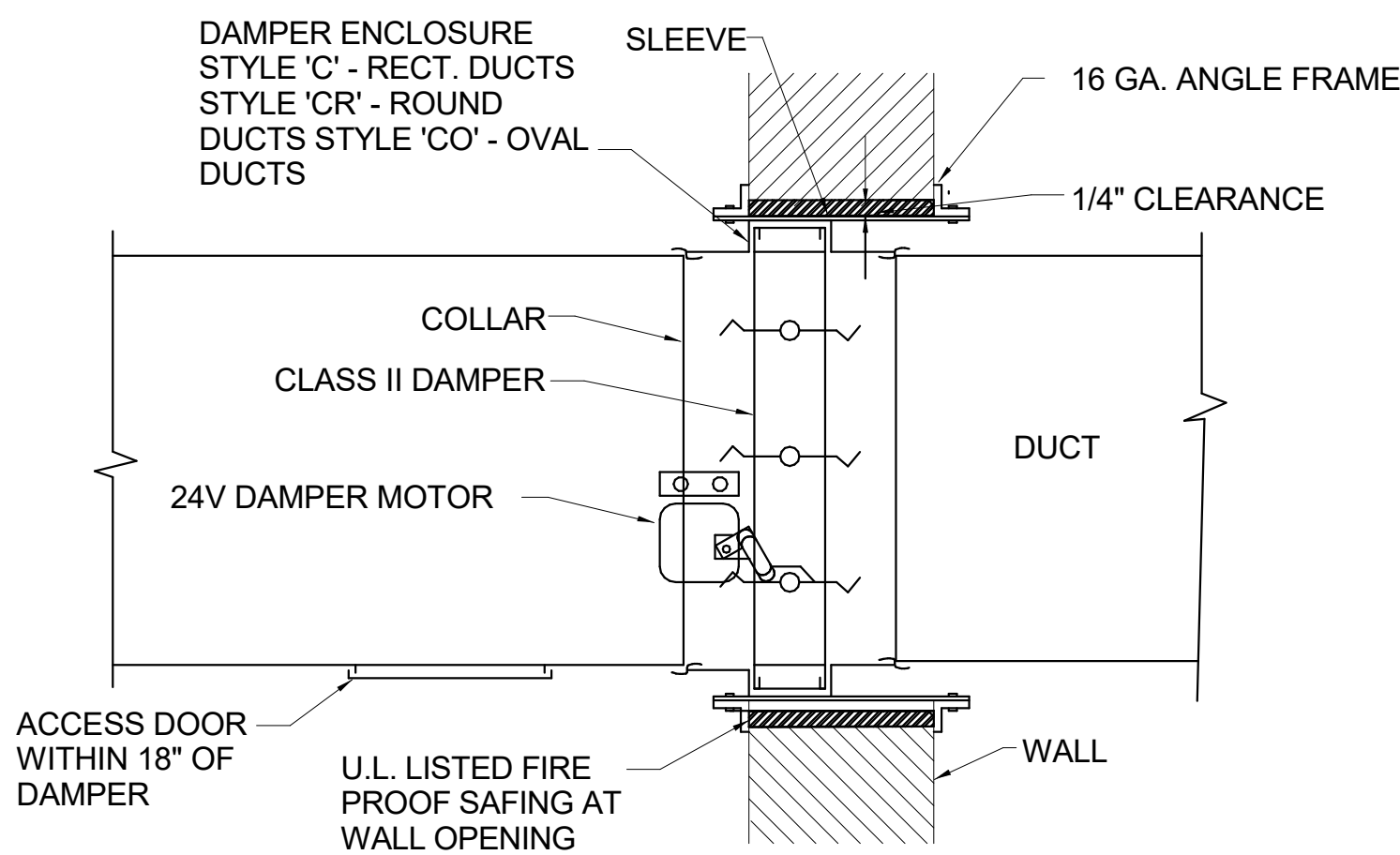
5 TYPICAL VAV BOX DISCONNECT

SCALE: NONE



6 CONDUIT FIRE PENETRATION

SCALE: NONE



NOTE:

CLEAR OPENING OF SMOKE DAMPER IS TO BE THE SAME AS DUCT.

SMOKE DAMPERS SHALL BE FABRICATED & INSTALLED ACCORDING TO SMACNA, AND NFPA-90A RECOMMENDATIONS, AND REQUIREMENTS OF APPLICABLE CODE AUTHORITIES HAVING JURISDICTION. UNIT SHALL BE UL 555 AND 555S LISTED.

PROVIDE ACCESS DOOR IN DUCT FOR SERVICE

DAMPER MOTOR TO BE CONTROLLED AND POWERED FROM FIRE ALARM SYSTEM. COORDINATE ALL POWER AND CONTROL REQUIREMENTS WITH FIRE ALARM AND ELECTRICAL CONTRACTORS.

