4/20/22

Competitive Sealed Proposal 22-932

Addendum #1

Please note the following changes which have been made for clarification to this Invitation for Sealed Bid. **This addendum must be listed as Addendum #1 on the** ACKNOWLEDGMENT OF RECEIPT OF ADDENDA/AMENDMENTS FORM of the bid package as verification that you have received and are aware of the information contained herein.

QUESTIONS/CLARIFICATION/CHANGES:

CHANGES:

Proposals must be received by **5:00 p.m. on Wednesday, May 18, 2022, Central Standard Time.**

Deadline for Questions is **Monday, May 9, 2022**.

ADDITIONAL INFORMATION:


ADDENDUM 1 INFO.pdf


Document Drawings FINAL SET

Questions that were received within the last 2 weeks will be answered in a future Addendum

Air Force Plant 3, Building 7

This addendum to the specifications for the construction of the enclosures around the boilers and asbestos abatement in Air Force Plant 3 (AFP#) Building 7 is provided to clarify a few questions that have risen and is being made mandatory.

- The enclosures around the boilers and equipment are classified as "Confined Spaces". The enclosures once constructed will have limited entrances and with the boilers and equipment have obstacles making egress from them potentially difficult. The asbestos that will be left in the enclosures is in excellent condition or inside of the boilers, thus an actual asbestos hazard is not present unless they are disturbed. No other conditions will exist in the enclosures. For this reason, the enclosures will be Confined Spaces but not Permit Required Confined Space.

- The enclosures will not be occupiable space once completed.

- The door(s) leading into the enclosure will be fitted with a lock (lockable with a key only) on the exterior side of the enclosure door. On the interior of the door(s) will be fitted with a panic release bar.

- Signage will be posted on the door(s) to the enclosure stating:

- Building 7 does not have functioning electrical service. All abatement and construction activity will be conducted using contractor supplied temporary electrical service.

- The primary exit during abatement and construction activity will be located on the south end of the building. The primary Exit will be fitted with an Exit Light/signage that will be powered by the contractor's temporary power source when the building is being occupied by abatement and construction workers.

- A secondary emergency exit will be in the middle of the building on the west side leading into Building 6. The secondary emergency Exit will be fitted with an Exit Light/signage that will be powered by the contractor's temporary power source when the building is being occupied by abatement and construction workers.

- The corridor (pathway between the enclosures) walls must meet the specifications of Table 603 of the Life Safety code in that Fire Retardant Wood must be used.

Jeffrey L Jenkins, CIH, CSP
Oklahoma Asbestos Project Designer

October 15, 2021
Date

3/14/22

Request for

Competitive Sealed Proposal

22-932 Air Force Plant 3 Property Renovation – Phase 2

NIGP Commodity Code(s):

910-38 Asbestos Removal Services
910-40 Inspection, Monitoring of Insulation and Asbestos Installation and Removal
918-13 Asbestos Consulting
926-58 Lead and Asbestos Inspection Services

Submit proposals (sealed) to:
Deputy City Clerk
City of Tulsa
175 E. 2ND St.
Suite 260
Tulsa, OK 74103

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QUALITY ASSURANCE PROJECT PLAN (QAPP) Asbestos Abatement Portions of Air Force Plant 3

I. STATEMENT OF PURPOSE:

With this Competitive Sealed Proposal (CSP) request, we are searching to secure services to remove, transport, enclose, and properly dispose of regulated asbestos containing materials (RACM) from the city-owned Air Force Plant No. 3 (AFP3), Building 7, property located at 3300 North Mingo Road, Tulsa, OK 74116.

AFP3 is a one-mile-long building complex comprising 2.89 million square feet that was originally developed as a bomber manufacturing plant. Building 7 is a 28,000-sf building which makes up part of AFP3. The AFP3 facility was constructed in early 1942 for the production and repair of aircraft during World War II and remained in use until 1994 when aircraft production and repair operations ceased. During the late 1990's, McDonnell Douglas – Tulsa (The Boeing Company) occupied some of the buildings, but the majority remained vacant. The facility was eventually deeded to the City of Tulsa. McDonnell Douglas retained A & M Engineering and Environmental Services to conduct asbestos surveys of the facility. The surveys were initiated in late 1998 and a report finalized in March 1999. Today, the City of Tulsa has tenants in many of the buildings, but much of the asbestos remains. The City of Tulsa is looking to abate Building 7 of the asbestos containing materials (ACM) to allow more space to be modernized and restored to useful production.

.

II. INSTRUCTIONS FOR SUBMITTING A PROPOSAL:

A. General Requirements

1. The proposal **must** be received by **5:00 p.m. on Wednesday, May 18, 2022, Central Standard Time.** Proposals must be sealed in an envelope or box clearly labeled "**CSP 22-932 Air Force Plant 3 Property Renovation – Phase 2.** Proposals arriving late will be returned unopened.

2. Proposals must be delivered sealed to:

Deputy City Clerk
City of Tulsa
175 E. 2nd St.
Suite 260
Tulsa, OK 74103

3. All interested Respondents (Sellers) are required to register with the Project Buyer, in order to receive updates, addenda or any additional information required. The City is not responsible for any failure to register.

4. Inquiries to the Buyer requesting clarification regarding this CSP request or the content herein must be made via e-mail and must be received prior to the end of the business day on **May 9, 2022.**

Donny Tiemann, Senior Buyer
dtiemann@cityoftulsa.org

Any questions regarding this CSP request will be handled as promptly and as directly as possible. If a question requires only clarification of CSP request instructions or specifications, it will be handled via e-mail, or verbally. If any question results in material changes or additions to the CSP request, those changes or additions will be forwarded to all registered Respondents as quickly as possible by addendum.

5. Respondents shall designate a contact person, with appropriate contact information, to address any questions concerning a proposal. Respondents shall also state the name and title of individuals who will make final decisions regarding contractual commitments and have legal authority to execute a contract on the Respondent's behalf.

6. Proposals will be opened on the morning after the due date, at 8:30am, at the:

Standards, Specifications, and Awards Committee Meeting
175 East 2nd Street, 2nd Floor
City Council Chamber

7. **Mandatory Pre-proposal Meeting:** Attending one of the two pre-proposal meetings is required for a response to be considered for award.
The meetings will be held at Air Force Plant No. 3 (AFP3), Building 7, 3300 North Mingo Road, Tulsa, OK and include a tour of the work area.
The meetings are scheduled for:
Tuesday, April 5, 2022, at 2:00 PM Central Standard Time and,
Thursday, April 7, 2022, at 10:30 AM Central Standard Time.
We will meet at the south end of Building 7 and begin our tour at the scheduled time. Please arrive early.

B. General Notifications

1. With this Competitive Sealed Proposal request, the City reserves the right to do the following:

a. To conduct oral or written discussions with Respondents, after proposals are received, concerning technical and Price aspects of the proposals and/or to allow Respondents to revise their proposals, including Price;

b. To evaluate, after proposals are received, the relative abilities of Respondents to perform, including their technical or professional experience and/or expertise;

c. To conduct a comparative evaluation, after proposals are received, of the differing Price, service, quality, contractual factors, technical content and/or technical and performance capability of the proposals;

d. To negotiate mutually agreeable terms in a contract;

2. The City of Tulsa notifies all possible Respondents that no person shall be excluded from participation in, denied any benefits of, or otherwise discriminated against in connection with the award and performance of any contract on the basis of race, religious creed, color, national origin, ancestry, physical disability, sex, age, ethnicity, or on any other basis prohibited by law.

3. All Respondents shall comply with all applicable laws regarding equal employment opportunity and nondiscrimination.

4. All Respondents shall comply with the Americans with Disabilities Act (ADA) and all proposals and any subsequent contract shall include the following statement:

> "Contractor shall take the necessary actions to ensure its operations in performance of this contract and its employment practices are in compliance with the requirements of the Americans with Disabilities Act."
>
> It is understood that the program of the Respondent is not a program or activity of the City of Tulsa. The Respondent agrees that its program or activity will comply with the requirements of the ADA. Any costs of such compliance will be the responsibility of the Respondent. Under no circumstances will the Respondent conduct any activity which it deems to not be in compliance with the ADA.

5. Although it is the City's intent to choose only the most qualified Respondents to interview, the City reserves the right to choose any number of qualified finalists for interview and/or final selection.

6. This Competitive Sealed Proposal request does not commit the City of Tulsa to pay any costs incurred in the submission of a proposal or the costs incurred in making necessary studies and designs for preparation thereof, or contract for service or supplies.

7. The Respondent to whom a contract is awarded will be required to furnish bonds as follows:

a. Performance Bond - A Performance Bond to the City in an amount equal to one hundred percent (100%) of the Contract price

b. Statutory Bond – A Statutory Bond to the State of Oklahoma in the amount equal to one hundred percent (100%) of the contract price

c. Maintenance Bond – A Maintenance Bond to the City in an amount equal to one hundred percent (100%) of the contract price.

The bonds shall be executed on the forms included in the contract documents by a surety company authorized to do business in the State of Oklahoma and acceptable as Surety to the City of Tulsa.

Accompanying the bonds shall be a "Power-of-Attorney" authorizing the attorney-in-fact to bind the Surety Company and certified to include the dates of the bonds.

8. Seller and its subcontractors must obtain at Seller's expense and keep in effect during the term of the Purchase Agreement, including any renewal periods, policies of General Liability insurance in the minimum amounts set forth below and Workers' Compensation insurance in the statutory limits required by law.

Personal injury, each person	$ 175,000.00
Property damage, each person	$ 25,000.00
Auto Liability, each occurrence	$ 1,000,000.00
Personal injury and property damage, each occurrence	$ 1,000,000.00
Workers' Compensation	(Statutory limits)

SELLER'S INSURER MUST BE AUTHORIZED TO TRANSACT BUSINESS IN THE STATE OF OKLAHOMA.

You will have 10 days after notification that your Bid was selected for contract award by City to provide proof of such coverage by providing the assigned Project Buyer, shown in the "INSTRUCTIONS FOR SUBMITTING A PROPOSAL" section of this document, with a Certificate of Insurance. The Certificate of Insurance must be completed with the following information:

A. Your name
B. Insurer's name and address
C. Policy number
D. Liability coverage and amounts
E. Commencement and expiration dates
F. Signature of authorized agent of insurer
G. Invitation for Bid number

The Seller shall not cause any required insurance policy to be cancelled or to permit it to lapse. It is the responsibility of Seller to notify City of any change in coverage or insurer by providing City with an updated Certificate of Liability Insurance. Failure of Seller to comply with the insurance requirements herein may be deemed a breach of the Purchase Agreement. Further, a Seller who fails to keep required insurance policies in effect may be deemed to be ineligible to bid on future projects, ineligible to respond to invitations for bid, and/or ineligible to engage in any new purchase agreements.

III. SCOPE OF WORK

1. All sampling and laboratory analytical work shall be performed in accordance with the Quality Assurance Project Plan (QAPP) attached as Appendix A.
2. The Respondent shall provide labor, material, supplies and equipment to abate asbestos in AFP3 Building 7 in accordance with the Project Design, which is included as Appendix B.
3. The City has obtained required building permits from Tulsa County which are included as Appendix C. Respondent shall obtain any additional necessary federal, state, and local permits and licenses prior to commencing work.
4. The Respondent shall conduct the work in accordance with its Site-Specific Health & Safety Plan (HASP).
5. Work shall be conducted in compliance with Davis-Bacon regulations included here as Appendix D. Reporting will be required documenting compliance.
6. Work shall be conducted in compliance with federal objectives for MBE/WBE contracting. The Respondent shall document in the bid how they intend to meet the fair share objectives in the Price Summary Sheet. The fair share objectives for this contract are as shown below. Reporting will be required for compliance.

Service Type	MBE	WBE
Construction	11.25%	7.41%
Supplies	16.15%	16.443%
Services	9.04%	19.85%
Equipment	6.68%	12.16%

The Respondent agrees to make the following good faith efforts whenever procuring construction, equipment, services and supplies. Records documenting compliance with the good faith efforts shall be retained:

(a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through direct outreach. This will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
(b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process.
(c) Consider breaking activities into small subtasks suitable for subcontracting with DBEs. DBEs may be used for indirect project expenses, such as on-site sanitary services or food service.
(d) Contract with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
(e) Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

7. Before equipment and personnel are demobilized from the site, a pre-final site inspection will be performed with City of Tulsa representatives. A punch item list will be generated identifying tasks to be completed. Any identified punch list items will be immediately corrected and/or completed to the satisfaction of City of Tulsa. Assuming formal acceptance of work is granted, personnel of the Respondent will remove equipment, materials, and temporary facilities from the site. Equipment will be properly cleaned prior to demobilization from the site. Staging areas will be disassembled once no longer needed. Areas where construction activities occurred will be left in a clean and stable condition prior to fully demobilizing from the site. All required record documents and other pertinent submittals including final applications for payment/lien releases will be issued in a timely fashion after demobilization.

IV. TIME FRAME FOR REVIEW:

The committee expects the evaluation and selection process to be completed in approximately three (3) to five (5) weeks. However, this period depends on the number of participants and the complexity of the proposals.

V. DELIVERABLES:

The products, reports, and plans to be delivered to the City prior to contracting will include:

- Health & Safety Plan
- Respiratory Protection Program
- Proof of DOL contractor's license and supervisor's license
- Any ODOL or ODEQ violations in the last 3 years.

The products, reports, and plans to be delivered to the City as final documents shall include:

- Worker air monitoring records and calibration reports
- Disposal waste manifests
- Worker and supervisor licenses and proof of respirator clearances for all
- DOL and other agency inspection reports
- Area monitoring lab reports
- Daily field logs
- Davis-Bacon compliance reporting
- MBE/WBE/DBE contracting reporting

VI. RESPONDENT AND PROPOSAL REQUIREMENTS

To be considered, interested Respondents should submit or address the following:

A. One (1) unbound original and one (1) copy of the proposal **plus** one (1) electronic copy on CD, DVD, or flash drive.

B. A description of the Respondent's qualifications and experience and that of or subcontractors assigned to this project. It is noted that equipment, including sanitary facilities, material and staff shall be provided by the Respondent.

C. A description of previous projects that Respondent's firm has conducted of similar size and complexity. Provide contact names and telephone numbers of references from these organizations.

D. Provide a project schedule, identifying beginning and ending dates of work, as well as project target dates.

E. At the discretion of the City, one or more Respondents may be invited to be interviewed for purposes of clarification or discussion of the proposal.

F. Any expenses incurred by the Respondent(s) in appearing for an interview or in any way providing additional information as part of the response to this Competitive Sealed Proposal request are solely the responsibility of the Respondent. The City of Tulsa is not liable for any costs incurred by Respondents in the preparation of proposals or any work performed by the Respondent prior to the approval of an executed contract by the City of Tulsa. The City assumes no responsibility or liability for any costs you may incur in responding to this CSP request, including attending meetings or contract negotiations.

G. The Contractor must provide the following information:

1. Narrative

Provide a narrative describing in detail the information requested by Items B, C, and D above. Attach additional information as needed.

2. Litigation

a. During the last five (5) years, has the Contractor had a contract for services terminated for any reason, or has the Contractor received a notice of breach, notice of default, or similar notice? If so, provide full details related to the termination or notice.

b. During the last five (5) years, describe any damages or penalties or settlements pertaining to contract disputes under any of the Contractor's existing or past contracts as it relates to services performed that are similar to the services contemplated by this CSP. If so, indicate the reason for the penalty, damages or exchange of property, goods, or services and the estimated amount of the cost of that incident to the Contractor.

c. During the last five (5) years, describe any order, judgment or decree of any Federal or State authority barring, suspending or otherwise limiting the right of the Contractor to engage in any business, practice or activity.

d. During the last five (5) years, list and summarize of all litigation, threatened litigation, administrative or regulatory proceedings, or similar matters to which the Contractor or its officers have been a party. The Contractor must also state whether it or any owners (other than general public stockholders), officers, or primary partners have ever been convicted of a felony. Failure to disclose these matters may result in rejection of the Bid Proposal or in termination of any subsequent contract. This is a continuing disclosure requirement. Any such matter commencing after submission of a Bid Proposal,

and with respect to the successful Contractor after the execution of a contract, must be disclosed in a timely manner in a written statement to the Lead Agency.

e. During the last five (5) years, have any irregularities been discovered in any of the accounts maintained by the Contractor on behalf of others? If so, describe the circumstances of irregularities or variances and disposition of resolving the irregularities or variances.

H. The Bidder shall provide 3 references

Company Name: _____
Contact Name: _____
Address: _____
Phone number: _____
Email Address: _____
Services Provided: _____

Company Name: _____
Contact Name: _____
Address: _____
Phone number: _____
Email Address: _____
Services Provided: _____

Company Name: _____
Contact Name: _____
Address: _____
Phone number: _____
Email Address: _____
Services Provided: _____

VII. EVALUATION OF PROPOSALS:

Selection shall be determined to be in the best interest of the City as evaluated by the City of Tulsa. The approval of the selected Respondent will be subject to the final determination of the City and will be contingent on the successful completion of a contract between the City and the successful Respondent.

VIII. AWARD OF PROPOSALS:

The City evaluates proposals based on the general criteria identified in Tulsa Revised Ordinance (TRO) Title 6, Chapter 4, and listed below:

A. The total base bid submitted by the lowest secure bidder unless otherwise directed in the form of the proposal.

B. The ability, capacity and skill of the Respondent team to perform the contract or provide the service required,

C. Whether the Respondent can perform the contract or provide the service promptly or within the time specified, without delay or interference.

D. The Respondent's plan to meet the federal objectives for MBE/WBE contracting,

E. The character, integrity, reputation, judgment, experience and efficiency of the Respondent,

F. The quality of performance by Respondent of previous contracts or services,

G. The previous and existing compliance by the Respondent with laws and ordinances relating to the contract or service,

H. The sufficiency of the financial resources and ability of the Respondent to perform the contract or provide the service,

I. The quality, availability and adaptability of the Services offered by Respondent to the particular use required,

J. The ability of the Respondent to provide future maintenance, support and service related to Respondent's offer,

K. Where an earlier delivery date would be of great benefit to the Using Department, the date and terms of delivery may be considered in the Proposal award,

L. The degree to which the Proposal submitted is complete, clear, and addresses the requirements in the CSP request specifications,

M. If a point system has been utilized in the CSP request specifications, the number of points earned by the Respondent.

N. The total cost of ownership, including the costs of supplies, materials, maintenance, and support necessary to perform the item's intended function.

O. If an evaluation committee performs the evaluation, the recommendation of such committee.

IX. MISCELLANEOUS

A. Your response to this CSP request will be considered part of the contract if one is awarded to you.

B. All data included in this CSP request, as well as any attachments, are proprietary to the City of Tulsa.

C. The use of the City of Tulsa's name in any way as a potential customer is strictly prohibited except as authorized in writing by the City of Tulsa.

D. Your proposal must clearly indicate the name of the responding organization, including the Respondent's e-mail address and web site information, if applicable, as well as the name, address, telephone number and e-mail address of the organization's primary contact for this proposal. Your proposal must include the name, address, telephone number and e-mail address of the Respondent and/or team of Respondents assigned to the City account.

E. The City is bound to comply with Oklahoma's Open Records Act, and information submitted with your proposal, with few exceptions, is a matter of public record. For specifics on the Oklahoma Open Records Act, see the link below:

https://libraries.ok.gov/law-legislative-reference/library-laws/statutes-open-records/

The City shall not be under any obligation to return any materials submitted in response to this CSP request.

F. The City expects to enter into a written Agreement with the chosen Respondent that will incorporate this CSP request and your proposal. In addition to any terms and conditions included in this CSP request, the City may include in the Agreement other terms and conditions as deemed necessary.

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AFFIDAVIT

NON-COLLUSION, INTEREST, AND CLAIMANT

STATE OF _____)
)ss.
COUNTY OF_____)

I, _____, of lawful age, being first duly sworn, state that:
(Seller's Authorized Agent)

1. I am the Authorized Agent of Seller herein for the purposes of certifying facts pertaining to the existence of collusion between and among Bidders and municipal officials or employees, as well as facts pertaining to the giving or offering of things of value to government personnel in return for special consideration in the letting of any contract pursuant to the proposal to which this statement is attached.

2. I am fully aware of the facts and circumstances surrounding the making of Seller's Bid to which this statement is attached, and I have been personally and directly involved in the proceedings leading to the submission of such Bid; and

3. Neither the Seller nor anyone subject to the Seller's direction or control has been a party:
   a. to any collusion among Bidders in restraint of freedom of competition by agreement to respond at a fixed price or to refrain from responding,
   b. to any collusion with any municipal official or employee as to quantity, quality, or price in the prospective contract, or as to any other terms of such prospective contract, nor
   c. in any discussions between Bidders and any municipal official concerning exchange of money or other thing of value for special consideration in the letting of a contract.

4. No officer or employee of the City of Tulsa either directly or indirectly owns a five percent (5%) interest or more in the Bidders business or such a percentage that constitutes a controlling interest. Affiant further states that the following officers and/or employees of the City of Tulsa own an interest in the Bidders business, which is less than a controlling interest, either direct or indirect.

   _____

5. All invoices to be submitted pursuant to this agreement with the City of Tulsa will be true and correct.

6. That the work, services or material furnished will be completed or supplied in accordance with the plans, specifications, orders, requests or contract furnished or executed by the affiant. Affiant further states that (s)he has made no payment directly or indirectly to any elected official, officer or employee of the City of Tulsa or of any public trust where the City of Tulsa is a beneficiary, of money or any other thing of value to obtain payment of the invoice or procure the contract or purchase order pursuant to which an invoice is submitted. Affiant further certifies that (s)he has complied with all applicable laws regarding equal employment opportunity.

By: _____
Signature
Title: _____

Subscribed and sworn to before me this _____day of _____, 20____.

_____
Notary Public

My Commission Expires: _____

Notary Commission Number: _____

The Affidavit must be signed by an Authorized Agent and notarized

RESPONDENT INFORMATION SHEET

Respondent's Legal Name: _____
(Must be Respondent's company name as reflected on its organizational documents, filed with the state in which Respondent is organized)

State of Organization: _____

Respondent's Type of Legal Entity: (check one)

☐ Sole Proprietorship
☐ Partnership
☐ Corporation
☐ Limited Liability Company
☐ Limited Partnership
☐ Limited Liability Partnership
☐ Limited Liability Limited Partnership
☐ Other: _____

Respondent's Address: _____
Street City State Zip Code

Respondent's Website Address: _____

Sales Contact:

Name: _____

Title/Position: _____

Street: _____

City: _____

State: _____

Phone: _____

Email: _____

Contact for Legal Notice:

Name: _____

Title/Position: _____

Street: _____

City: _____

State: _____

Phone: _____

Email: _____

How did you learn about this business opportunity with the City of Tulsa?

☐ Email from Assigned Buyer
☐ City of Tulsa Website
☐ Tulsa World posting
☐ Purchasing search engine
☐ Industry colleague
☐ Other: Click or tap here to enter text.

Price Sheet Summary

Base Bid:

Add Alternate Option 1:

Add Alternate Option 2:

Add Alternate Option 3:

Company Name: _____ Date: _____

Signature: _____

Name Printed: _____

Title: _____

It is anticipated that the City of Tulsa will enter into a contract with the selected Respondent for an initial term ending one (1) year from the date of its execution by the City's Mayor, with four (4) one-year renewals available at the option of the City. Contracts entered into by the City of Tulsa generally include, but are not limited to, the following terms:

1. **Renewals.** Contractor understands and acknowledges that any future contracts or renewals are neither automatic nor implied by this Agreement. The continuing purchase by City of the Services set forth in this Agreement is subject to City's needs and to City's annual appropriation of sufficient funds in City's fiscal year (July 1st to June 30th) in which such Services are purchased. In the event City does not appropriate or budget sufficient funds to perform this Agreement, this Agreement shall be null and void without further action by City.

2. **No Indemnification or Arbitration by City.** Contractor understands and acknowledges that City is a municipal corporation that is funded by its taxpayers to operate for the benefit of its citizens. Accordingly, and pursuant to Oklahoma law, City shall not indemnify nor hold Contractor harmless for loss, damage, expense or liability arising from or related to this Agreement, including any attorneys' fees and costs. In addition, Contractor shall not limit its liability to City for actual loss or direct damages for any claim based on a breach of this Agreement and the documents incorporated herein. City reserves the right to pursue all legal and equitable remedies to which it may be entitled. City will not agree to binding arbitration of any disputes.

3. **Intellectual Property Indemnification by Contractor.** Contractor agrees to indemnify, defend, and save harmless City and its officers, employees and agents from all suits and actions of every nature brought against them due to the use of patented, trademarked or copyright-protected appliances, products, materials or processes provided by Contractor hereunder. Contractor shall pay all royalties and charges incident to such patents, trademarks or copyrights.

4. **General Liability.** Contractor shall hold City harmless from any loss, damage or claims arising from or related to the performance of the Agreement herein. Contractor must exercise all reasonable and customary precaution to prevent any harm or loss to all persons and property related to this Agreement.

5. **Liens.** Pursuant to City's Charter (Art. XII, §5), no lien of any kind shall exist against any property of City. Contractor agrees to indemnify and hold the City harmless from all claims, demands, causes of action or suits of whatever nature arising out of the services, labor, and material furnished by Contractor or Contractor's subcontractors under the scope of this Agreement.

6. **No Confidentiality.** Contractor understands and acknowledges that City is subject to the Oklahoma Open Records Act (51 O.S. §24A.1 *et seq.*) and therefore cannot assure the confidentiality of contract terms or other information provided by Contractor pursuant to this Agreement that would be inconsistent with City's compliance with its statutory requirements there under.

7. **Compliance with Laws.** Contractor shall be responsible for complying with all applicable federal, state and local laws. Contractor is responsible for any costs of such compliance. Contractor shall take the necessary actions to ensure its operations in performance of this contract and its employment practices are in compliance with the requirements of the Americans with Disabilities Act. Contractor certifies that it and all of its subcontractors to be used in the performance of this agreement are in compliance with 25 O.S. Sec. 1313 and

participate in the Status Verification System. The Status Verification System is defined in 25 O.S. Sec. 1313 and includes, but is not limited to, the free Employee Verification Program (E-Verify) available at www.dhs.gov/E-Verify.

8. **Right to Audit.** The parties agree that books, records, documents, accounting procedures, practices, price lists or any other items related to the Services provided hereunder are subject to inspection, examination, and copying by City or its designees. Contractor shall retain all records related to this Agreement for the duration of the contract term and a period of three years following completion and/or termination of the contract. If an audit, litigation or other action involving such records begins before the end of the three year period, the records shall be maintained for three years from the date that all issues arising out of the action are resolved or until the end of the three year retention period, whichever is later.

9. **Governing Law and Venue.** This Agreement is executed in and shall be governed by and construed in accordance with the laws of the State of Oklahoma without regard to its choice of law principles, which shall be the forum for any lawsuits arising under this Agreement or incident thereto. The parties stipulate that venue is proper in a court of competent jurisdiction in Tulsa County, Oklahoma and each party waives any objection to such venue.

10. **No Waiver.** A waiver of any breach of any provision of this Agreement shall not constitute or operate as a waiver of any other provision, nor shall any failure to enforce any provision hereof operate as a waiver of the enforcement of such provision or any other provision.

11. **Entire Agreement/No Assignment.** This Agreement and any documents incorporated herein constitute the entire agreement of the parties and supersede any and all prior agreements, oral or otherwise, relating to the subject matter of this Agreement. This Agreement may only be modified or amended in writing and must be signed by both parties. Notwithstanding anything to the contrary herein, the City does not agree to the terms of any future agreements, revisions or modifications that may be required under this Agreement unless such terms, revisions or modifications have been reduced to writing and signed by both parties. Contractor may not assign this Agreement or use subcontractors to provide the Goods and/or Services without City's prior written consent. Contractor shall not be entitled to any claim for extras of any kind or nature.

12. **Equal Employment Opportunity**. Contractor shall comply with all applicable laws regarding equal employment opportunity and nondiscrimination

The undersigned agrees to the inclusion of the above provisions, among others, in any contract with the City of Tulsa.

Company Name: _____ Date: _____

Signature: _____

Name Printed: _____

Title: _____

A & M Engineering and
Environmental Services, Inc.
Consulting - Design - Construction - Remediation

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Asbestos Abatement
Portions of Air Force Plant 3

Tulsa International Airport
City of Tulsa, Tulsa County, Oklahoma

A & M Project Number 2320-001-008

Version 2
Revised February 2022
Original August 1, 2019

Prepared For:

CITY OF Tulsa
A New Kind of Energy.

City of Tulsa
175 East 2nd Street, Suite 15-041
Tulsa, Oklahoma 74103
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A & M Engineering and
Environmental Services, Inc.
Consulting - Design - Construction - Remediation

August 9, 2019

Ms. Michelle Barnett, P.E.
Deputy Chief of Economic Development
City of Tulsa
Office of the Mayor
175 East 2nd Street, Suite 15-041
Tulsa, Oklahoma 74103

A & M Project Number 2320-001-008

Email: mbarnett@cityoftulsa.org
Phone: (918) 596-7457

REF: Quality Assurance Project Plan (QAPP) for Asbestos Abatement at Portions of Air Force Plant 3, located at the Tulsa International Airport, City of Tulsa, Tulsa County, Oklahoma.

Dear Ms. Barnett:

A & M Engineering and Environmental Services, Inc. (A & M) has prepared the enclosed Quality Assurance Project Plan (QAPP) for **Asbestos Abatement** to be performed at the above referenced site.

Thank you for choosing A & M. If you have any questions feel free to contact us at (918) 665-6575 or via email.

Respectfully,
A & M Engineering and Environmental Services, Inc.

Jeff Jenkins, CIH, CSP
Senior Industrial Hygienist
ODOL Project Designer (OKPD 143988)
jjenkins@aandmengineering.com

Jeff Elbert
Director of Compliance
jelbert@aandmengineering.com

Enclosure

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1.0 PROJECT TITLE AND QAPP APPROVAL

This Quality Assurance Project Plan (QAPP) will be reviewed and approved by the City of Tulsa's Quality Assurance Manager, United States Environmental Protection Agency's (USEPA's) Project Officer, Consultant's Project Manager, and Consultant's Project Quality Assurance Manager prior to implementation and commencement of project activities. Project title and approval information is provided below:

Project Title:	Asbestos Abatement at portions of Former Air Force Plant 3 located at the Tulsa International Airport, City of Tulsa, Tulsa County, Oklahoma	
Implementing Organization:	City of Tulsa	
QAPP Effective Date:	August 1, 2019 rev February 8, 2022	
Approving Officials:	The City of Tulsa's Quality Assurance Manager will have primary responsibility for project oversight and quality assurance on behalf of the City of Tulsa. The USEPA's Project Officer will ensure that the policies, goals, and objectives of the project are achieved on behalf of the USEPA. The consultant will provide a Project Manager designated with the primary responsibility for project oversight on behalf of the consultant. They will also provide a Project Quality Assurance Manager to ensure Quality Assurance expectations are met on behalf of the consultant. The consultant will also provide a Health and Safety Officer to ensure safe work practices throughout the project.	
Michelle Barnett, P.E.	Michelle P.E.	9/3/19
City of Tulsa's Quality Assurance Manager (print name)	**Signature**	**Date**
Paul Johnson		
USEPA's Project Officer (print name)	**Signature**	**Date**
Jeff Elbert		8-09-2019
Consultant's Project Manager (print name)	**Signature**	**Date**
Jeff Jenkins, CIH, CSP		8-09-2019
Consultant's Project Quality Assurance Manager and Health and Safety Officer (print name)	**Signature**	**Date**

2.0 QAPP DISTRIBUTION AND PROJECT ORGANIZATION

Any individual or organization participating in this project may request a copy of this QAPP. All individuals listed in Section 1.0 of this QAPP will receive a final copy of this QAPP and comprise the project organization and distribution list, as listed below:

Name	Title	Company/Agency/Entity	Project Role
Michelle Barnett, P.E.	Deputy Chief of Economic Development	City of Tulsa	City of Tulsa's Quality Assurance Manager
Paul Johnson	EPA Project Officer	US EPA	USEPA's Project Officer
Bernita Hart	ODOL Director Asbestos	ODOL	ODOL Director Asbestos
Jeff Elbert	Director of Compliance	A & M Engineering and Environmental Services, Inc.	Consultant's Project Manager
Jeff Jenkins, CIH, CSP	Senior Industrial Hygienist/ Oklahoma Project Designer	A & M Engineering and Environmental Services, Inc.	Consultant's Project Quality Assurance Manager

It shall be the responsibility of the USEPA's Project Officer to distribute the QAPP to the required Project Managers, Quality Assurance Managers, and any other representatives of their groups involved in the project.

3.0 INTRODUCTION

This QAPP has been prepared to document quality assurance and quality control procedures to be implemented for Asbestos Abatement at the Former Air Force Plant 3 located at the Tulsa International Airport, City of Tulsa, Tulsa County, Oklahoma, henceforth referenced as the Site. Appendix A (Project Figures) contains a Site Map (Figure 1).

This QAPP has been developed by A & M Engineering and Environmental Services, Inc. (A & M) in accordance with applicable USEPA protocols outlined in the USEPA's Requirements for Quality Assurance Project Plans, USEPA QA/R-5 (EPA, 2001), and USEPA Guidance for Quality Assurance Project Plans (EPA QA/G-5) (EPA, 2002).

The Asbestos Abatement Project Design has been prepared in accordance with the specific governing including but not limited to: 29 Code of Federal Regulations (CFR) 1926.1101 (OSHA Construction Industry Asbestos Standard), 29 CFR 1910.134 (OSHA Respiratory Protection), 40 CFR 61, Subpart M (Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP), and Oklahoma Asbestos Control Act (OAC) 380:50 with approved variances.

4.0 OTHER PROJECT PLANS

This QAPP incorporates the following additional Project Plans including:

- **Project Design (PD)** that outlines the planned work activities and implementation. Appendix B contains a copy of the PD.

5.0 AMENDMENTS

All amendments to this QAPP and/or associated other plans (PD) will be reviewed/approved prior to implementation by the individuals identified in Section 1.0 of this QAPP. Appendix C contains a QAPP Amendment Log Form to be completed for all such amendments. Completed Amendment Log Forms will also be kept in Appendix C or the appropriate appendix of the other associated plans, as appropriate.

6.0 PROBLEM DEFINITION AND BACKGROUND

Air Force Plant 3 (AFP3) is located on approximately 332 acres of land immediately east of the Tulsa International Airport and contains a total of ninety-two (92) buildings, of these four (4) are electrical power stations.

The AFP3 facility was constructed in early 1942 for the production and repair of aircraft during World War II and remained in use until 1994 when aircraft production and repair operations ceased. During the late 1990's, McDonnell Douglas – Tulsa (The Boeing Company) occupied some of the buildings, but the majority remained vacant. The facility was eventually deeded to the City of Tulsa. McDonnell Douglas retained A & M Engineering and Environmental Services to conduct asbestos surveys of the facility. The surveys were initiated in late 1998 and a report finalized in March 1999.

Today, the City of Tulsa has tenants in many of the buildings, but much of the asbestos remains. The City of Tulsa is looking to abate the buildings of the asbestos containing materials (ACM) to allow more of the buildings to be modernized and restored to useful production.

7.0 PROJECT MANAGEMENT

Project management includes the elements and personnel in place to ensure that the project has defined goals that are understood by all participants and achieved with implementation of the designed approach. Project Managers ensure that project planning, implementation, Quality Assurance/Quality Control (QA/QC), and reporting are properly documented.

7.1 PROJECT/TASK ORGANIZATION

The individuals and organizations participating in this project along with their specific roles and responsibilities are categorized by Principal Data Users, Quality Assurance Managers, Consultants, Subcontractors, and Key Decision Makers as described below and on the following pages.

Principal Data Users

Those principal persons/representatives, companies, agencies, and/or entities that will represent principal users of the data generated during the course of this project are identified below along with their contact information:

City of Tulsa's Quality Assurance Manager	
Name:	Michelle Barnett, P.E.
Title:	Deputy Chief of Economic Development
Company/Agency/Entity:	City of Tulsa - Office of the Mayor
Mailing Address:	175 East 2nd Street, Suite 15-041, Tulsa, Oklahoma 74103
Email Address:	mbarnett@cityoftulsa.org
Phone:	(918) 596-7457
USEPA's Project Officer	
Name:	Paul Johnson
Title:	EPA Project Officer
Company/Agency/Entity:	US Environmental Protection Agency
Mailing Address:	1445 Ross Avenue, Suite 1200; Dallas, TX 75202
Email Address:	Johnson.Paul@epa.gov
Phone:	(214) 665-2246
DOL Director - Asbestos	
Name:	Bernita Hart
Title:	Director – Asbestos/Alarm Locksmiths and Fire Sprinkler
Company/Agency/Entity:	Oklahoma department of Labor
Mailing Address:	3017 N Stiles, Suite 100; Oklahoma City, OK 73105
Email Address:	Bernita.Hart@labor.ok.gov
Phone:	(405) 521-6467
Consultant's Project Manager	
Name:	Jeff Elbert
Title:	Director of Compliance
Company/Agency/Entity:	A & M Engineering and Environmental Services, Inc.
Mailing Address:	10010 East 16th Street; Tulsa, OK 74128
Email Address:	jelbert@aandmengineering.com
Phone:	(918) 665-6575
Consultant's Project Quality Assurance Manager and Health and Safety Officer	
Name:	Jeff Jenkins, CIH, CSP
Title:	Senior Industrial Hygienist/ OK Asbestos Project Designer
Company/Agency/Entity:	A & M Engineering and Environmental Services, Inc.
Mailing Address:	10010 East 16th Street; Tulsa, OK 74128
Email Address:	jjenkins@aandmengineering.com
Phone:	(918) 665-6575

Asbestos Abatement Contractor's Project and Quality Assurance Manager	
Name:	To Be Determined
Title:	To Be Determined
Company/Agency/Entity:	To Be Determined
Mailing Address:	To Be Determined
Email Address:	To Be Determined
Phone:	To Be Determined

Quality Assurance Managers

City of Tulsa's Quality Assurance Manager

The City of Tulsa's Quality Assurance Manager for this project will have primary responsibility for project oversight and quality assurance on behalf of the City of Tulsa.