7 COMBINATION FIRE/SMOKE DAMPER DETAIL

SCALE: NONE

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Details

M-8.00



FIRST FLOOR DAMPER SCHEDULE				
SMOKE CONTROL ZONE IN ALARM (FLOOR) (ZONE)	FANS OFF	FANS ON	DAMPER CLOSE	DAMPER OPEN
1-A	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2
	SP-1 & SP-2	SAF-2A & B	EAD-1-3	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-B	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2
	SP-1 & SP-2	SAF-2A & B	EAD-1-3	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-C	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2 & 3
	SP-1 & SP-2	SAF-2A & B		FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-D	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2 & 3
	SP-1 & SP-2	SAF-2A & B		FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-E	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-F	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-G	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-H	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-I	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
1-J	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2
	SP-1 & SP-2	SAF-2A & B	EAD-1-3	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		

General Notes: First Floor Only

1. UPON DETECTION THE FIRE ALARM SYSTEM SHALL IDENTIFY SMOKE CONTROL ZONE AND COMMAND THE BMS TO INITIATE AUTOMATIC SMOKE CONTROL SYSTEM FOR THAT ZONE.
2. EACH SMOKE CONTROL ZONE SHALL HAVE THE CAPABILITY OF OVERRIDE THRU THE FIREMAN'S CONTROL PANEL AND BMS.
3. ONCE ZONE IS CLEARED, SYSTEM WILL REQUIRE A MANUAL RESET TO NORMAL MODE.
4. DESIGN MAXIMUM ZONES IN ALARM AT ONE TIME ARE TWO.
5. TERMINAL BOXES SHALL BE IN NORMAL OPERATION.
6. ZONE CORRESPONDS TO DAYROOM IDENTIFICATION.
7. SAF = SUPPLY FAN (AHU); SD = SMOKE DAMPER; SEF = SMOKE EXHAUST FAN; SEF-R = SMOKE EXHAUST FAN (ROOF); RRF = RETURN FAN (AHU); VV = TERMINAL BOX; SP = SMOKE PURIFIER.
- STW = STAIRWELL FAN; EF = GENERAL EXHAUST FAN.

AHU SMOKE CONTROL SEQUENCE OF OPERATIONS

VAV AIR HANDLING UNITS NORMAL OPERATION (EAST AND WEST)  
SECTION 15940

3.7 VAV AIR HANDLING UNITS NORMAL OPERATION (EAST AND WEST)

- A. IF SMOKE MANAGEMENT IS NEEDED THE SMOKE CONTROL SEQUENCE SHALL OVERRIDE THE AHU NORMAL SEQUENCE. AHU SMOKE CONTROL SEQUENCE AND BUILDING SMOKE CONTROL SEQUENCE PROVIDED IN SEPARATE SOP.

3.8 AIR HANDLING UNITS SMOKE EXHAUST MODE (EAST AND WEST)

- A. ACTIVATED BY SMOKE DETECTION ON ANY FLOOR SMOKE ZONE, SOFTWARE OVERRIDE OR MANUAL SWITCH OVERRIDDEN FROM THE FIRE CONTROL PANELS AND INTERLOCKED WITH THE BMS.
- B. DE-ENERGIZE FANS RRF-1A,1B,2A AND 2B.
- C. ENERGIZE SEF-R-1 AND R-2.
- D. SAF'S SHALL MAINTAIN NORMAL DUCT STATIC PRESSURE SET POINT.
- E. 'OPEN' AHU CHILL WATER VALVE TO FULL FLOW THROUGH THE COIL. ENERGIZE PIMPS P-15 AND P-16 AND OVERRIDE PUMP VFD TO FULL CAPACITY.
- F. DURING SMOKE EVENT FREEZE STAT SHALL BE OVERRIDDEN.
- G. 'OPEN' OUTDOOR AIR DAMPERS AT SAF-1A,1B,2A AND 2B.
- H. UPON VERIFICATION OF OUTDOOR AIR DAMPERS ('OPEN'), 'CLOSE' RETURN AIR DAMPERS AND RELIEF DAMPERS AT SAF-1A,1B,2A AND 2B.
- I. 'CLOSE' RETURN AIR RISER DAMPERS AT ALL NON-INCIDENT FLOORS.
- J. 'CLOSE' SUPPLY AIR DAMPERS, ONE FLOOR AT A TIME, AT ALL FLOORS EXCEPT FLOOR OF INCIDENT, FLOOR ABOVE INCIDENT AND FLOOR BELOW INCIDENT.