Their project management responsibilities include the following:

- Overall contracting and management of the grant (as applicable) and project performance.
- Development of the QAPP and other associated project plans.
- Shared responsibility of review/approval of the QAPP and other associated project plans.
- Contractor oversight including review, evaluation and decision-making regarding the contractor's recommendations.
- Impose stop work authority, whenever necessary.

Their quality assurance responsibilities include QA/QC oversight comprised of the following:

- Technical assistance to ensure environmental compliance.
- Shared responsibility for review/approval of the QAPP and other associated project plans including subsequent revisions.
- Maintaining the official/approved QAPP and ensuring that all involved parties have the most recent version of the QAPP and receive all amendments.
- Serve as the official QA/QC contact for all intramural and extramural QA/QC activities for the City of Tulsa.
- Report directly, as a partner, to the City of Tulsa regarding all QA/QC matters.
- Review and concur with the QAPP and submit to the QAPP to the USEPA Project Officer prior to the planned initiation of secondary environmental data review activities.
- Work with the City of Tulsa personnel to take appropriate corrective action when, where, and however needed, during the proposed project activities.
- Assure that all secondary environmental data review activities are accomplished in strict compliance with QAPP requirements.
- Impose stop work authority, whenever necessary.

USEPA's Project Officer

The USEPA's Project Officer will ensure that the policies, goals, and objectives of the project are achieved on behalf of the USEPA and implement the following:

- Assist the City of Tulsa's QA/QC staff.
- Shared responsibility for review/approval of the QAPP and other associated project plans including subsequent revisions.
- Provide overall resources to accomplish the implementation of the associated program.
- Routinely evaluate the relevant programs effectiveness.
- Impose stop work authority, whenever necessary.

When necessary, the City of Tulsa's Quality Assurance Manager and/or USEPA's Project Officer will coordinate with all appropriate State Agencies in a manner that ensures that compliance with all applicable State regulatory requirements are achieved. These agencies may include the Oklahoma Department of Environmental Quality (ODEQ), Oklahoma Department of Labor (ODOL), and/or others, as appropriate.

ODOL Director - Asbestos

The ODOL Director - Asbestos will ensure that the policies, goals, and objectives of the project are achieved on behalf of the ODOL and implement the following:

- Review and Approve the Project Design.
- Shared responsibility for review/approval of the QAPP and other associated project plans including subsequent revisions.
- Provide required regulatory inspections during the course of the project.
- Impose stop work authority, whenever necessary.

Consultants

The Consultant's Project Manager and Project Quality Assurance Manager designated for this project are responsible for project oversight and QA/QC on behalf of the consultant.

Consultant's Project Manager

The Consultant's Project Manager responsibilities include project oversight comprised of the following:

- Oversee project work and scheduling.
- Interact with City of Tulsa and USEPA staff with regard to the project, provides progress reports, and participates in routine work progress meetings.
- Shared responsibility for review/approval of the QAPP and other associated project plans including subsequent revisions.
- Provide oversight of all project activities and assurance that compliance with the QAPP and other associated project plans is met.

- Manage amendments to the QAPP and other associated project plans.
- Review and submit final documents.
- Schedule, coordinate, and attend required/necessary meetings.
- Impose stop work authority, whenever necessary.

Consultant's Project Quality Assurance Manager and Health and Safety Officer

The Consultant's Project Quality Assurance Manager will work closely with the Consultant's Project Manager, City of Tulsa's Quality Assurance Manager, and Subcontractor's Project and Quality Assurance Manager to ensure the following:

- Adherence and compliance with the QAPP and other associated project plans.
- Proper review and approval of Subcontractor work plans, safety plans, and QA/QC procedures.
- Proper implementation and documentation of all QA/QC procedures in accordance with the QAPP and other associated project plans.
- Shared responsibility for review/approval of the QAPP and other associated project plans including subsequent revisions.
- Stop work authority is imposed, whenever necessary.

The Consultant's Health and Safety Officer will monitor project activities to ensure that they are performed in accordance with the Project Design (PD) to ensure the following:

- Proper and complete implementation of the PD.
- Safe and healthful working environment.
- Prevent safety incidents and close call incidents, which harm or could harm, people, the environment, or the assets or reputation of all parties involved.
- Pre-planning, pro-active implementation, and constant risk evaluation.
- Stop work authority is imposed, whenever necessary.

Asbestos Abatement Contractor

Asbestos Abatement Contractor's Project and Quality Assurance Manager

The Asbestos Abatement Contractor's Project and Quality Assurance Manager will work closely with the Consultant's Project Manager and Project Quality Assurance Manager to ensure that all their work plans, safety plans, and QA/QC procedures have been properly reviewed and approved prior to implementation. This close communication will also function to ensure proper implementation of the QAPP and other associated project plans as work is carried out. The Asbestos Abatement Contractor's Project and Quality Assurance Manager also has stop work authority.

Project organization has been established in order to demonstrate overall key personnel associated with this project and provide functional overview of the team that will be used to complete the scope of work, along with lines of authority. Appendix D contains a Project Organizational Chart.

Key Decision Makers

The key decision makers for this project include the following individuals representing the identified companies/agencies/entities:

City of Tulsa's Quality Assurance Manager	
Name:	Michelle Barnett, P.E.
Title:	Deputy Chief of Economic Development
Company/Agency/Entity:	City of Tulsa
USEPA's Project Officer	
Name:	Paul Johnson
Title:	EPA Project Officer
Company/Agency/Entity:	US EPA
ODOL Director Asbestos	
Name:	Bernita Hart
Title:	Director – Asbestos/Alarm Locksmiths and Fire Sprinkler
Company/Agency/Entity:	Oklahoma department of Labor

7.2 PROJECT MEETINGS

Regularly scheduled teleconference meetings are planned for this project in order to ensure understanding and proper/safe implementation including a Pre-Work Meeting and Weekly Progress Meetings. Additionally, Called Meetings may be held (as necessary). A Project Close-Out Meeting will be held upon project completion.

Pre-Work Teleconference Meeting

A Pre-Work Meeting will be held via teleconference in order to review and resolve any uncertainties of the QAPP and other associated project plans prior to commencement of the work. All individuals on the project distribution list will be notified and invited to the meeting. This meeting will be organized and directed by the Consultant's Project Manager. A written record of the meeting discussions will also be kept by the Consultant's Project Manager.

Weekly Progress Teleconference Meetings

Weekly Progress Meetings will be held via teleconference or email distribution in order to review progress against the planned work schedule and to identify existing or anticipated problems. These meetings will also be utilized to provide updates on data acquisition and review, address safety issues, ensure maintenance of quality standards, discuss pending changes and substitutions, and discuss any other items that could affect timely completion of the work. All individuals on the project distribution list will be notified and invited to these meetings. These meetings will be organized and directed by the Consultant's Project Manager. A written record of the meeting discussions will also be kept by the Consultant's Project Manager.

Called Meetings

Called Meetings can be requested by any of the individuals listed on the project distribution list to discuss specific concerns, problems, or deficiencies. All individuals on the project distribution list will be notified and invited to these meetings. A written record of the meeting discussions will also be kept by the Consultant's Project Manager.

Project Close-Out Meeting

A Project Close-Out Meeting will be conducted upon completion to facilitate the collection of field data, final reports, records, invoices, and any other required documentation. All individuals on the project distribution list will be notified and invited to the meeting. This meeting will be organized and directed by the Consultant's Project Manager. A written record of the meeting discussions will also be kept by the Consultant's Project Manager.

7.3 PROJECT/TASK DESCRIPTION AND PRE-WORK SITE WALK

The project has been organized into specific tasks in order to ensure accuracy and efficiency.

Task 1 Contractor Bidding

Once the QAPP and other associated project plans have been signed by all individuals identified on the project distribution list, the Consultant will work with the City of Tulsa Quality Assurance Manager to obtain competitive bids from qualified asbestos abatement contractors. This task includes the gathering and evaluation of secondary environmental data. The Consultant will gather and evaluate existing data provided by the City of Tulsa for this project.

Task 2 Site Access Arrangements and Pre-Work Site Walk

The Consultant's Project Manager, in coordination with the City of Tulsa Quality Assurance Manager, will coordinate a mandatory Pre-Bid Walk Through to allow contractors the opportunity to view the project and ask specific questions prior to bidding. All individuals on the project distribution list will be invited.

Task 3 Document Review

The City of Tulsa will determine a top three (3) contractor's bids and may ask the consultant to determine if any quality issues with any of the three (3) contractors.

Task 4 Third Party Monitoring and Project Oversight

The Consultant Project and Quality Assurance Manager will provide Third-Party Air Monitoring during the Asbestos Abatement Phase as required by OAC 380:50-11-7. The Consultant Project and Quality Assurance Manager will provide project oversight on the City of Tulsa's behalf and immediately notify the City of Tulsa Quality Assurance Manager of any deviations from the approved QAPP, Project Design, or safety concerns. The Consultant Project and Quality Assurance Manager will be on-sight whenever the contractor is performing any type of asbestos abatement work activity.

Task 5 Reporting

A Final Report will be compiled by the Consultant of all work activity during the asbestos abatement. The report will include sufficient detail to meet the requirements for recordkeeping to include but not limited to: Worker licenses, worker respirator clearances, daily logs and air monitoring data, waste shipments, ODOL or USEPA inspections, etc. A single draft report will be circulated for comments by all individuals identified on the project distribution list. Comments will then be incorporated into a final report to be re-distributed to the same individuals. The draft report will be provided in electronic Portable Document Format (PDF) only. The final report will be provided in both electronic PDF and hard copy.

The consultant during the project will conduct Davis Bacon wage interviews and supply the documentation with the final report as a separate document.

Task 6 Project Close-Out

A Project Close-Out Meeting will be conducted upon completion in order to confirm no outstanding items remain; to gain acknowledgment from all members of the project distribution list that the project is complete; and to facilitate invoicing. All individuals on the project distribution list will be notified and invited to the meeting.

8.0 PROJECT QUALITY OBJECTIVES, CRITERIA, AND PERFORMANCE MEASURES

In order to ensure project goals are met it is imperative that quality objectives and criteria are established and measured.

Project Quality Objectives

The data quality objectives take into account both the best practices for similar projects and the resources available for this project. If necessary, the Consultant's Project Manager will rely upon USEPA's *Generic Guide to Statistical Aspects of Developing and Environmental Results Program* (2003) for advice in making decisions related to optimizing the following aspects of data quality for this project, including:

Precision

Precision is the measurement of agreement or reproducibility among replicate samples of the same media under prescribed similar conditions. It is normally expressed as the Relative Percent Difference (RPD) between two (2) values.

Accuracy

Accuracy is a measure of the closeness of an individual measurement or the average of a number of measurements, to the true value. Bias is the systematic or persistent distortion of a measurement process that causes error in one direction. Accuracy is normally expressed as a percent recovery.

Representativeness

Representativeness is an expression of the degree to which a sample accurately and precisely represents a characteristic of a population, parameter variations at a sampling point or an environmental condition. Representativeness is a qualitative parameter, which relies upon the proper design of a sampling program and proper laboratory protocol.

Comparability

Comparability is defined as an expression of the confidence with which one data set can be compared to another. In most instances, the proficiency of field sampling efforts will be the determining factor that affects the overall comparability of environmental measurement data. To optimize the comparability of environmental measurement data, sample collection activities should always be performed using standardized procedures whenever possible. When performing a site investigation, adhering to the quality control criteria will facilitate these efforts.

Completeness

Completeness is defined as the measurement of the amount of data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. Data completeness is often expressed as the percentage of valid data obtained from a given measurement system. To consider data valid, it is customary to assess if a set of data satisfies all of the specified acceptance and performance criteria (accuracy measures, precision measures, etc.) to render a determination.

Performance Measures

To the extent that performance measures rely on the generation of data, this QAPP and other associated plans seek to verify that the project quality objectives are appropriate for the regulatory and non-regulatory decisions to be made based upon that data. Performance measures to ensure the project quality objectives are achieved include the following:

- Protection of site workers and public through adherence to the PSAHP.
- Protection of the environment.
- Successful completion of abatement with no visible emissions or asbestos debris left behind
- Successful control of the asbestos abatement documented by air samples outside of containment less than 0.01 fibers per cubic centimeter (f/cc).
- Successful clearance of all abated spaces for re-occupancy documented by air samples outside of containment less than 0.01 f/cc.

9.0 SPECIAL TRAINING/CERTIFICATIONS

All Consultant's employees assigned to this project and will be onsite will be properly trained and licensed by the ODOL. Air monitoring analyst's performing on-site analysis of the collected air samples will have attended a National Institute of safety and Health (NIOSH) 582 course or an approved 582 equivalent (582e) course and will have demonstrated proficiency by successful completion in American Industrial Hygiene s (AIHA) Proficiency Analytical Program (PAT).

All Asbestos Abatement Contractor's employees will hold a current ODOL asbestos worker license and be medically cleared for respirator use. All work crews will be supervised by an ODOL licensed Asbestos Abatement Supervisor. The contractor will always have a licensed supervisor onsite when asbestos work activities are being conducted.

The Consultant's Air Monitor and Oversight Representative and/or Contractor's Supervisor will not allow anyone inside containment without proper training and licensure.

10.0 DOCUMENTATION AND RECORDS

Documents and records generated as a result of the asbestos abatement are considered quality assurance records and will be processed in accordance with the requirements of this QAPP and other project plans. Quality assurance records provide a record of events that have occurred for all aspects of the project. Their adequate generation, review, protection, and submittal are essential to the success of the process. Copies of all field generated data including daily field logs/notes and all other relevant forms and documentations will be maintained by the Consultant's Project Manager.

Records pertaining to this project and its related work tasks, including all field generated data, will be maintained by the Consultant for a minimum of five (5) years following the conclusion of work performed.

11.0 PROJECT SCHEDULE

It is anticipated that the project will begin immediately upon approval of the QAPP, Project Design approval, funding, and all notifications have been made. The total estimated project duration is ninety (90) calendar days. If necessary, time extension notices will be submitted.

12.0 DATA SELECTION AND MANAGEMENT

Readily available data will be selected and managed in association with this project to ensure proper project knowledge and familiarity with background information.

12.1 EXISTING DATA SOURCES

The primary existing data source for this project includes the asbestos survey report prepared by A & M (dated March 1999).

12.2 EXISTING DATA SOURCES INTENDED USES AND LIMITATIONS

Data from the A & M Asbestos Report will be utilized to identify the materials to be abated and their locations. A new asbestos survey report will not be conducted.

12.3 FIELD GENERATED DATA

The project will involve the field generation of data by both the Consultant and Contractor including primarily daily field logs, air monitoring data, and/or notes.

12.4 SAMPLING AND ANALYTICAL METHODS

Daily air monitoring will be conducted outside of containment at locations as identified in the Project design. Sample pump flow rates will be checked using a calibrated rotameter at the beginning and completion of the sampling period. The rotameter will be calibrated to a primary calibrator monthly as required by OAC 380:50-11-1(4). All daily air monitoring and analytical data will be entered onto an Air Monitoring Data Form. A copy of the Air Monitoring Data Form is provided in Appendix E.

Suspect materials identified during the abatement, that may not have been previously sampled or for confirmation, will be sampled for Bulk Asbestos Analysis by Polarized Light Microscopy (PLM) using method EPA/600/R-93/116. Bulk samples will be shipped to a Third-Party Laboratory that is accredited by National Voluntary Laboratory Accreditation program (NVLAP).

12.5 EQUIPMENT/INSTRUMENT OPERATION AND CALIBRATION

Equipment (rotameters) used for calibrating air sample flow rates will be calibrated to a primary standard on a monthly basis.

The Phase Contrast Microscopy (PCM) used for analysis of collected air samples will be checked each time it is moved using the HSE test slide and centering telescope for proper optical alignment.

All electrical equipment will be protected using Ground-Fault Circuit Interrupters (GFCI).

13.0 ASSESSMENT AND OVERSIGHT

Assessment and oversight procedures are in place to assess the effectiveness of project implementation and the associated QA/QC activities. The purpose of assessment is to ensure proper implementation of the QAPP and other associated project plans.

Self-assessment and performance evaluations will be conducted weekly to evaluate the effectiveness of project implementation and determine whether QAPP and other project plan procedures are being properly implemented. The self-assessments and performance evaluations will be conducted by the Consultant's Project Manager and/or Project Quality Assurance Manager, whom will have the authority to stop work in the event that non-conforming conditions are identified that cannot be remedied or resolved with immediate actions in a manner that protects the validity of the information being gathered.

The Consultant's Project Manager and/or Project Quality Assurance Manager will review the documentation required to be maintained. A record of any significant deviations from normal procedures will be documented to ensure that corrective actions are taken to correct any noted deficiencies. Minor deviation items will be corrected on the spot. Significant deviations or recurring deviations will be recorded and addressed at the Weekly Progress Meeting.

14.0 DATA REVIEW, VERIFICATION, VALIDATION, AND EVALUATION

This QAPP and other associated project plans will govern the operation of the project at all times. Each responsible party listed in the project distribution list shall adhere to the procedural requirements of the QAPP and other associated project plans and ensure that subordinate personnel do likewise.

This QAPP and other associate project plans will be reviewed at least quarterly to ensure that the project will achieve all intended purposes. All the persons listed in the distribution list shall participate in the review of the QAPP and other associated project plans. The Consultant's Project Manager and/or Project Quality Assurance Manager is responsible for determining that data are of adequate quality to support this project. The project will be modified as directed by the Consultant's Project Manager and/or Project Quality Assurance Manager. The Consultant's Project Manager and/or Project Quality Assurance Manager will be responsible for the implementation of changes to the project and shall document the effective date of all changes made.

Initial data review, verification, and validation of all data and information acquired will be accomplished by experienced/qualified team members performing within their disciplines and practicing professional judgment. The final layer of data review, verification, and validation will be performed by the Consultant's Project Manager and Project Quality Assurance Manager during their reviews. During either phase of these reviews the data can be accepted, rejected, or qualified by any of these individuals.

15.0 USER REQUIREMENTS RECONCILIATION

The results obtained from the project will be reconciled with the requirements defined by the data user and/or decision makers. The data will be analyzed to determine possible anomalies and/or departures from any assumptions made during the planning phase. The data will be analyzed by experienced/qualified team members performing within their disciplines and practicing professional judgment initially followed by reviews performed by the Consultant's Project Manager and Project Quality Assurance Manager. The decision makers will be made aware of any limitations associated with the data and/or information collected.

The work to be done on this project is fairly straightforward in that standard work procedures are to be used. No deviations from the QAPP or other associated project plans are anticipated at this time. Should unforeseen conditions arise that warrant a deviation from the QAPP or other associated project plans, the Consultant's Project Manager will notify the City of Tulsa's Quality Assurance Manager and a determination will be made regarding notification of the appropriate regulatory agencies and decision makers.

Corrective action will be taken whenever data are determined unacceptable by comparison to pre-established quality control limits. Corrective actions will be the responsibility of the Consultant's Project Manager or, in the case of Contractor's, the Contractor's Project and Quality Assurance Manager.

Corrective action will, in general, consist of the following:

- Review of raw data and calculations
- Review of procedures to determine that appropriate abatement procedures, sample collection, and analytical methods were followed.
- Review of instrumentation operation, calibration, and maintenance.
- Other actions as deemed necessary by the USEPA.

As a result of the above, corrective action may be identified and will be pursued as necessary. This action may include:

- Stop-Work until conditions have been corrected.
- Recleaning of an area using specilaizzed cleaning and/or abatement procedures.
- Recalibration of instrumentation/equipment.
- Instrumentation/equipment repairs.
- Additional training.
- Other action as deemed necessary by the USEPA.

A Deviation Record will be completed and approved by the individuals identified on the project distribution list. The final report will include a description of any deviations, assumptions, or limitations along with a summary of any associated reconciliation that occurred during the course of the project.

16.0 PROJECT COMPLETION AND REPORT

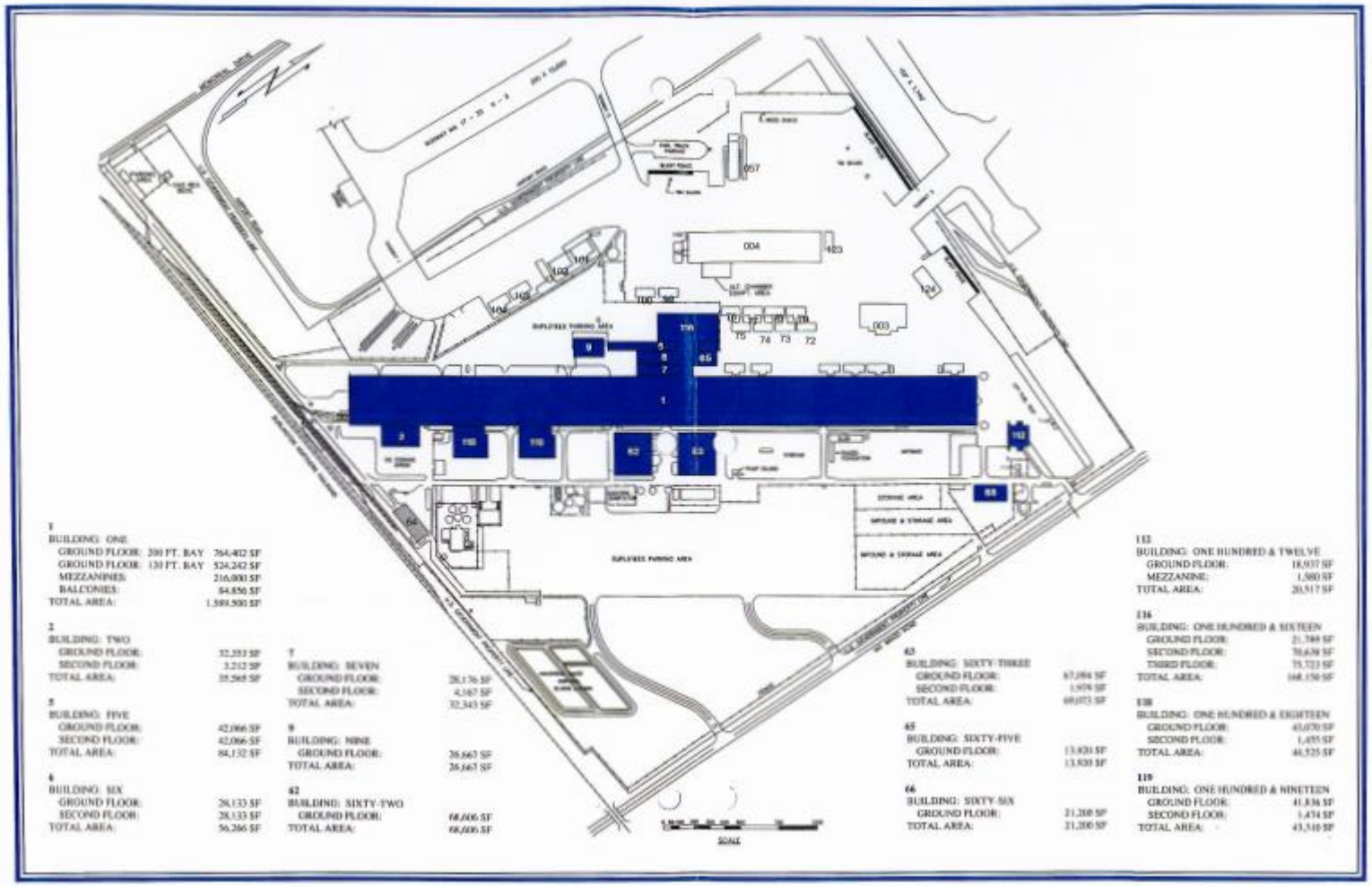
After completion of all work as outlined in this QAPP, the Consultant's Project Manager will deliver to the City of Tulsa's Quality Assurance Manager one (1) electronic PDF and hardcopies of the final report containing:

- List of any deviations, assumption, or limitations along with a summary of any associated reconciliation.
- Certification that all work specified in the QAPP has been completed.
- Summary of field activities and methodologies used.
- Overview of QA/QC procedures.
- Asbestos daily records to include notes and air monitoring data.
- ODOL inspection forms.
- Waste disposal receipts.
- Findings and recommendations.
- Bacon Davis Wage Interview forms

A Certificate of Work Completion and authorization for final payment will not be issued by the consultant representative until the documents and data are reviewed and approved by the client representatives, and the documents are submitted in satisfactory form.

Appendix A

Project Figures


1
BUILDING: ONE
GROUND FLOOR: 200 FT. BAY 764,402 SF
GROUND FLOOR: 130 FT. BAY 524,242 SF
MEZZANINES: 216,000 SF
BALCONIES: 84,856 SF
TOTAL AREA: 1,589,500 SF
2
BUILDING: TWO
GROUND FLOOR: 32,353 SF
SECOND FLOOR: 3,212 SF
TOTAL AREA: 35,565 SF
5
BUILDING: FIVE
GROUND FLOOR: 42,066 SF
SECOND FLOOR: 42,066 SF
TOTAL AREA: 84,132 SF
6
BUILDING: SIX
GROUND FLOOR: 28,133 SF
SECOND FLOOR: 28,133 SF
TOTAL AREA: 56,266 SF
7
BUILDING: SEVEN
GROUND FLOOR: 28,176 SF
SECOND FLOOR: 4,167 SF
TOTAL AREA: 32,343 SF
9
BUILDING: NINE
GROUND FLOOR: 39,667 SF
TOTAL AREA: 39,667 SF
62
BUILDING: SIXTY-TWO
GROUND FLOOR: 68,606 SF
TOTAL AREA: 68,606 SF
63
BUILDING: SIXTY-THREE
GROUND FLOOR: 67,094 SF
SECOND FLOOR: 1,979 SF
TOTAL AREA: 69,073 SF
65
BUILDING: SIXTY-FIVE
GROUND FLOOR: 13,920 SF
TOTAL AREA: 13,920 SF
66
BUILDING: SIXTY-SIX
GROUND FLOOR: 21,200 SF
TOTAL AREA: 21,200 SF
111
BUILDING: ONE HUNDRED & TWELVE
GROUND FLOOR: 18,937 SF
MEZZANINE: 1,580 SF
TOTAL AREA: 20,517 SF
116
BUILDING: ONE HUNDRED & SIXTEEN
GROUND FLOOR: 21,789 SF
SECOND FLOOR: 70,638 SF
THIRD FLOOR: 75,723 SF
TOTAL AREA: 168,150 SF
118
BUILDING: ONE HUNDRED & EIGHTEEN
GROUND FLOOR: 43,070 SF
SECOND FLOOR: 1,455 SF
TOTAL AREA: 44,525 SF
119
BUILDING: ONE HUNDRED & NINETEEN
GROUND FLOOR: 41,836 SF
SECOND FLOOR: 1,474 SF
TOTAL AREA: 43,310 SF
SCALE

Appendix B

Asbestos Abatement Project Design (PD)

A & M Engineering and
Environmental Services, Inc.
Consulting - Design - Construction - Remediation

Asbestos Abatement Project Design
Former Air Force Plant 3, Building 7

Tulsa International Airport
City of Tulsa, Tulsa County, Oklahoma

A & M Project Number 2320-001-018

Version 3 / Revision Date – February 25, 2021

February 26, 2021

Prepared For:

CITY OF Tulsa
A New Kind of Energy.

City of Tulsa
Office of the Mayor
175 East 2nd Street, Suite 15-041
Tulsa, Oklahoma 74103
Michelle Barnett, P.E. (Deputy Chief of Economic Development)
Email: mbarnett@cityoftulsa.org
Phone: (918) 596-7457

A & M Engineering and Environmental Services, Inc.
Consulting - Design - Construction - Remediation

February 26, 2021

Ms. Michelle Barnett, P.E.
Deputy Chief of Economic Development
City of Tulsa
Office of the Mayor
175 East 2nd Street, Suite 15-041
Tulsa, Oklahoma 74103

A & M Project Number 2320-001-018

Email: mbarnett@cityoftulsa.org
Phone: (918) 596-7457

REF: Asbestos Abatement Project Design (PD) for Asbestos Abatement at the Former Air Force Plant 3, Building 7 located at the Tulsa International Airport, City of Tulsa, Tulsa County, Oklahoma.

Dear Ms. Barnett:

A & M Engineering and Environmental Services, Inc. (A & M) has prepared the enclosed Asbestos Abatement Project Design (PD) for **Asbestos Abatement** to be performed at the above referenced site.

Thank you for choosing A & M. If you have any questions, feel free to contact us at (918) 665-6575 or via email.

Respectfully,
A & M Engineering and Environmental Services, Inc.

Jeff Jenkins, CIH, CSP
Senior Industrial Hygienist
ODOL Project Designer
jjenkins@aandmengineering.com

Jeff Elbert
Director of Compliance
jelbert@aandmengineering.com

Enclosure (1)

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TABLES

Table 1 Asbestos Materials to be Abated

APPENDICES

Appendix A Asbestos Sample Results
Appendix B 1999 Asbestos Report Drawings
Appendix C Proposed Abatement Layout
Appendix D Enclosure Construction Drawings and Specs.

1.0 INTRODUCTION

This Asbestos Project Design was prepared by A & M Engineering and Environmental Services Inc. (A & M), to provide a prudent course of action for abating Asbestos-Containing Materials (ACM) associated with Building 7 at the former Air Force Plant 3 (AFP3). Protocols to be used for compliance with governing regulations to protect workers and the environment from incidental exposure to airborne asbestos fibers during the work being performed are included or referenced.

This project design is being developed for the abatement and management of asbestos in the building and includes an Option 1, Option 2, and Option 3 which will be completed depending on funding. Unabated areas will have an enclosure constructed to prevent access and disturbance per option 2. Drawings depicting the base bid and options 1, 2, and 3 are provided in Appendix C.

- Base Bid: All north of column 79, and small pump near column 76 sticking out in passage aisle.
- Option 1: Add abatement of all ACM south of column 76 and the outside shed.
- Option 2: Build enclosure around boilers and equipment west of boilers and between columns 76 and 79. See Appendix D.
- Option 3: Add abatement between columns 76 and 79. (if Option 3 is performed the enclosure on west side of building will not be needed with the enclosure remaining around the boilers).

PROJECT INFORMATION:

Project Name:	**Air Force Plant 3, Building 7**
Description of Work/Occupancy:	Removal of friable ACM (thermal insulation) ***(North of Column #79)***
Project Type:	Pre-renovation
Contractor:	To be determined
Owner's Environmental Representative:	**A & M Engineering and Environmental Services, Inc. (A & M)**
IH/Air Monitoring Firm:	**A&M Engineering and Environmental Services**
Analytical Laboratory:	**Laboratory: A & M: AIHA PAT Laboratory # 272727.**

2.0 REGULATORY COMPLIANCE

The specific governing regulations affecting this work include but are not limited to: 29 Code of Federal Regulations (CFR) 1926.1101 (OSHA Construction Industry Asbestos Standard), 29 CFR 1910.134 (OSHA Respiratory Protection), 40 CFR 61, Subpart M (Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP), and Oklahoma Asbestos Control Act (OAC) 380:50 with approved variances. Waste transport and disposal is to be performed by an Oklahoma-licensed asbestos waste transporter with a waste disposal manifest/chain of custody signed by the receiving landfill. DOT Class 9 placards are to be displayed during transportation of asbestos waste.

The contractor shall maintain a daily log showing the number and names of workmen and supervisory personnel by craft physically on the job site each working day, and a report of daily progress. The daily entries shall include a brief statement of the work in progress and a record of any accidents, injuries and/or safety meetings held on that day. All workmen must sign in and out during abatement operations and provide a brief description of operations performed. These logs shall always be available for inspection at the job site while work is in progress. A reproducible copy of these logs shall be provided to the Owner's Representative at the weekly progress meeting. All personnel entering containment must have their current asbestos licenses onsite with them.

The technicians performing on-site air monitoring must maintain an onsite daily activity log. The log shall include, but not be limited to:

- Time of on-site arrival and departure.
- Times of entrance into the regulated area to ensure sample integrity.
- Signature of on-site asbestos supervisor.

In addition, all cassettes must be properly labeled as they are placed for sample collection. At least one (1) technician performing on-site air monitoring will be present at the job site while asbestos abatement work is being performed.

3.0 WORK SEQUENCING/SCHEDULING

The asbestos abatement of the AFP3, Building 7 is being conducted in a single phase, but may involve subsections, multiple areas, and/or options. The tentative start date will be determined following contractor bidding and contract issuance by City of Tulsa. The work is to be scheduled by the Abatement Contractor in coordination with City of Tulsa and A & M. Work is expected to be conducted during normal work hours, Monday through Friday, and hours of 7:00 AM to 5:00 PM.

The enclosure must be constructed following abatement of the Base Plan, as some materials will ened to be abted prior to construction of the enclosure.

Option 1, Option 2, and Option 3 will only be included if funding allows.

4.0 EGRESS AND FIRE PROTECTION

Workers must be briefed on emergency exit procedures and the assembly point at the beginning of the work shift. In the event emergency evacuation is necessary, workers will exit immediately through the decon and to the nearest exit.

Emergency illumination shall be provided for not less than 1-1/2 hours in the event of failure of normal lighting. Emergency lighting facilities shall be arranged to provide initial illumination that is not less than an average of one (1) foot-candle (ft.-candle) and, at any point, not less than 0.1 ft.-candle, measured along the path of egress at walk surface. The emergency lighting system shall be arranged to provide the required illumination automatically in the event of any interruption of normal lighting. Where maintenance of illumination depends on changing from one (1) energy source to another, a delay of not more than ten (10) seconds shall be permitted. The Abatement Contractor will provide a minimum of one (1) ABC dry-charged fire extinguisher ten (10) pound (lb.) for every three thousand (3,000) square feet (SF) of work area and at least one (1) outside the decon during abatement. The fire extinguishers must have a valid inspection tag and be decontaminated upon removal from the work area.

All poly used should be rated Fire Retardant Polyethylene and meet National Fire protection Association (NFPA) 701-04, American Standards for Testing and Materials (ASTM) E84, and Canvas Products Association International (CPAI) 84 or equivalent.

The Abatement Contractor must provide appropriate and sufficient signs at the abatement-controlled access entrances to direct pedestrian traffic away from blocked entrances. Signs shall be clearly visible and readable at fifty (50) feet from the abatement work area. The contractor shall install signs at the onset of work.

5.0 MATERIALS TO BE ABATED

Table 1 lists the identified ACM that is included as part of this Asbestos Project Design

Table 1
ACM to be Abated

Materials	Friable	Location(s) of the Homogeneous Material	% Asbestos Content	Estimated Quantity	Condition
Pipe Insulation	Friable	North of Column 79	Chrysotile	14,500 LF	Intact
Pipe Fittings				2,000 fittings	
Pipe Insulation	Friable	Option 1	Chrysotile	300 LF	Intact
Pipe Fittings				2,000 fittings	
Enclosure construction	Friable	Option 2	Chrysotile	Abated with Base Bid	
Pipe Insulation	Friable	Option 3	Chrysotile	5,500 LF	Intact
Pipe Fittings				50 fittings	

ND = None Detected; NQ = Not Quantified; SF Square Foot; LF Linear Feet

The quantities and materials are extracted from various survey reports conducted by Galson Technical Services (1991) and A & M (1999). Quantities should be verified by the contractor. A copy of the laboratory analyses (A&M March 1999 report) is provided in Appendix A. A site drawing of sampled materials, prepared by A & M (1999), is provided in Appendix B.

6.0 METHOD OF ABATEMENT

The north end of Building #7 will be cleared of any movable materials prior to any preparation work being conducted. The contractor must follow OAC 380:50-17 for abatement procedures. **Pipe size is for planning purposes only and all ACM piping in an area will be abated.**

Blue colored insulated pipes (14-inch and 16-inch pipes) and bright white insulated (2-inch to 3-inch) pipes were installed in the late 1980's. These pipes, primarily located in the cooler loft, are fiberglass and will not be abated.

Green colored insulated pipes (3-inch and 4-inch) are fiberglass on the straight runs; however, the fittings require abatement.

Brown, yellow, or gray insulated pipes (14-inch and 16-inch pipes) and fittings will be abated.

Fittings and pipe insulation in the northeast portion of the building will be abated using glove bag techniques.

Pipe insulation, fittings, and insulated tanks along the west wall and north of Column 79 will be abated in full containment using wet removal techniques. Loose abated material will be bagged up immediately.

A small pump located in the path of the hallway to be constructed on the south end that will be abated using a mini containment.

All areas and equipment will be locked down with a tinted coating following the final visual and prior to clearance sampling.

Option 1 includes primarily three (3) inch pipes and fittings and will be abated, if included, using glove bag techniques. Option 1 includes the area south of Column 76 and the outside shed.

Option 2 is for an enclosure surrounding the three (3) boilers and the area between column 76 and Column 79 will have a **durable enclosure constructed** such that the North and South ends are enclosed floor to ceiling (approximately fifty (50) feet) except for a passage hallway leading between the west side equipment and the boilers. The hallway will have a height (approximately 10 feet) and width (approximately 8 feet) sufficient to allow forklifts and material movement from the front (south end) of the building to the back (north end) of the building. A self-closing and sealing door will be added in the enclosure walls to allow emergency repairs and inspections be made in the areas of the boilers and the piping and equipment on the west side. The enclosure should be constructed without disturbing existing asbestos materials. The enclosure will be sealed around any protrusions that must penetrate the enclosure. If materials that must penetrate the enclosure contain asbestos materials at the point of penetration, they will be abated using glove bag techniques. The durable enclosure will remain in place until the boilers and asbestos piping and equipment is abated.