SMOKE CONTROL SEQUENCE OF OPERATIONS

GENERAL NOTES: FIRST FLOOR ONLY

1. UPON DETECTION THE FIRE ALARM SYSTEM SHALL IDENTIFY SMOKE CONTROL ZONE AND COMMAND THE BMS TO INITIATE AUTOMATIC SMOKE CONTROL SYSTEM FOR THAT ZONE.
2. EACH SMOKE CONTROL ZONE SHALL HAVE THE CAPABILITY OF OVERRIDE THRU THE FIREMAN'S CONTROL PANEL AND BMS.
3. ONCE ZONE IS CLEARED, SYSTEM WILL REQUIRE A MANUAL RESET TO NORMAL MODE.
4. DESIGN MAXIMUM ZONES IN ALARM AT ONE TIME ARE TWO.
5. TERMINAL BOXES SHALL BE IN NORMAL OPERATION.
6. ZONE CORRESPONDS TO DAYROOM IDENTIFICATION.
7. SAF = SUPPLY FAN(AHU); SD = SMOKE DAMPER; SEF = SMOKE EXHAUST FAN; SEF-R = SMOKE EXHAUST FAN (ROOF); RRF = RETURN FAN (AHU); VV = TERMINAL BOX; SP = STAIRWELL FAN; EF = GENERAL EXHAUST FAN.

FIRST FLOOR

SMOKE CONTROL ZONE IN ALARM (FLOOR) (ZONE)	FANS OFF	FANS ON	DAMPER CLOSE	DAMPER OPEN
FLR1-1	EF-FLR1	SEF1-2	RAD1-5	MUAD1-1
FLR1-2		SEF1-3	RAD1-6	EAD1-2 EAD1-3

SEQUENCE OF OPERATIONS  
SMOKE EXHAUST FANS  
SECTION 15940

3.1 A. SMOKE EXHAUST FANS (SEF-R1 AND SEF-R2)

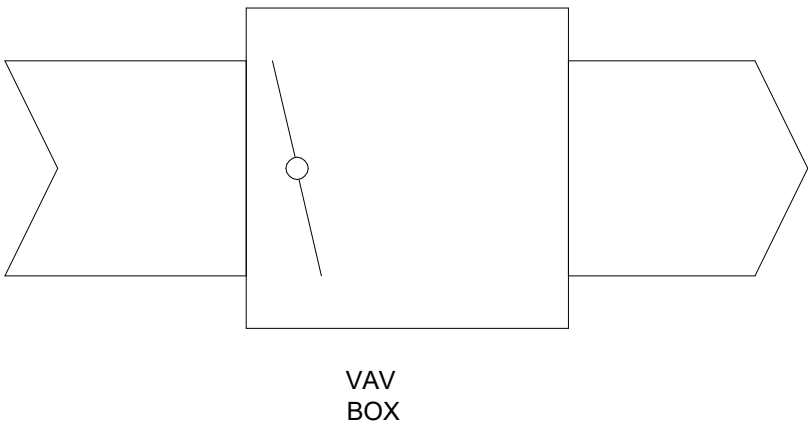
1. ACTIVATED THROUGH VFD BY BMS.
2. FAN 'OFF' DURING NORMAL MODE AND 'ON' DURING FIRE OR SMOKE EVENT.
3. BACK DRAFT DAMPER TO OPEN UPON FAN START.
4. DIFFERENTIAL PRESSURE SWITCH ACROSS FAN TO SIGNAL FAN OPERATION.
5. IF AIRFLOW IS NOT PROVEN BY DIFFERENTIAL PRESSURE SWITCH AN ALARM SHALL BE PROCESSED VIA BMS.
6. FAN SPEED SHALL BE MODULATED BY THE RETURN AIR RISER STATIC PRESSURE SENSOR TO MAINTAIN A NEGATIVE PRESSURE OF 1.0" W.G. (ADJUSTABLE).