Option 3 includes: pipes up to eighteen (18) inch diameter on three levels; heat exchangers; and insulated tanks. These pipes, heat exchangers, and tanks will be abated using full containment. Option 2 includes the west wall portion between columns 76 and 79.

Removed material will be promptly bagged in accordance with OAC 380:50-17-6.

7.0 AIR MONITORING and RESPIRATORY PROTECTION

A total of five (5) background monitoring samples from full containment areas may be conducted prior to mobilization and set-up of containment. There will be asbestos that remains in the building following abatement and will be placed under an Operations and Maintenance (O&M) Program.

Daily air monitoring will be conducted in accordance with OAC 380:50-11-1 through 380:50-11-7. A minimum of one (1) area air monitor will be located:

- In each active abatement work area;
- Along the load-out path during loadout;
- Each independent exit area directly outside and adjacent to the work area;
- Immediately outside the clean room;
- At the exhaust point of each Air Filtration Device (AFD) or from a bank of AFD's (may not exceed 0.01 fibers/cubic centimeter (f/cc));
- Outside of a critical barrier adjacent to the work area;

- Occupied areas adjacent to the work area.

The Contractor is responsible for (may arrange with A & M to provide):

- Personal air monitor samples to be collected on one (1) out of every four (4) workers (25%); or a minimum of two (2) personal air samples per abatement crew.

All non-primary calibration devices must be calibrated to a primary calibrator within one month of use and will not include any adjustable flow restricting devices as part of its construction. Calibration records or chart must be maintained onsite.

Removal of ACM materials must be conducted in full-face APR respirators fitted with High Efficiency Particulate Air (HEPA) cartridges.

8.0 CLEARANCE SAMPLING

The work area in the building will eventually be re-occupied; therefore, clearance by AHERA Phase Contrast Microscopy (PCM) protocol must be conducted. A minimum of five (5) samples per /work area shall be collected. Clearance samples shall be collected following the post-abatement ODOL inspection. Clearance samples inside of full containment areas will be conducted using aggressive sampling techniques.

9.0 AIR FILTRATION

Negative Air Machines (NAM) will be utilized to provide a negative air pressure of 0.02" negative pressure (water pressure drop) through the decontamination areas of full containments. The NAMs must be fitted with HEPA filters. Ventilation must be adequate to provide four (4) Air Changes per Hour (ACH).

The containment will have approximately 120,000 cubic feet (20 feet (') x 200' x 30') enclosed. A minimum of six (6) two thousand (2,000) Cubic Feet per Minute (CFM) NAMs must be used inside of containment. One (1) NAM must be available for an operational back-up, if needed.

Option 1 will be abated using glove bags.
Option 2 will be for enclosure of asbestos containing materials but will not disturb ACM. ACM in the path of the enclosure will be abated during the primary scope.
Option 3 containment will be approximately identical to the main containment.

10.0 CONTAINMENT METHODS

Preparation of asbestos abatement work area will be per OAC 380:50-17-4. Critical barriers shall be utilized over openings (e.g. windows, doors, exhaust vents) where feasible and where construction of the critical barrier would not be of significant hazard. Non-moveable fixtures and equipment will be covered with a minimum single layer of 4 mil poly following pre-cleaning of surface dberis prior to asbestos removal. All surfaces and equipment are to be thoroughly sprayed with a lock-down encapsulant after abatement.

11.0 DECONTAMINATION SYSTEM

A remote decontamination facility (decon) under negative pressure is planned for the abatement. The Remote Decon is to be used with the Glove-bag operations. The Remote Decon will be established per OAC 380:50-15-7 (Clean room requirements) and OAC 380:50-15-12 (decontamination facility preparation) consisting of three (3) chambers: a clean room, a shower and a dirty room. The airlocks for the Remote Decon unit shall consist of triple

six (6) mil polyethylene overlapping flaps. The decon shower shall be equipped with a five (5) micron wastewater filter, liquid cleaning agent, non-porous shower grates and a functioning in-line water heater with capacity for five (5) gallons per worker. Disposal of wastewater will be into the sanitary sewer. The temperature of the clean room and Remote Decon must be maintained above fifty (50) degrees °F during abatement activities. Decon procedures will be per OAC 380:50-15-8 (Decontamination procedures).

The full containment area will have an attached decontamination facility (decon) with the "dirty room" opening to the work area. The containment will be under negative pressure with make-up air flowing through the three (3) chamber decon facility. The decon unit will be established per OAC 380:50-15-7 (Clean room requirements) and OAC 380:50-15-12 (decontamination facility preparation) consisting of three (3) chambers: a clean room, a shower and a dirty room. The airlocks for the decon unit shall consist of triple six (6) mil polyethylene overlapping flaps. The decon shower shall be equipped with a five (5) micron wastewater filter, liquid cleaning agent, non-porous shower grates and a functioning in-line water heater with capacity for five (5) gallons per worker. Disposal of wastewater will be into the sanitary sewer. The temperature of the clean room and decon must be maintained above fifty (50) degrees °F during abatement activities. Decon procedures will be per OAC 380:50-15-8 (Decontamination procedures).

A fully equipped decon trailer may be used with workers removing and replacing outer disposable coveralls in an airlock prior to exiting and heading to the decon trailer. The decon trailer must be set up as identified above with for full containment.

12.0 SOIL CONTAMINATION CLEANUP

Not Applicable.

13.0 SPECIAL MATERIALS or METHODS

Scaffolding and Fall Protection

Work during this abatement will require the use of scaffolding and/or man-lifts. Scaffolding will be erected by a trained scaffold erector and certified prior to use. Fall protection must be used where appropriate. The asbestos abatement contractor will comply with 29 CFR 1926 Subpart L-Scaffolds and Subpart M-Fall Protection.

Electrical

The building currently has the electrical service disconnected. Electric service must be provided by the contractor and may require the use of generator(s). Lockout/tagout procedures must be used on all electrical circuits which penetrate the work area.

Water

Water service is currently off and should be provided by the contractor.

Heat Stress

The contractor shall monitor heat stress in general accordance with OSHA Technical Manual Section III, Chapter 4 when the National Weather Service (NWS) Heat Index falls within an extreme caution condition.

Sanitation Facilities

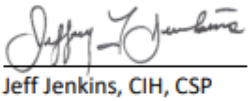
Currently the building is vacant, with utilities non-operational. Sanitation facilities in the building is not available for use. The asbestos contractor will be responsible for arranging for sanitation facilities.

14.0 VARIANCES REQUESTED

The abatement will most likely be conducted using generator(s). A variance is being requested to allow the generators to be shut off thirty (30) minutes following the abatement activity for the day and started thirty (30) minutes prior to anyone entering the containment.

15.0 CERTIFICATION

This project design was prepared by the undersigned for compliance with applicable federal and State regulations.



Jeff Jenkins, CIH, CSP
Asbestos Project Designer, OKPD 143988

February 26, 2021
Date

Appendix A

Asbestos Sample Results

BUILDING NO. 007:

Date of Construction: 1942

Original Use: Boiler House

Floor Area: 32,343 square feet

Figures 007A – 007E

Asbestos Containing Materials (ACM):

Homogeneous Areas:

HA-2: White fibrous duct, pipe, joint, tank jacket, boiler jacket insulation (+)

Consists of 18,500 linear feet of piping (4" – 24") insulation, 3,500 joints (4" – 24"), and 66,350 square feet (6 inches thick) of boiler jacket insulation, described as white fibrous. This insulation material, found in the boiler room interior (FS-1), is in overall good condition with some localized physical damage. A couple of trash bags full of friable white fibrous insulation was observed on the cat walks, above the boilers.

HA-5: Brown fibrous (cardboard like) pipe insulation (+ inconsistent)

Consists of 1,800 linear feet of pipe insulation described as brown fibrous cardboard type. Several of the Galson samples identified this material as positive. A verification sample collected by A & M Engineering showed the material to be negative. Since the Galson samples were more numerous with a consistent positive reading, it is assumed the material is most likely positive. This insulation material found in the boiler room interior (FS-1) is in overall fair condition with some damage.

HA-7: Roof tar/felt/gravel (Assume +)

Consists of 33,000 square feet of roofing materials which are in good condition and require no immediate response.

Non-Asbestos Containing Materials Which Were Suspect:

Homogeneous Areas:

HA-1: Newer yellow fibrous (white foil wrapped) pipe insulation (Assume -)

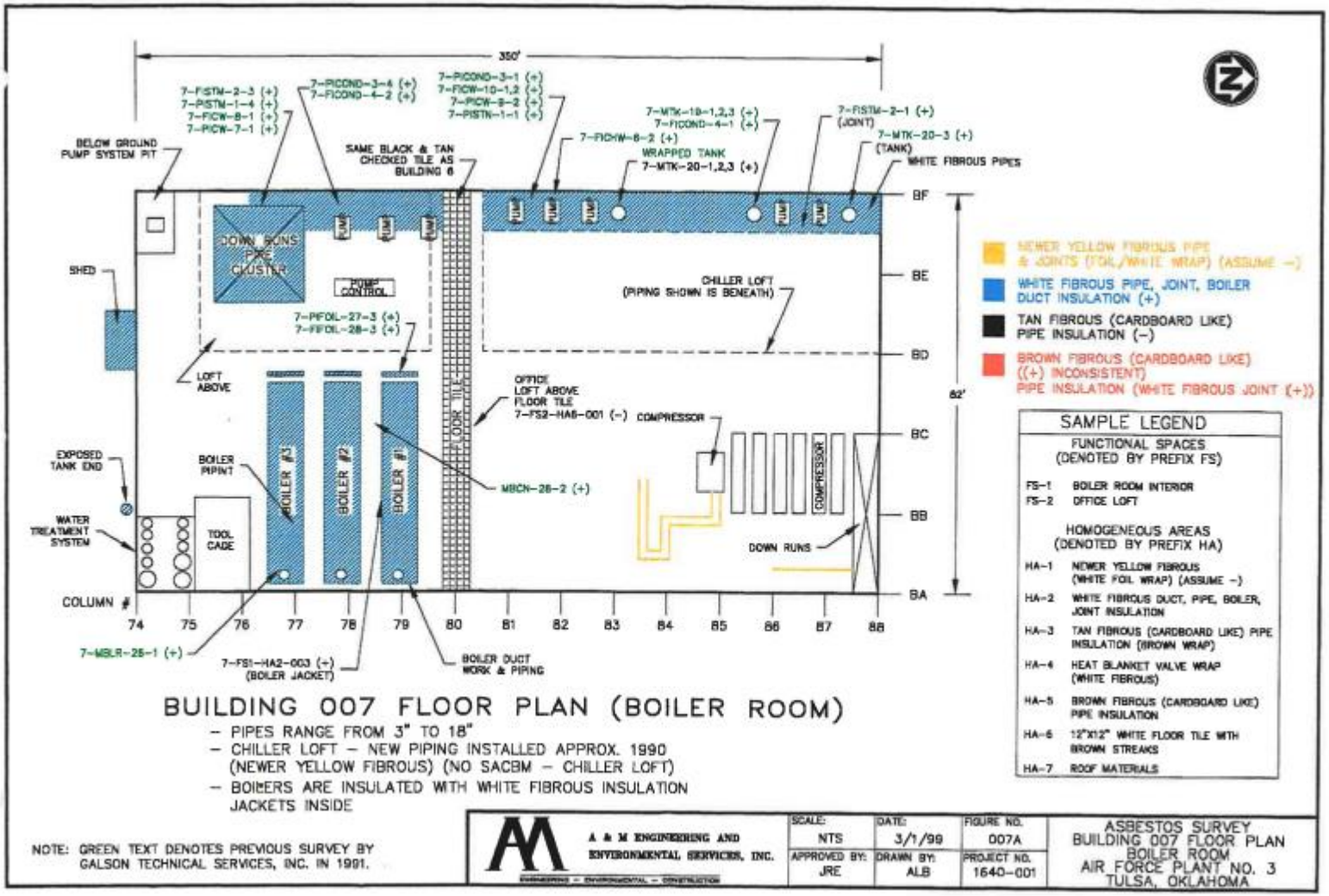
HA-3: Tan fibrous (cardboard like) pipe insulation (-)

HA-4: White fibrous heat blanket valve wrap (-)

HA-6: 12" x 12" floor tile – white with brown streaks (-)

Appendix B

1999 Asbestos Report Drawings



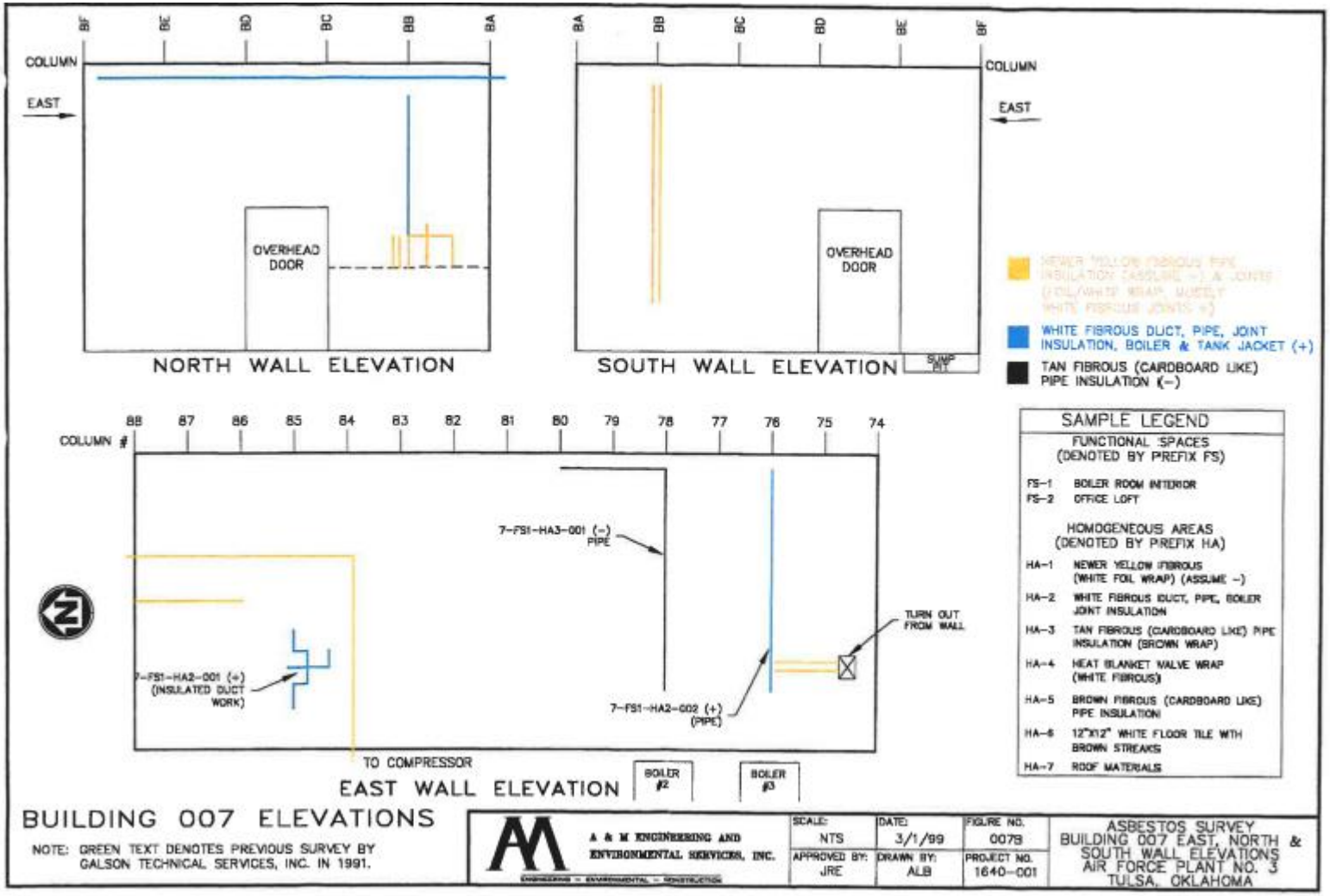
BUILDING 007 FLOOR PLAN (BOILER ROOM)

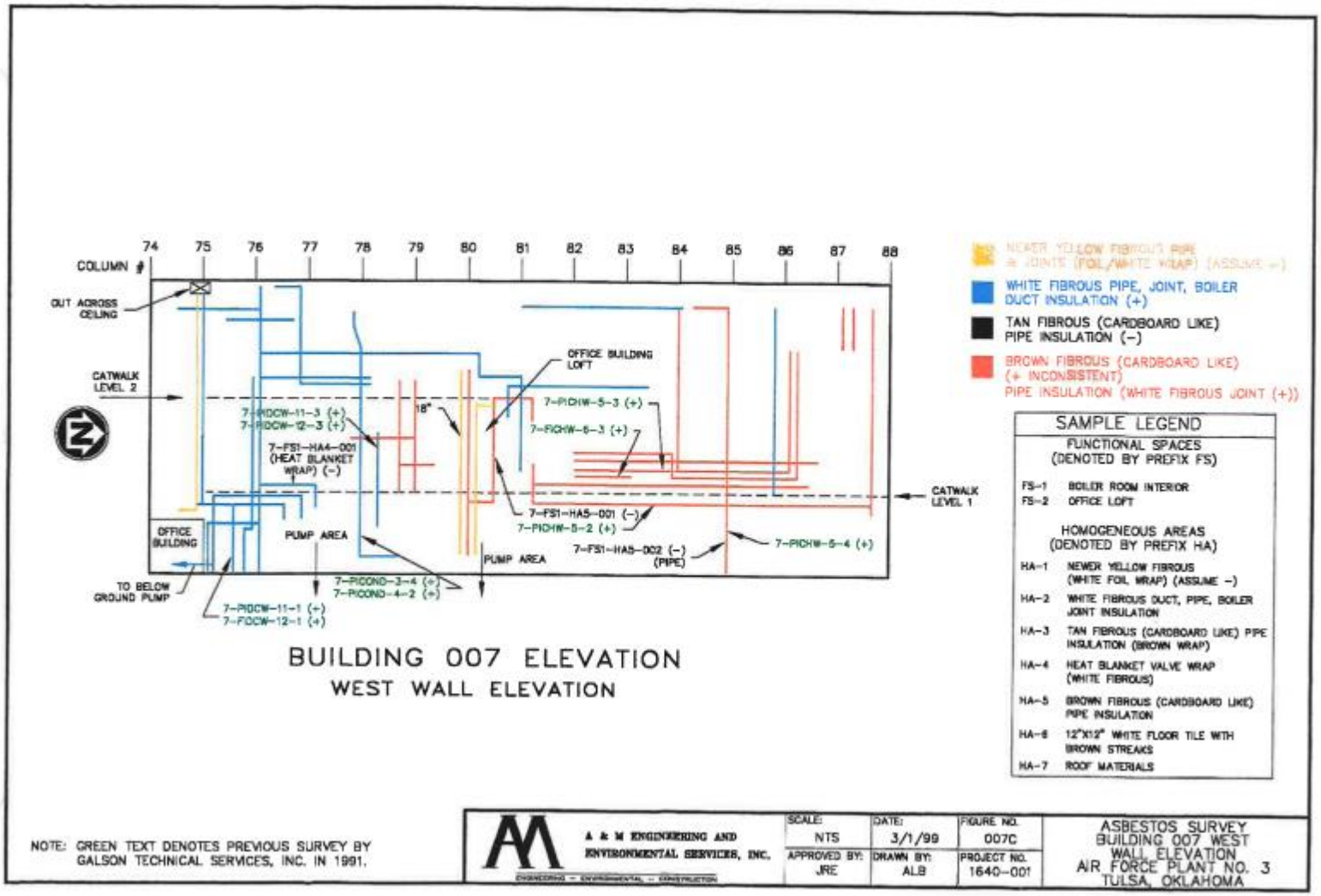
- PIPES RANGE FROM 3" TO 18"
- CHILLER LOFT – NEW PIPING INSTALLED APPROX. 1990 (NEWER YELLOW FIBROUS) (NO SACBM – CHILLER LOFT)
- BOILERS ARE INSULATED WITH WHITE FIBROUS INSULATION JACKETS INSIDE

NOTE: GREEN TEXT DENOTES PREVIOUS SURVEY BY GALSON TECHNICAL SERVICES, INC. IN 1991.

A & M ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

SCALE:	DATE:	FIGURE NO.	ASBESTOS SURVEY BUILDING 007 FLOOR PLAN BOILER ROOM AIR FORCE PLANT NO. 3 TULSA, OKLAHOMA
NTS	3/1/99	007A	
APPROVED BY: JRE	DRAWN BY: ALB	PROJECT NO. 1640-001	


8F 8E 8D 8C 8B 8A
COLUMN
EAST
OVERHEAD DOOR
NORTH WALL ELEVATION
8A 8B 8C 8D 8E 8F
COLUMN
EAST
OVERHEAD DOOR
SUMP PIT
SOUTH WALL ELEVATION
NEWER YELLOW FIBROUS PIPE INSULATION (ASSUME -) & JOINTS (FOIL/WHITE WRAP, MOSTLY WHITE FIBROUS JOINTS +)
WHITE FIBROUS DUCT, PIPE, JOINT INSULATION, BOILER & TANK JACKET (+)
TAN FIBROUS (CARDBOARD LIKE) PIPE INSULATION (-)
COLUMN # 88 87 86 85 84 83 82 81 80 79 78 77 76 75 74
7-FS1-HA3-001 (-) PIPE
TURN OUT FROM WALL
7-FS1-HA2-001 (+) (INSULATED DUCT WORK)
7-FS1-HA2-002 (+) (PIPE)
TO COMPRESSOR
EAST WALL ELEVATION
BOILER #2
BOILER #3
SAMPLE LEGEND
FUNCTIONAL SPACES (DENOTED BY PREFIX FS)
FS-1 BOILER ROOM INTERIOR
FS-2 OFFICE LOFT
HOMOGENEOUS AREAS (DENOTED BY PREFIX HA)
HA-1 NEWER YELLOW FIBROUS (WHITE FOIL WRAP) (ASSUME -)
HA-2 WHITE FIBROUS DUCT, PIPE, BOILER JOINT INSULATION
HA-3 TAN FIBROUS (CARDBOARD LIKE) PIPE INSULATION (BROWN WRAP)
HA-4 HEAT BLANKET VALVE WRAP (WHITE FIBROUS)
HA-5 BROWN FIBROUS (CARDBOARD LIKE) PIPE INSULATION
HA-6 12"X12" WHITE FLOOR TILE WITH BROWN STREAKS
HA-7 ROOF MATERIALS
BUILDING 007 ELEVATIONS
NOTE: GREEN TEXT DENOTES PREVIOUS SURVEY BY GALSON TECHNICAL SERVICES, INC. IN 1991.
A & M ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
SCALE: NTS
DATE: 3/1/99
FIGURE NO. 0079
APPROVED BY: JRE
DRAWN BY: ALB
PROJECT NO. 1640-001
ASBESTOS SURVEY BUILDING 007 EAST, NORTH & SOUTH WALL ELEVATIONS AIR FORCE PLANT NO. 3 TULSA, OKLAHOMA



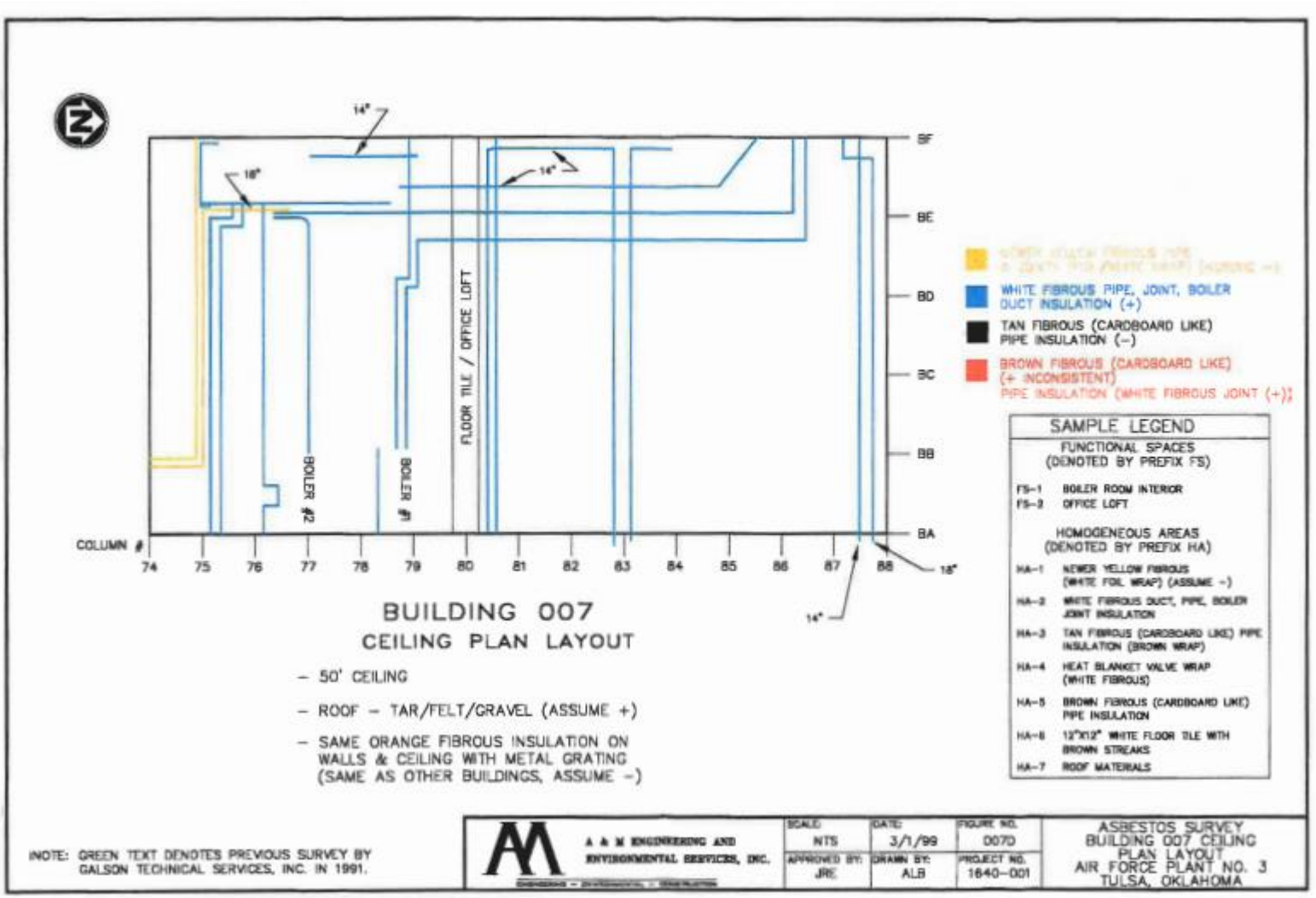
BUILDING 007 ELEVATION
WEST WALL ELEVATION

NOTE: GREEN TEXT DENOTES PREVIOUS SURVEY BY GALSON TECHNICAL SERVICES, INC. IN 1991.

A & M ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

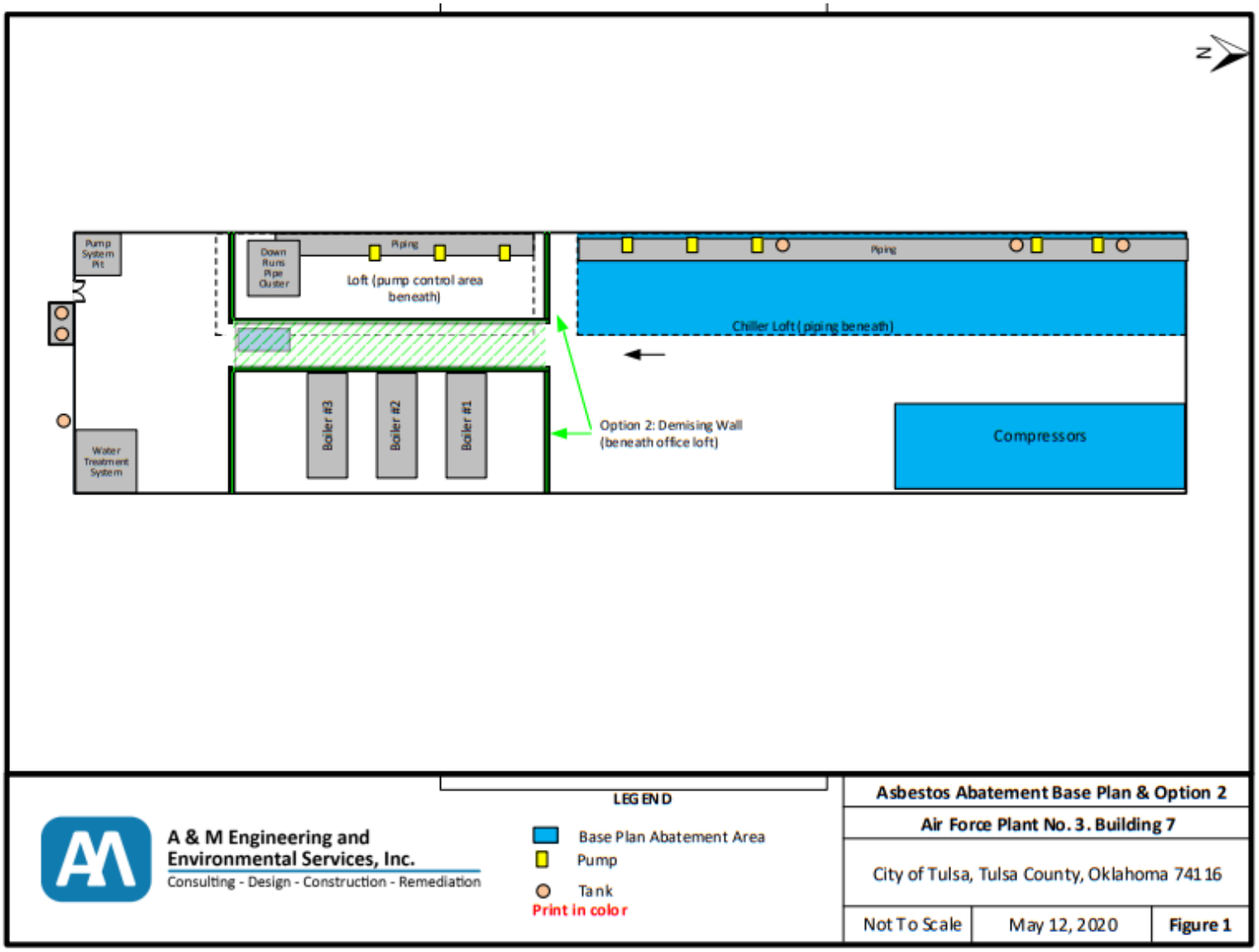
SCALE:	DATE:	FIGURE NO.
NTS	3/1/99	007C
APPROVED BY: JRE	DRAWN BY: ALB	PROJECT NO. 1640-001

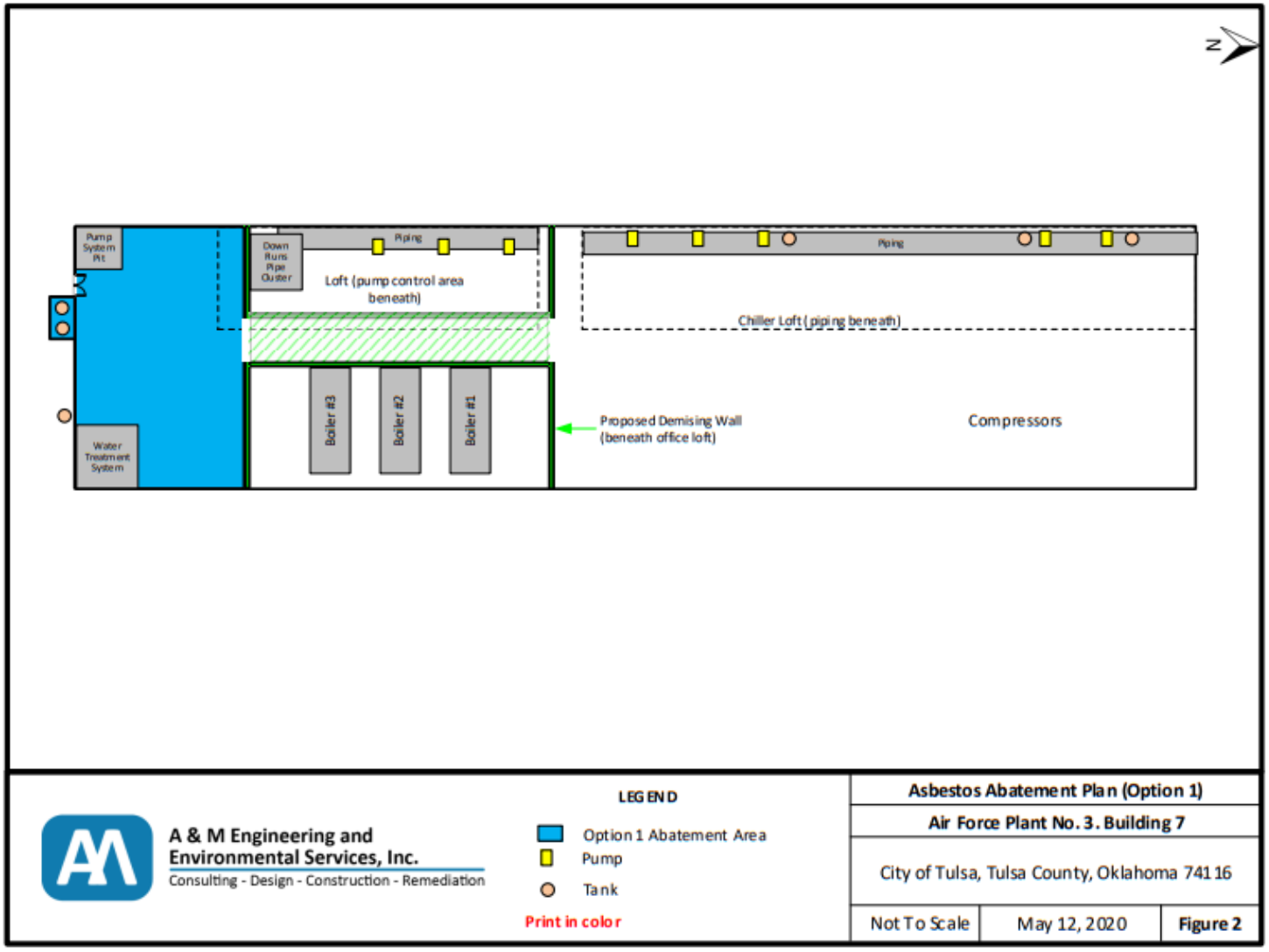
ASBESTOS SURVEY
BUILDING 007 WEST WALL ELEVATION
AIR FORCE PLANT NO. 3
TULSA, OKLAHOMA