3.1 B. SMOKE EXHAUST FANS-DAY ROOM (SEF-1-2 & SEF-1-3)

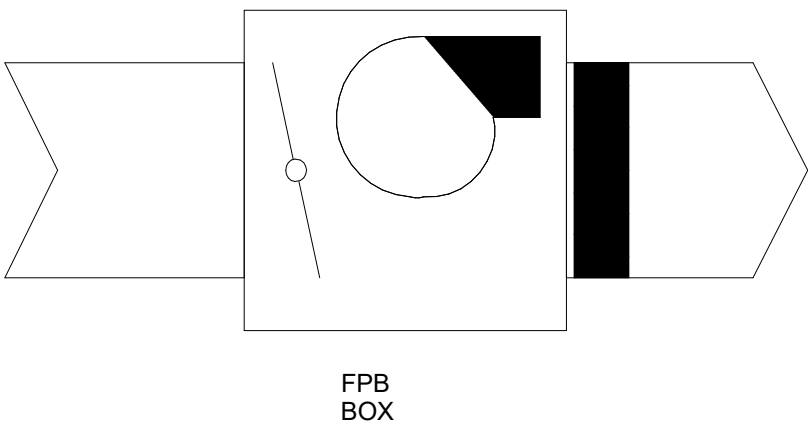
1. ACTIVATED THROUGH STARTER BY BMS.
2. FAN 'OFF' DURING NORMAL MODE AND 'ON' DURING FIRE OR SMOKE EVENT.
3. PROVIDE DIFFERENTIAL PRESSURE SWITCH ACROSS FAN TO PROVE FAN OPERATION.
4. IF AIRFLOW IS NOT PROVEN BY DIFFERENTIAL PRESSURE SWITCH AN ALARM SHALL BE PROCESSED VIA BMS.
5. SYSTEM SHALL BE DESIGNED SO THAT NOT MORE THAN TWO TANK EXHAUST FANS CAN OPERATE AT THE SAME TIME.
6. THE STARTER SHALL BE INTERLOCKED WITH DAMPER POSITION SWITCHES SO THAT IN A MANUAL OPERATION OF THE FAN (HOA OF STARTER, ETC.) THE FAN WILL BE UNABLE TO START UNLESS THE FAN INLET DAMPERS ARE OPEN.

SEQUENCE OF OPERATIONS  
ELEVATOR SHAFT DAMPERS  
SECTION 15940  
3.11 ELEVATOR SHAFT DAMPERS

- A. EXISTING CONTROL SEQUENCES TO REMAIN. SEE SMOKE EVACUATION SEQUENCE FOR CONTROL.
- B. DAMPER SWITCHES TO PROVIDE POSITION AND STATUS ALARM TO BMS.



VAV BOX



FPB BOX

SEQUENCE OF OPERATIONS  
VC TERMINAL BOXES  
SECTION 15940

3.3 VC TERMINAL BOXES W/MIXED AIR DAMPER AND ELECTRIC HEAT (TANKS ONLY)

- A. THE ROOM SENSOR, THROUGH THE DIGITAL BOX CONTROLLER, WILL MAINTAIN SPACE TEMPERATURE BY MODULATING THE COOLING DAMPER TO A MINIMUM OF 10% AND A MAXIMUM OF 100% OF THE DESIGN CFM AS INDICATED ON CONTRACT DRAWINGS. INITIAL COOLING SET POINT SHALL BE 74 DEGF. ALL SET POINTS ARE TO BE USER ADJUSTABLE FROM THE BMS OPERATOR WORKSTATION.
- B. DAYROOM OF INCIDENT VV TERMINAL BOXES SHALL COMMAND THE PRIMARY AIR DAMPER OPEN 100% DURING SMOKE EXHAUST MODE.
- C. ALL OTHER VV TERMINAL BOXES ON THE FLOOR OF INCIDENT SHALL 'OPEN' TO ITS MAXIMUM DESIGN CFM.
- D. ALL OTHER VV TERMINAL BOXES ON OTHER FLOORS SHALL OPERATE IN 'NORMAL' MODE.

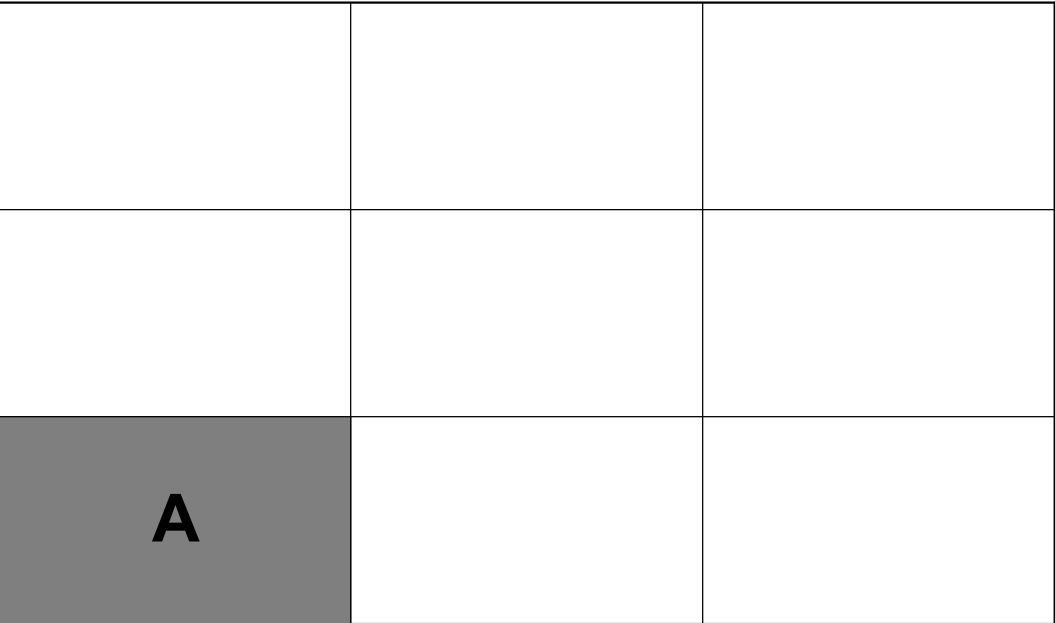
SEQUENCE OF OPERATIONS  
FP FAN POWERED TERMINAL BOXES W/ELECTRIC HEAT  
SECTION 15940  
3.4 FP FAN POWERED TERMINAL BOXES W/ELECTRIC HEAT

- A. THE TERMINAL BOX INCLUDES A PRIMARY AIR DAMPER AND ACTUATOR, VOLUME CONTROLLER, MIXED AIR DAMPER AND ACTUATOR, ELECTRIC HEATING COIL, AND AN EXISTING IN-LINE FAN DOWNSTREAM OF THE BOX. THE ROOM TEMPERATURE SENSOR, THROUGH THE DIGITAL BOX CONTROLLER, SHALL MAINTAIN SPACE TEMPERATURE BY MODULATING THE COOLING DAMPER (MINIMUM OF 10% AND A MAXIMUM OF THE DESIGN CFM AS INDICATED ON CONTRACT DOCUMENTS) AND FINALLY ENERGIZING THE STAGE OF ELECTRIC HEAT (WHEN PROOF OF AIRFLOW). INITIAL COOLING SET POINT SHALL BE 74 DEGF. AND INITIAL HEATING SET POINT SHALL BE 69 DEGF. ALL SET POINTS ARE TO BE USER ADJUSTABLE FOR THE BMS OPERATOR WORKSTATION.
- B. PROVIDE TERMINAL BOX CONTROL WITH 5 DEGREE DEADBAND BETWEEN COOLING AND HEATING SET POINTS.
- C. ALL OTHER FP TERMINAL BOXES ON FLOOR OF INCIDENT SHALL 'OPEN' TO ITS MAXIMUM DESIGN CFM AND FAN AND HEAT SHALL BE DISABLED.
- D. ALL OTHER FP TERMINAL BOXES ON OTHER FLOORS SHALL OPERATE IN 'NORMAL' MODE.

SEQUENCE OF OPERATIONS  
SMOKE MANAGEMENT SYSTEM (TANKS)  
SECTION 15940 3.3  
SMOKE MANAGEMENT SYSTEM (TANKS)

- A. ACTIVATED BY SMOKE DETECTION SYSTEM, SOFTWARE OVERRIDE, AUTOMATICALLY AND MANUALLY OVERRIDDEN FROM FIRE CONTROL PANEL AND INTERLOCKED WITH BMS. (DAYROOMS SHALL BE ACTIVATED BY BMS IN PAIRS, WHEN REFERENCED BELOW AS AN ACTIVATED DAYROOM SHALL INCLUDE ITS ASSOCIATED DAYROOM).
- B. SMOKE ACTIVATED DAYROOM (INCLUDES ROOM OF INCIDENT AND ASSOCIATED DAYROOM) NORMALLY CLOSED SMOKE DAMPERS SHALL BE COMMANDED 'OPEN'. NORMALLY OPEN SMOKE DAMPERS SHALL BE COMMANDED 'CLOSED'. WHEN DDG CONTROLLER HAS PROVEN DAMPER POSITIONS SEF-X-X (ACTIVE DAYROOM ONLY) SHALL BE COMMANDED 'ON'.
- C. TERMINAL BOXES FOR ACTIVATED ROOM SHALL 'OPEN' TO 100%, CLOSE MIXED AIR DAMPER, AND THE INLINE SUPPLY BOOSTER FAN SHALL REMAIN 'ON'.
- D. DEACTIVATION OF SEF-X-X SHALL BE BY THE SMOKE DETECTION SYSTEM, SOFTWARE OVERRIDE, AUTOMATICALLY AND MANUALLY OVERRIDDEN FROM FIRE CONTROL PANEL AND HOA AT STARTER.