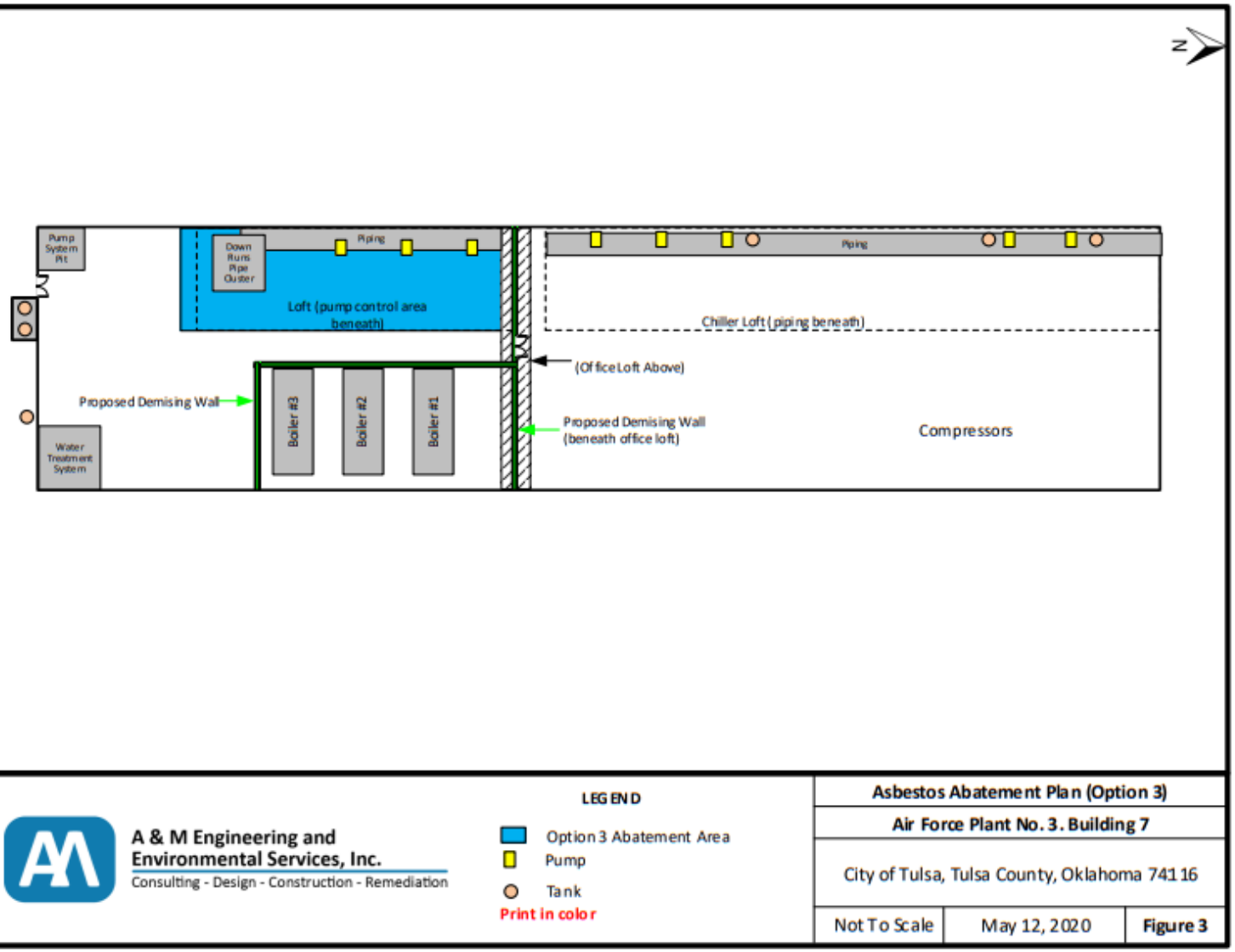

14"
18"
14"
BF
BE
BD
BC
BB
BA
FLOOR TILE / OFFICE LOFT
BOILER #2
BOILER #1
COLUMN #
74 75 76 77 78 79 80 81 82 83 84 85 86 87 88
18"
14"
WHITE FIBROUS PIPE, JOINT, BOILER DUCT INSULATION (+)
TAN FIBROUS (CARDBOARD LIKE) PIPE INSULATION (-)
BROWN FIBROUS (CARDBOARD LIKE) (+ INCONSISTENT) PIPE INSULATION (WHITE FIBROUS JOINT (+))
SAMPLE LEGEND
FUNCTIONAL SPACES (DENOTED BY PREFIX FS)
FS-1 BOILER ROOM INTERIOR
FS-2 OFFICE LOFT
HOMOGENEOUS AREAS (DENOTED BY PREFIX HA)
HA-1 NEWER YELLOW FIBROUS (WHITE FOIL WRAP) (ASSUME -)
HA-2 WHITE FIBROUS DUCT, PIPE, BOILER JOINT INSULATION
HA-3 TAN FIBROUS (CARDBOARD LIKE) PIPE INSULATION (BROWN WRAP)
HA-4 HEAT BLANKET VALVE WRAP (WHITE FIBROUS)
HA-5 BROWN FIBROUS (CARDBOARD LIKE) PIPE INSULATION
HA-6 12"X12" WHITE FLOOR TILE WITH BROWN STREAKS
HA-7 ROOF MATERIALS
BUILDING 007
CEILING PLAN LAYOUT
- 50' CEILING
- ROOF - TAR/FELT/GRAVEL (ASSUME +)
- SAME ORANGE FIBROUS INSULATION ON WALLS & CEILING WITH METAL GRATING (SAME AS OTHER BUILDINGS, ASSUME -)
NOTE: GREEN TEXT DENOTES PREVIOUS SURVEY BY GALSON TECHNICAL SERVICES, INC. IN 1991.
A & M ENGINEERING AND ENVIRONMENTAL SERVICES, INC.
SCALE: NTS
DATE: 3/1/99
FIGURE NO. 007D
APPROVED BY: JRE
DRAWN BY: ALB
PROJECT NO. 1640-001
ASBESTOS SURVEY
BUILDING 007 CEILING PLAN LAYOUT
AIR FORCE PLANT NO. 3
TULSA, OKLAHOMA

Appendix C

Proposed Abatement Layout


N
Pump System Pit
Down Runs Pipe Cluster
Piping
Loft (pump control area beneath)
Piping
Chiller Loft (piping beneath)
Boiler #3
Boiler #2
Boiler #1
Option 2: Demising Wall (beneath office loft)
Compressors
Water Treatment System
LEGEND
Base Plan Abatement Area
Pump
Tank
Print in color
A & M Engineering and Environmental Services, Inc.
Consulting - Design - Construction - Remediation
Asbestos Abatement Base Plan & Option 2
Air Force Plant No. 3. Building 7
City of Tulsa, Tulsa County, Oklahoma 74116
Not To Scale
May 12, 2020
Figure 1


N
Pump System Pit
Down Runs Pipe Cluster
Piping
Loft (pump control area beneath)
Piping
Chiller Loft (piping beneath)
Boiler #3
Boiler #2
Boiler #1
Proposed Demising Wall (beneath office loft)
Compressors
Water Treatment System
A & M Engineering and Environmental Services, Inc.
Consulting - Design - Construction - Remediation
LEGEND
Option 1 Abatement Area
Pump
Tank
Print in color
Asbestos Abatement Plan (Option 1)
Air Force Plant No. 3. Building 7
City of Tulsa, Tulsa County, Oklahoma 74116
Not To Scale
May 12, 2020
Figure 2


N
Pump System Pit
Down Runs Pipe Cluster
Piping
Loft (pump control area beneath)
Piping
Chiller Loft (piping beneath)
(Office Loft Above)
Proposed Demising Wall
Boiler #3
Boiler #2
Boiler #1
Proposed Demising Wall (beneath office loft)
Compressors
Water Treatment System
A & M Engineering and Environmental Services, Inc.
Consulting - Design - Construction - Remediation
LEGEND
Option 3 Abatement Area
Pump
Tank
Print in color
Asbestos Abatement Plan (Option 3)
Air Force Plant No. 3. Building 7
City of Tulsa, Tulsa County, Oklahoma 74116
Not To Scale
May 12, 2020
Figure 3

Appendix D

Enclosure Construction Drawings and Specs
(Option 2)

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AFP3 BUILDING 7 BOILER ENCLOSURE
Tulsa International Airport

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END OF SECTION

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REFERENCE DRAWINGS ONLY (AS-BUILT)*

A4.1* OVERALL BUILDING SECTIONS & PARTIAL PLAN @ MECH. DECKS AND SUPERSTRUCTURE

A4.2* OVERALL BUILDING SECTION – BLOW-UP

PART 1 - GENERAL

1.01 WORK OF THE CONTRACTOR:

A. Scope of Work: Contractor shall perform, within the time stipulated, the Contract, including all of its component parts, and everything required to be performed, and to provide and furnish any and all of the labor, materials, tools, expendable equipment, and all applicable taxes, and all utility and transportation services necessary to perform the Contract and complete, in a workmanlike manner, all of the Work required in connection with the following titled Project in strict conformity with the Contract Documents:

TULSA INTERNATIONAL AIRPORT
AFP3 BUILDING 7 BOILER ENCLOSURE
3300 North East Avenue
Tulsa, Oklahoma

B. Phasing: not applicable

C. Work hours for the Project shall be from 7:00 a.m. until 10:00 p.m. Monday through Saturday, unless advance permission to deviate from these hours is obtained from the City of Tulsa, and this request is also approved in writing five working days beforehand by the Engineer of Record.

D. All project close-out/punch list items, project record documents, submittals, and operations manuals and spare parts, warranties and guarantees and Contractor's Final Verified Report shall be reviewed and accepted prior to the Engineer agreed upon authorization to file the Notice of Completion with the City of Tulsa.

E. The intent of these contract documents is that the work of alteration, rehabilitation or construction is to be accordance with Iternation Building Code 2015 edition. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the Contract Documents wherein the finished work will not comply with the above, a change order, or a separate set of plans and specifications, detailing and specifying the required repair work shall be submitted to and approved by the Engineer of Record before proceeding with the repair work.

1.02 RELATED WORK BY DISTRICT:

A. General: All such work indicated in Contract Documents and/or specified herein.

B. Coordination:
   1. Contractor shall schedule and coordinate Owner / Engineer, work with his work; give 5 days min. advance notice of all dates; verify that Owner / Engineer that work has been accomplished prior to beginning his work

C. Owner Furnished Items or Products (IF ANY):
   1. Owner Responsibilities:
      a. Delivery of items or products to site.
      b. Schedule delivery date with supplier in accord with Contractor's schedule.
      c. Obtain installation drawings and instructions.
      d. Submit claims for transportation damages.
      e. Arrange guarantees, warranties.
   2. Contractor's Responsibilities:
      a. Schedule required delivery date for each product, and inform Owner.
      b. Promptly inspect delivered products, report damaged or defective items.
      c. Unload; handle at site, including uncrating and storage.
      d. Protect from exposure to elements, from damage.
      e. Repair or replace items damaged as result of Contractor's operations.
      f. Install, connect, finish products.

D. The Contractor shall provide adequate storage within his fenced staging area, to store the equipment. The Contractor is solely responsible for the storage of this equipment within his staging area and all subsequent movement of this equipment. The Contractor shall be solely responsible for the maintenance and protection of all material.

E. Bidders submitting under this Contract shall include the price for all necessary coordination with the Engineer of Record and the equipment manufacturer, as required for proper and complete coordination between all trades and all Contractors, within their bid.

1.03 WORK BY OTHERS

A. The City of Tulsa reserves the right to do other work in connection with the project or adjacent thereto by contract or otherwise, and Contractor shall at all times conduct the work so as to impose no hardship on City or others engaged in City's work nor to cause any unreasonably delay or hindrance thereto.

B. Where two or more Contractors are employed on related or adjacent work, each shall conduct their operation in such a manner as not to cause delay or additional expense to the other.

C. Contractor shall be responsible to others engaged in the related or adjacent work for all damage to work, to persons, or for loss by failure to finish the work within the specified time for completion. Contractor shall coordinate his work with the work of others so that no discrepancies shall result in the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

9. Availability of local maintenance service within a 50 mile air radius of the project.
10. Source of replacement material or spare parts; if necessary, within a 50 mile air radius of the project.

1.04 SUBSTITUTION REQUESTS DURING BIDDING PERIOD

No request for substitution approval will be considered unless written request in triplicate has been submitted on the "Substitution Request" form included herein, and has been received by the Engineer of Record at least ten (10) working days prior to bid opening date. The Engineer will issue addenda prior to bid opening listing all approved substitutions, should there be any approved.

1.05 SUBSTITUTION REQUESTS AFTER CONTRACT AWARD

A. Approval will be granted only when:
   1. Specified product cannot be delivered without project delay, or
   2. Specified product has been discontinued, or,
   3. Specified product has been replaced by superior product, or
   4. Specified product cannot be guaranteed as specified, or
   5. Specified product will not fit within designated space, or
   6. Substitution otherwise determined by the District to be in its best interest.

B. The Contractor's request for substitution shall be accompanied by evidence documenting the reason for the substitution falls within one or more of the cases listed in A1 through A6 above.

C. A Construction Change Document authorizing substitutions and revising Contract Sum where appropriate will be issued for approved substitutions.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

SUBSTITUTION REQUEST (in triplicate)

TO: _____

PROJECT: _____

SPECIFIED ITEM: _____
SECTION PAGE PARAGRAPH DESCRIPTION

The undersigned requests consideration for the following:

PROPOSED SUBSTITUTION: _____

STATE THE REASON(S) FOR PROPOSED SUBSTITUTION: (REASON MUST CONFORM TO ONE OR MORE CASES LISTED IN PARAGRAPH 1.05 A1 THROUGH 1.0A6.)

_____

_____

_____

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

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

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitution does not affect dimensions shown on drawings:
2 The undersigned will pay for changes to the building design, including Architect's and engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other trades, the construction schedule or specified warranty requirements.
4. Maintenance and service parts will be locally available (<50 miles from project) for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature: _____

Accepted as noted

Firm: _____

Address: _____

_____

Date: _____

Telephone: _____

For use by the Engineer or Architect:

☐ Accepted ☐

☐ Not Accepted ☐ Received too late

By: _____

Date: _____

Remarks: _____

_____

Attachments: _____

_____

END OF SECTION

SECTION 01 26 00
REQUEST FOR INFORMATION (RFI)

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedure for requesting clarification of the intent of the Contract Documents.

1.02 RELATED SECTIONS

A. Section 01 11 00: Summary of the Project

B. Section 01 32 16: Schedules and Reports

C. Section 01 77 00: Project Closeout

PART 2 - PRODUCTS (Not applicable)

PART 3 - EXECUTION

3.01 PROCEDURE

A. Prime Contractor shall prepare a Request for Information on the form provided and approved by the Engineer of Record and City of Tulsa. Prior to the submission of any RFI Prime Contractor is responsible for thoroughly reviewing all contract documents to insure that the answer to the question is not contained therein. Prime Contractor shall transmit the Request for Information to the Engineer of Record with any supporting information.

B. Prime Contractor shall maintain a log of all RFI's that he submits to the Engineer of Record on a weekly basis at the weekly project meetings. RFI's shall be identified with a sequential number and be dated. Reference your company's name and the name of the subcontractor asking the question, if applicable, as well as the scope of work.

C. RFI question and location shall be specific and clear. Indicate reference to construction documents sheet and detail number, as well as specification section.

D. ENGINEER or ARCHITECT response is a clarification of the intent of the Contract Documents and does not authorize changes in the Contract Amount, Milestones and/or Contract Time.

E. A Request for Information may be returned with a stamp or notation "Not Reviewed", if, in the opinion of ENGINEER or ARCHITECT:
   1. The requested clarification is ambiguous or unclear to ENGINEER or ARCHITECT.
   2. The requested clarification is equally available to the requesting party by researching and/or examining the Contract Documents.
   3. Prime Contractor has not reviewed the Request for Information prior to submittal to Engineer or Architect.

F. Allow a minimum of seven (7) calendar days for review and response time, after receipt by ENGINEER or ARCHITECT. Engineer will forward response to Contractor and Project Manager and any required Inspectors.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Procedures for submitting to the Engineer, shop drawings, product data, samples, and material lists required by specification section and procedures for submitting hardware lists to the City.

1.02 RELATED SECTIONS:

A. Section 013216: Schedules and Reports.

B. Submittal of guarantees, warranties, certificates, operation and maintenance manuals and as-built drawings: Section 017700, Contract Close-Out.

C. Submittals: See Respective Specification Sections.

1.03 PROCEDURES:

A. At the start of the project the Contractor shall review the documentation required for Project Completion. This shall include documentation requested by the Engineer: Shop drawings, manufacturer's catalogs, samples, warranties, operation and instruction manuals.

B. The Contractor shall, during the course of the project, secure, review and approve, and submit the required documentation to the Engineer for review and approval.

C. After the Engineer of Record and Architect has date-stamped, signed and reviewed the submittals, with corrections noted if any, the Engineer of Record will transmit submittals to Contractor and if not rejected, to the City Inspector.

1.04 CONTRACT:

A. Furnish simultaneously the following number of executed copies of:
   1. Agreement: Five (5).
   2. Performance Bond: Five (5).
   3. Payment Bond: Five (5).
   4. Certificate - Workmen's Compensation: Six (6).

5. Certificates showing "Proof of Carriage of Insurance" required by General Conditions: Six (6).
6. Non-Collusion Affidavit: Six (6).

1.05 SUBMITTALS; GENERAL:

A. Deliver all submittals to the Engineer of Record. Identify project name and address, telephone number of Contractor, subcontractor and supplier. Identify, as appropriate, the pertinent drawing sheets, detail numbers and Specification Section numbers. Clearly identify any deviations from contract documents. Number submittals using the appropriate specification section, and a hyphen, then the number of the submittal, in sequence.

B. Make submittals in accordance with approved Construction Schedule in sequence that avoids delaying work and the progress of other Contractors.

C. Contractor shall thoroughly review; make coordination corrections, date and sign submittals prior to transmitting to Engineer of Record, specifically noting relative deviations from the Contract Documents.

D. Timing of Submittals:
   1. Contractor shall submit required submittals in a timely manner, according to the construction schedule, allowing time for the Engineer or Architect and related consultants or Structural Engineer's, or City Inspector's review, for the project and/or each respective Phase of Construction.
   2. Contractor shall submit ALL required submittals for the project/phase not less than thirty-five (35) calendar days before the product/material is required for inclusion in the construction of the project beginning with the City's Notice to Proceed. Failure to meet the 35 day requirement shall result in a $160.00 per calendar day for each submittal not submitted in order to compensate for any necessary expedited review by A&E/Inspector. Submittals shall be complete and shall meet the requirements of the Contract Documents or they shall be considered invalid and the penalty shall apply. The contractor shall submit submittals earlier than the 35 day requirement if the project schedule requires. The contractor shall allow for the Engineer's and Architect's contract review time in order to return the Submittal to the contractor. The Submittals shall

be related to the work progress, and shall be so organized as to allow sufficient time for mailing, reviewing, corrections, resubmission and re-reviewing.

3. The Contractor shall coordinate the submittal of related items with their respective subcontractors.
4. In scheduling, allow at least ten (10) full working days for Engineer's or Architect's review following receipt of the submittal. For Mechanical, Plumbing, Electrical, Structural and other submittals that require joint review, allow a minimum of fifteen (15) full working days following receipt of submittal.

E. Each submittal shall be accompanied by a letter of transmittal containing a complete itemized and numbered list of the submitted materials. Separate letters of transmittal shall accompany each submittal from different specification sections.

F. Resubmission: If requested, resubmit submittals in a timely manner. Resubmit as specified for initial submittal but identify as such with a sequential alphabetical character. Indicate any changes that have been made other than those requested by Engineer or Architect.

1.06 SUBSTITUTIONS:

A. Contractor shall provide specified manufacturer's products unless:
1. Specified product cannot be delivered without project delay, or.
2. Specified product has been discontinued, or,
3. Specified product has been replaced by superior product, or
4. Specified product cannot be guaranteed as specified, or
5. Specified product will not fit within designated space, or
6. Substitution otherwise determined by the City to be in its best interest.

B. Contractor shall submit request for substitutions in accordance with the General Conditions.

1.07 SHOP DRAWINGS:

A. Shop Drawings are original drawings prepared by the Contractor, subcontractor, supplier, or distributor, which illustrate some portion of the work by showing fabrication, layout, setting, or erection details.

Reproductions in whole or in part of the contract drawings shall not be part of the shop drawings.

B. Make shop drawings accurately to scale and sufficiently large to show all pertinent assembly features and methods of connection.

C. Copies Required and Distribution: Unless otherwise indicated, submit six (6) sets of drawings, and one electronic copy of the shop drawings in pdf. The Architect will retain two sets, two will be returned to the Contractor, one to the District Project Manager and, one to the District Inspector. In some cases, contractor will be required to submit more than six copies. In such cases the actual number of sets required shall be as stated in the individual specification sections.

1.08 PRODUCT DATA:

A. Manufacturer's Standard Schematic Drawings:
   1. Delete information, which is not applicable to Project. Failure to do so shall be grounds for rejecting the entire submittal.
   2. Supplement standard Drawings to provide additional information applicable to Project.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data:
   1. Clearly mark each copy to identify pertinent materials, products, or models in terms of this contract.
   2 Delete information, which is not applicable to Project. Failure to do so shall be grounds for rejecting the entire submittal.
   3. Show dimensions and clearances required.
   4. Show performance characteristics and capacities.
   5. Show wiring diagrams and controls.

C. Copies Required and Distribution: Submit six (6) copies and one electronic copy in pdf. The Architect will retain two copies, two will be returned to the Contractor and two to the City Inspector.

1.09 SAMPLES:

A. Samples:
   1. Submit samples of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of product or material, with integral parts and attachment devices.

b. Full range of colors, textures, and patterns as required by this contract.