KEY PLAN



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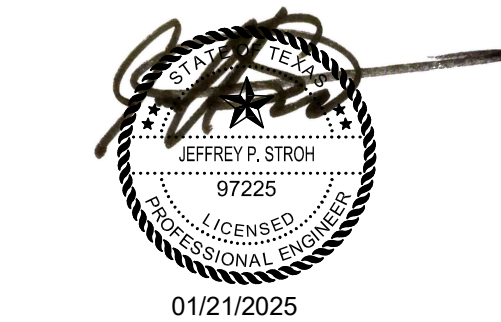
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Mechanical  
Controls

M-9.00



SMOKE EXHAUST SYSTEMS DESIGN, OPERATIONS AND TESTING REQUIREMENTS

Design Requirements

1. Smoke Exhaust System is designed in accordance with TX Admin Code Title 37 Part 9 Chapter 263 Subchapter E RULE \$263.51.
2. The space being treated has the following systems engaged within the space:

a. Automatic Sprinkler System

b. Active smoke detection

c. Smoke Removal and Make Up Air Systems

d. Supply, Return and Exhaust systems.
3. Mechanical smoke control systems and smoke removal systems shall be provided for all inmate housing areas, including cells, day rooms, dormitories, and special purpose cells.
4. Control of Smoke Migration

a. The Smoke Control System shall contain smoke in the area of origin.

b. Shall restrict smoke from entering the means of egress.

c. Smoke shall not migrate from the affected area to other areas of the building.
5. The Capacity of the Smoke Removal System shall not be less than 15 Air Changes per Hour.
6. Prior to any other testing of new smoke management systems, an air balance report prepared in accordance with nationally recognized practices shall be submitted to the county. Such report shall bear certification that the smoke control and removal systems meet the engineer of record's design requirements with respect to pressure differentials achieved and air flow rates necessary to meet the intended smoke management operation.

a. A copy of the air balance report shall be maintained at the facility and made available to the commission's inspector during all tests and inspections.

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SMOKE EXHAUST CALCULATION																
Room No. (#)	Room Name	Room Area (sqft)	Room Hght (ft)	Room Vol. (cuft)	Smoke Control											
					Smoke Exhaust							Make-up Air (cfm)				
					Fan No. (#)	Required (min) (ACH)	(cfm)	Min	Design	Max	(ACH)	Source	MAU (cfm)			
1-A	DAY ROOM	1,372	10	13,720	SEF-1-2	15	3,430	4,550	4,550	4,550	19.90	MAUD-1-1	4,550	4,550	4,550	
1-B	DAY ROOM	1,386	10	13,860	SEF-1-2	15	3,465	4,760	4,760	4,760	20.61	MAUD-1-1	4,760	4,760	4,760	
1-C	DAY ROOM	1,355	10	13,550	SEF-1-2	15	3,388	4,400	4,400	4,400	19.48	MAUD-1-1	4,400	4,400	4,400	
1-D	DAY ROOM	1,519	10	15,190	SEF-1-3	15	3,798	4,400	4,400	4,400	17.38	MAUD-1-1	4,400	4,400	4,400	
1-E	DAY ROOM	1,341	10	13,410	SEF-1-3	15	3,353	4,450	4,450	4,450	19.91	MAUD-1-1	4,450	4,450	4,450	
1-F	DAY ROOM	1,038	10	10,380	SEF-1-3	15	2,595	2,970	2,970	2,970	17.17	MAUD-1-1	2,970	2,970	2,970	
1-G	SECURE CORR	917	8	7,336	SEF-1-3	15	1,834	2,760	2,760	2,760	22.57	MAUD-1-1	2,760	2,760	2,760	
1-H	SECURE CORR	917	8	7,336	SEF-1-3	15	1,834	2,760	2,760	2,760	22.57	MAUD-1-1	2,760	2,760	2,760	
1-I	STORAGE	73	8	584	SEF-1-3	15	146	220	220	220	22.60	MAUD-1-1	220	220	220	
1-J	STORAGE	218	8	1,744	SEF-1-2	15	436	610	610	610	20.99	MAUD-1-1	610	610	610	
					SEF-2	Req total	10,719	Grille total		14,320	Fan scheduled airflow		14,320			
					SEF-3	Req Total	13,413	Grille total		17,560	Fan scheduled airflow		17,560			

SMOKE CONTROL OPERATION  
EXHAUST FANS, RETURN AIR DAMPERS, & OUTSIDE AIR DAMPER SHALL RECEIVE INPUTS FROM THE UL 864 LISTED CONTROLLER. LISTED CONTROLLER WILL RECEIVE INPUTS ONLY FROM THE FACP.

FIRST FLOOR DAMPER SCHEDULE				
SMOKE CONTROL ZONE IN ALARM (FLOOR) (ZONE)	FANS OFF	FANS ON	DAMPER CLOSE	DAMPER OPEN
1-A	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2
	SP-1 & SP-2	SAF-2A & B	EAD-1-3	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-2		
1-B	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2
	SP-1 & SP-2	SAF-2A & B	EAD-1-3	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-2		
1-C	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2 & 3
	SP-1 & SP-2	SAF-2A & B		FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-2 & 3		
1-D	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2 & 3
	SP-1 & SP-2	SAF-2A & B		FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-2 & 3		
1-E	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-3		
1-F	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-3		
1-G	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-3		
1-H	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-3		
1-I	SEF-1-2	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-3
	SP-1 & SP-2	SAF-2A & B	EAD-1-2	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-3		
1-J	SEF-1-3	EF-1	RAD-1-5	MUAD-1-1
	SEF-R-1 & 2	SAF-1A & B	RAD-1-6	EAD-1-2
	SP-1 & SP-2	SAF-2A & B	EAD-1-3	FP-1-A THRU G
		RRF-1A & B		
		RRF-2A & B		
		SEF-1-2		

General Notes; First Floor Only

1. UPON DETECTION THE FIRE ALARM SYSTEM SHALL IDENTIFY SMOKE CONTROL ZONE AND COMMAND THE BMS TO INITIATE AUTOMATIC SMOKE CONTROL SYSTEM FOR THAT ZONE.
2. EACH SMOKE CONTROL ZONE SHALL HAVE THE CAPABILITY OF OVERRIDE THRU THE FIREMAN'S CONTROL PANEL AND BMS.
3. ONCE ZONE IS CLEARED, SYSTEM WILL REQUIRE A MANUAL RESET TO NORMAL MODE.
4. DESIGN MAXIMUM ZONES IN ALARM AT ONE TIME ARE TWO.
5. TERMINAL BOXES SHALL BE IN NORMAL OPERATION.
6. ZONE CORRESPONDS TO DAYROOM IDENTIFICATION.
7. SAF = SUPPLY FAN (AHU); SD = SMOKE DAMPER; SEF = SMOKE EXHAUST FAN; SEF-R = SMOKE EXHAUST FAN (ROOF); RRF = RETURN FAN (AHU); VV = TERMINAL BOX; SP = SMOKE PURIFIER.  
STW = STAIRWELL FAN; EF = GENERAL EXHAUST FAN.

Operations

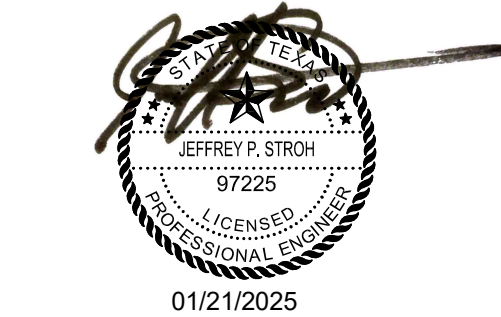
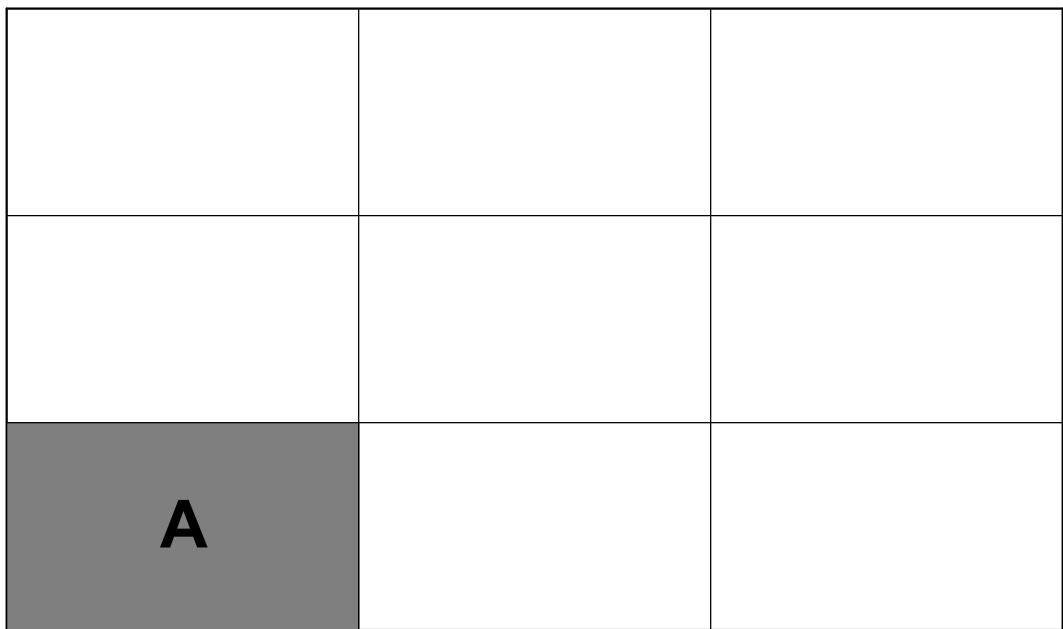
1. The Smoke Removal System operates within the identified areas:

a. Day Room area, the large high ceiling space outside of the Dormitory Cells but within the controlled space.
2. Upon activation of any smoke detection device within the spaces the system shall follow the "cause and effect" table (MOTORIZED DAMPER - FIRST FLOOR DAMPER SCHEDULE) and Sequence of Operations on M9.00 as it applies to the affected space.

Testing

1. Items below are identified form the reference code under "Design Requirements."
2. The smoke management system shall be tested in both normal and emergency power modes.
3. Smoke Detection. Artificial smoke shall be introduced into the space to be tested. The rate of introduction of smoke shall be two times the volume of the space to be tested. The commission may establish a minimum amount of smoke to be introduced into a space. The smoke detection system shall alarm and initiate the smoke control and removal system(s) within 60 seconds of the beginning of smoke introduction.
4. Smoke Migration. The smoke management system shall be deemed to be controlling smoke migration if smoke from the detection test does not migrate from the affected area for a period of ten minutes from the time of detection and activation of the smoke control system. The inspector may conduct the smoke migration test with the compartment exit door open or closed.
5. Smoke Removal. Utilizing the procedure for testing smoke detection, smoke removal shall be completed in the space to be tested within fifteen minutes from the time of system activation.
6. Maintenance and Retesting. The smoke management systems shall be regularly maintained to assure consistent performance. The smoke management systems shall be operationally tested quarterly and may be tested by the commission's inspector on an annual basis utilizing the smoke testing procedures.

KEY PLAN



Smoke Control  
Requirements

M-9.01

<b>DALLAS COUNTY - RENOVATION PROJECTS</b> <b>COST BREAKDOWN</b> 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 - 4)		\$ -
6	Payment & Performance Bonds:		
7	Insurance		
8	Permit Fee		
9	Contractor Fee/Profit:		
10	Total Markups (Line Items 6 - 8)		\$ -
11	Owner Contingency :	5%	
12	TOTAL SUBMITTED COSTS: (Line Items 5+9+10)		\$ -
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 Uniformat Level II Classification
- \* Cost of Work should include any Allowances if identified in the Bid Documents
- \* Owner approval required. 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 Conditions, General Requirements and relevant markups.



**Solicitation Number No.: 2025-039-7064, Pre-Bid Meeting Date: May 28, 2025,  
Project Title: IFB West Tower Jail 1st Floor - Smoke Evacuation System Upgrade,  
Bid Due Date: June 12, 2025.**



## **INVITATION FOR BID**

**Solicitation Number No.: 2025-039-7064, Pre-Bid Meeting Date: May 28, 2025,  
Project Title: IFB West Tower Jail 1st Floor - Smoke Evacuation System Upgrade,  
Bid Due Date: June 12, 2025.**

## **Scope of Work/Specifications**

### **I. Introduction, Purpose and Intent**

This is a one-time construction contract for the removal and upgrade of the Smoke Evacuation System on the first floor of the Lew Sterrett Justice Center West Tower. The project area has been shut down and will require repairs to existing facilities that have been damaged through use, restoring them to their original condition. The project will involve repairing any damage to the facilities caused by use, removing equipment and devices that are no longer necessary, and repairing any damage caused during the installation of the new system.

### **II. Specification**

Specifications - Exhibit 1  
Drawings - Exhibit 2

### **III. References**

Dallas County request reference letters from at least three sources/customers where the bidder has provided services of similar size and scope for all solicitations that will result in services.

### **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 **May 28, 2025, at 11:00 a.m. (CST)**, the pre-bid meeting will be conducted through a conference call.

**[Join the meeting now](#)**

**Meeting ID: 255 812 961 526 0**

**Passcode: VE3vC2Jf**

**Dial in by phone**

**[+1 469-208-1731,,299135388#](#) United States, Carrollton**

**[Find a local number](#)**

**Solicitation Number No.: 2025-039-7064, Pre-Bid Meeting Date: May 28, 2025,  
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**Phone conference ID: 299 135 388#**

The deadline for the submission of questions is on **June 3, 2025, at 1:00 p.m. (CST)** through BidNet.

**V. Term and Commencement Date**

This will be a one-time purchase 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 **June 12, 2025, 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.

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.

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## **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 **Marvin Kines**.

All questions regarding this solicitation are to be submitted in writing to **Marvin Kines**, 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 **marvin.kines@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:

- 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

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- 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 will cause delays in payment processing. The County will not be responsible for payment delays due incorrect invoices or invoices sent to the wrong address.

**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**

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

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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

- 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

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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 be made payable without conditions to Dallas County and must reference the IFB number on the check or bond. Bid bond 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.

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- 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, 5<sup>th</sup> 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:

- 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;



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- 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 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);

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- 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.

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.

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## **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:

- Contractor shall become insolvent, or shall make a transfer in fraud of creditors, or shall make an assignment for the benefit of creditors;

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- 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.
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

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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.

**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](https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm))

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**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.

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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](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