2. Provide permanent identification for each sample.
3. Color and pattern: Whenever a choice of color or pattern is available in a specified product, submit accurate color chips and pattern charts to the Engineer or Architect for review and selection.
4. Number Required: Submit four of each. Engineer of Record and City will retain one each, one will be returned to the Contractor and one to the City Inspector. Additional samples shall be provided Engineer of Record at no cost for sample color boards if requested.

B. Field Samples and Mockups: When specified, erect field samples and mock-ups at the project site to illustrate materials, equipment, or workmanship and to establish standards by which completed work is judged.

C. After return of office samples or review of field samples, these items may be used in the construction of the project with the approval of the Architect.

1.10 COLOR SCHEDULES:

A. Following appropriate submittals by the Contractor, the Engineer of Record shall review and approve the color schedules prepared by the Contractor, who will distribute the approved schedules to the Engineer and City Inspector.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This section lists the abbreviations, symbols and acronyms used in these specifications.

1.02 ABBREVIATIONS:

ac	Alternating current
BTU	British thermal unit
cfh	Cubic feet per hour
cfm	Cubic feet per minute
cm	Centimeter
Co.	Company
COP	Coefficient of performance
Corp.	Corporation
d.	Penny
db.	Decibel
DB	Dry bulb
dc	Direct current
EER	Energy efficiency ratio
F	Degrees Fahrenheit
fpm	Feet per minute
gap	Gallons per hour
GPM	Gallons per minute
HP	Horsepower
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
Inc.	Incorporated
KHz	Kilohertz
lb	Pound
LED	Light emitting diode
MBH	100 BTUs per hour
MHz	Mega hertz
mil	Thousandth of an inch
mm	Millimeter
mph	Miles per hour
oz.	Ounce
pH	Acidity-alkalinity balance
psf	Pounds per square foot
psi	Pounds per square inch

psig	Pounds per square inch, gauge
RF	Radio frequency
rpm	Revolutions per minute
V	Volt
WB	Web bulb
#	Number
'	Foot/Feet
"	Inch (es)
%	Percent

1.03 ACRONYMS:

ABMA	American Boiler Manufacturers Association
ABMS	American Bureau of metal Statistics
ABPA	American Board Products Association
ACI	American Concrete Institute
AGA	American Gas Association
AHAM	Association of Heating and Air Conditioning Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
AQMD	Air Quality Management District
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute

CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standards, U.S. Department of Commerce
CTI	Ceramic Tile Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
FCC	Federal Communication Commission
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specifications
HPMA	Hardwood Plywood Manufacturers Association
IAMPO	International Association of Plumbing and Mechanical Officials
IBC	International Building Code
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical & Electronic Engineers, Inc.
IES	Illuminating Engineering Society
IMI	International Masonry Institute
IRI	Industrial Risk Insurers
MIA	Marble Institute of America
MIA	Masonry Institute of America
MLSFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers Standardization Society of the Valve & Fittings Industry.
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
nic	Not in contract
NOFMA	National Oak Flooring Manufacturers Association
NPCA	National Paint and Coatings Association
NSF	National Sanitation Foundation

NTMA	National Terrazzo & Mosaic Association
NWMA	National Woodwork Manufacturers Association
PCA	Portland Cement Association
PCI	Pre-stressed Concrete Institute
PDCA	Painting and Decorating Contractors of America
PDI	Plumbing and Drainage Institute
PEI	Porcelain Enamel Institute
PS	Product Standard, U.S. Department of Commerce
RCSB	Red Cedar Shingle and Hand split Shake Bureau
RIS	Redwood Inspection Service
RFCI	Resilient Floor Covering Institute
SCMA	Southern Cypress Manufacturers Association
SDI	Steel Deck Institute
SDI	Steel Door Institute
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor National Association
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendations, U.S.
SSPC	Steel Structure Painting Council
SWI	Steel Window Institute
TCA	Tile Council of America
UBC	Uniform Building Code
UCI	Uniform Construction Index
UL	Underwriters' Laboratories, Inc.
UMC	Uniform Mechanical Code
UPC	Uniform Plumbing Code
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The Contractor shall ensure that all employees, visitors, subcontractors, subcontractor employees, and suppliers, while on the worksite, comply with the requirements of OSHA, these requirements, and the safety precautions contained in the several Specification Sections.

B. The Contractor shall promptly and fully comply with and execute, without separate charge thereof to the City of Tulsa, shall enforce compliance with the provisions of the Williams Steiger Occupational Safety Health Act of 1970 (Public Law 91-596 with most recent updates and amendments) with particular attention paid, but not limited to, Title 29-Labor, Chapter XVII - Occupational Safety and Health Administration, Department of Labor Part 1926 - (Safety and Health Regulations for Construction), and part 1910 - (Occupational Safety and Health Standards), as printed, respectively, in the June 24, 1974, and June 27, 1974, Federal Register, and latest adopted amendments and changes thereto.

1.02 PRELIMINARY WORK

A. Prior to the start of and during the course of the work (above and below ground) the Contractor shall make a thorough survey of the entire worksite to determine all potential hazards. Workmen shall be made aware of those hazards and shall be instructed in procedures and the use of equipment for their protection. The Contractor shall verify the location and condition ("live" or "dead") of all utilities on and near the worksite and take precautions to protect his employees, subcontractors, material men, the general public, and the property.

1.03 IMMINENT DANGER

A. The City may stop those operations which create an imminent danger to employees (as defined by OSHA), to the public and to property.

B. The Contractor shall be wholly responsible for any accident (including death) occurring at any time during the progress of the work and until the final acceptance of the work by the District which may happen to any of his employees/workmen or those of any Subcontractor employed

on the building, the property, or for any damage or injuries (including death) which his work and operations may cause to the work being constructed, or to existing buildings, or to any tenants and occupants of the property, or of the adjoining properties, or to the public, or to any public or private property.

1.04 COOPERATION:

A. The Contractor shall cooperate with the safety representatives of the District, District's Insurance Managers and the City's Insurance Company in any and all inquiries before, during, and after the project.

1.05 SAFETY RESPONSIBILITIES:

A. Contractor's Superintendent shall:
   1. Ensure compliance with these requirements, OSHA requirements and other safety requirements, and provide and implement an Injury and Illness Prevention Program (IIPP) at the project site.
   2. Provide, supervise, and support a Contractor's Project Safety Supervisor and enable him/her to execute effectively their duties and responsibilities.
   3. Authorize immediate action to correct substandard safety conditions.
   4. Review and act to ensure compliance with safety procedures with his supervisors, subcontractors and suppliers.
   5. Take an active part in all supervisory safety meetings.
   6. Cooperate with safety representatives of the City, City Insurance Managers, and the City's insurance company.
   7. Ensure that all security and temporary fencing has been secured to prevent any movement or causal action that could contribute to any hazardous or unsafe condition, or which ultimately may cause harm.

B. Contractor's Project Safety Supervisor shall:
   1. Make thorough daily safety inspections of the worksite and immediately act to eliminate unsafe acts and unsafe conditions, and record all suggestions make and corrective action taken.
   2. Investigate worksite accidents and recommend immediate corrective action.

3. Weekly safety meetings shall be conducted and documented in the daily report of activity by the contractor. Weekly safety meeting notes shall be recorded, noting the contractors and trades on site, the topics that were discussed and the attendance by contractor name, workmen name and trade, in attendance on the project that day.
4. Review safety meetings reports submitted by job foremen and act to ensure that meaningful weekly safety meetings are held by the job foremen.
5. Attend foremen "tool box" safety meetings and evaluate effectiveness.
6. Assist in the preparation of accident investigation and reporting procedures.
7. Implement training programs for supervisors and employees as they apply to their specific responsibilities.
8. Be responsible for the control, availability, and use of safety equipment, including employee personal protective equipment.
9. Coordinate his activities with those of the District's Inspector and/or Project Manager, and immediately implement their safety suggestions.
10. Coordinate public relations aspects of the Contractor's safety program.

C. Contractor's Job Foreman shall:
1. Instruct workmen regarding safe work practices and work methods at the time workmen are given work assignments.
2. Furnish and enforce the use of personal protective equipment and suitable tools that are equipped with all the manufacturer's supplied safety features, and have not been altered in any way, for the job.
3. Continuously check to see that no unsafe practices and conditions are allowed to exist on this portion of the work.
4. Set a good example for his personnel.
5. Make a complete investigation of accidents to determine facts necessary to take corrective action to prevent a recurrence, and record the facts in a written report to accompany the daily report as set forth in the IIPP.
6. Promptly supply information for, or complete, an Accident Report and Investigation Form as directed by the Contractor Safety Supervisor and Contractor's Superintendent/Project Manager.

7. Hold weekly "tool box" safety meetings with his personnel to:
   a. Discuss observed unsafe work practices and unsafe conditions.
   b. Review the accident experience of his crew and discuss correction of the accident causes.
   c. Encourage safety suggestions from his crew and report those suggestions to the Safety Supervisor.
8. Ensure that first aid is promptly administered to an injured employee.
9. Report immediately, to Contractor's Superintendent/Project Manager, or Safety Supervisor, any injuries, or violations of job safety and security.

D. Subcontractor's Job Superintendent shall:
   1. Plan and execute his work so as to comply with the Construction Safety Program.
   2. Furnish and enforce the use of personal protective equipment.
   3. Attend supervisory personnel safety meetings schedule by the Contractor.
   4. Schedule and attend weekly "tool box" safety meetings to be held by job foremen for all employees.
   5. Report to the Contractor's Project Safety Supervisor or Contractor's Superintendent all observed unsafe conditions, unsafe practices, and violations of job security.
   6. Cooperate with the City's safety representative.

1.06 CONTRACTOR'S SAFETY SUPERVISOR:

A. Contractor shall designate a full-time employee as Contractor Project Safety Supervisor.

B. Qualifications must be approved by the City. Supervisor shall:
   1. Have heavy construction experience of not less than three (3) years, one of which must have been in a supervisory capacity.
   2. Be familiar with job safety laws and regulations.
   3. Have accident prevention experience.

C. Duties: Project Safety Supervisor shall conduct regular inspections of the work, shall ensure compliance with job safety requirements, shall maintain the Contractor's safety program IIPP on site and available for review by the City's Inspector and/or Project Manager and shall enforce safe practices, use of safety equipment and personal protective

equipment, and other such activities as may be required by OSHA, the safety requirements, and the safety precautions contained in the several Specification Sections.

D. If the Project Safety Supervisor is not effective in executing the duties assigned him, the District may request, in writing, that the Contractor furnish a new Project Safety Supervisor.

E. If the Contractor desires to replace the Project Safety Supervisor, he shall so notify the City and the City's Insurance Managers, in writing and shall submit the name, experience and qualifications of the proposed Project Safety Supervisor for approval.

1.07 REQUEST FOR VARIANCES

A. Request for variances to deviate from OSHA requirements must follow the current established procedures by that Agency.

1.08 FAILURE TO COMPLY

A. If the Contractor fails to comply with the requirements of OSHA, the safety requirements, and the safety precautions contained in the Specifications Sections, or to provide an on-site IIPP, the City may modify or stop the work and portions thereof, until such failure is remedied. Willful and repeated failure to comply could result in the shutdown of the work, and portions thereof. No part of the time lost due to any such modification of operations or stop orders shall be made the subject of a claim for extension of time or for increased costs of damage by the Contractor.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

SECTION 01 50 00
CONSTRUCTION FACILITIES AND
TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Temporary utilities, construction trailers/facilities and project sign(s) which are to be provided and maintained by the Contractor.

B. Dust and noise control.

C. General temporary items including staging area for material delivery and safety and security lighting.

1.02 TEMPORARY UTILITIES:

A. Water:
   1. Arrange for water with City Construction/Project Manager and install all necessary water lines, connections and metering devices for project, and upon completion of the work, remove such temporary facilities.
   2. City will pay for all water needed for construction. Water conservation techniques are to be observed by all workmen. Contractor is to provide and maintain all water conveyance equipment, hoses, nozzles, hose bib connections, free from leaks, and equip all hoses with positive closing, hand-squeeze-type operating nozzles - - it is not permitted to operate a hose without a positive closing nozzle.
   3. Provide suitable drainage system, subject to the approval of the Architect/Engineer and as indicated on the approved SWPPP, to carry construction waste water from site to an approved disposal location.

B. Electricity:
   1. City will pay for all electricity needed for construction. Contractor is to arrange for and install all necessary temporary poles, wiring and metering devices and, upon completion of the work, remove such temporary facilities. Electricity conservation best management practices shall be observed by all workmen, and any unnecessary lighting, or electrical discharge shall be turned off at the end of each shift. Only safety lighting is allowed after each shift is concluded.

2. Furnish and install area distribution boxes, so located that the individual trades may use 100 foot maximum length extension cords to obtain adequate power and work task lighting, at points where required for the work, for inspection and for safety.
3. Provide all electricity needed for construction including connections for construction equipment requiring power.
4. Lighting in the construction work area shall be sufficient to allow safe travel for workmen and the Engineering and Architectural team during normal working hours of the project, and shall be shut down to conserve energy after normal construction working hours.

C. Natural Gas: The Contractor shall provide and install gas equipment and piping necessary to perform his work, and shall remove same upon completion of the work. The Contractor shall pay for the Natural gas used in the work.

D. Telephone/Communications/Data:
1. Make necessary arrangements and pay costs for installation and operation of telephone, communication, or data service to the Contractor's office at the site.

E. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.

F. Make required connections to existing utility systems with minimum disruption to services in the existing utility systems. When disruption of the existing service is required, do not proceed without the Architect and/or Inspector's approval with at least 72 hours written request and approval. When required, provide alternate temporary service, should it be necessary as deemed by the Architect and/or Inspector, or Project Manager.

1.03 CONTRACTOR'S FACILITIES:

Contractor shall provide temporary offices, storage sheds, fencing, barricades, signage, hoists, scaffolds, railings and other facilities as required and specified. Installation and maintenance of such items shall be the responsibility of the Contractor.

A. Temporary Offices for Contractor, the City Project Manager and City Inspector of Record.

1. The contractor shall provide and maintain trailers on the site for the duration of the project if deemed necessary, up to and including the date the project completion .
2. One trailer shall be for the use of the general contractor, and the other trailer shall be for the use of both the City Project Manager, and the City IOR.
3. Trailers shall have ample headroom; shall be properly lighted, heated and ventilated, and supplied with air conditioning sufficient to properly heat and cool the trailer between 68 and 76 degrees Fahrenheit on any day during construction.
4. The Contractor shall provide temporary toilet facilities and wash sinks within close proximity (no more than 30 feet) to the trailer for the Project Manager, and the City IOR, which facilities shall be maintained as recommended by the supplier and common industry standards.
6. The trailer, equipment and the furniture shall remain the Contractor's property. Contractor shall remove such property upon completion of the work and the filing of the Certificate of Completion by the City.

B. Sanitary Facilities:
   1. The Contractor shall provide temporary toilet facilities which may consist of portable chemical toilets, and hand washing equipment. Number of toilets shall be based on number of workers with a minimum of 1 toilet facility per 10 workers. Placement of temporary toilet facilities shall be agreed upon at the site with the City Construction/Project Manager.
   2. Toilet facilities shall be kept supplied with toilet paper, and kept in a clean and sanitary condition until completion of the work, and then be removed from the work site. Upon removal, that portion of the site shall be properly cleaned and graded/repaired.

C. Contractor's Security Barricade:
   1. The Contractor shall erect the temporary security barricades for the purpose of defining construction lay-down areas, staging area and work zones. Temporary security barricades shall be provided on school site at exterior locations, and at building interiors, as necessary to provide a clear, obvious separation between school users and construction personnel. New or used material may be used.

2. Unless otherwise indicated or specified, barricade shall be constructed of 6'-0" high chain link fence material with T-post condition at bottom for stability, shall have top rails, and 6 gauge minimum wire support at the bottom, BLACK screen material securely attached to the chain link material. Space posts not to exceed 10 feet on centers. Posts shall be of the following nominal pipe dimensions: terminal, corner, and gate posts 2-1/2", line posts 2", with diagonal supports at each corner. Chain link fabric shall be not less than 13 gauge, 2" mesh, and in one width. Posts, fabric and accessories shall be galvanized. Some fencing may require terminal posts to be sunk in the ground, or with appropriately placed concrete footings, and/or may require sandbags for ballast, as determined by the Inspector and/or Project Manager.
3. Chain link fencing shall be free from barbs, icicles or other projections resulting from the galvanizing process, and shall be knuckle-knuckle. Fence fabric having such defects will be rejected even though it has been erected.
4. Gates shall be fabricated of steel pipe with welded corners, and horizontal and diagonal bracing as required to prevent flexing. Fabric to be attached to the frame at 12 inch centers. Provide all gate hardware of a strength and quality to perform satisfactorily until the barricade is removed upon completion of the work. Provide locks sufficient to secure the area, and that can be opened with one hand (e.g. combination locks).
5. At the completion of the work, remove barricade and concrete post footings from the site; backfill and compact fence footing holes by patching with like materials. Existing surface paving that is cut into or removed shall be patched and sealed to match the surrounding areas with like materials, and in the same finishes.
6. Contractor shall maintain all fencing and gates in good order on a daily basis, including the masking of graffiti as deemed necessary by the Inspector, and/or Project Manager, and shall secure the project fencing and gates at the end of every work day.

D. Other Enclosures:
   1. Provide temporary weather-tight enclosures at openings in exterior walls to create acceptable working conditions, and/or to allow for temporary heating and for necessary security.
   2. Provide protective barriers that shall be at least 4' in height, and extend to protect all areas at tree drip lines, around plants and other improvements designated to remain, as determined by the

Inspector and/or Project Manager and related specification sections.

E. Storage Yards and Storage Containers:
   1. The Contractor shall fence and maintain storage yards in an orderly manner.
   2. Provide steel storage containers, lockable, free from graffiti, and in good condition for materials and equipment that cannot be stored offsite or in a bonded and agreed-upon warehouse.
   3. Exact location, size and access of storage yards and steel storage containers shall be approved by the District Construction/Project Manager.
   4. Remove storage yards and containers as rapidly as progress of the work will permit.

1.04 REQUIRED SIGNS AT GATES

A. Contractor shall post at the work site signs not greater than twenty-five feet (25') apart at all gates stating "Authorized Personnel Only – Construction Area" and "No Parking – Fire Lane," as determined by the contract specifications and drawings, and/or as designated by the Inspector and/or Project Manager

1.05 HARD HAT SIGN

A. Contractor shall post a sign at each gate and/or entry to any area of construction, identifying the job site as a "hard hat area". No person without a hard hat shall be allowed in the sections of the project under construction. This shall be the responsibility of the Contractor's Project Safety Inspector to enforce.

1.06 DUST AND NOISE CONTROL

A. Throughout the entire construction period, Contractor shall maintain dust control by use of water or other environmental controls as may be approved by the Engineer of Record, Inspector, and/or Project Manager.

B. Noise Control: Muffle all equipment to a maximum of 85 Dba at 5' from equipment. Noise control is to be kept to a minimum to perform the operations of construction.

1.07 GENERAL ITEMS

A. Staging areas for delivery of materials and equipment will be at locations designated by the drawings and specifications, and/or as approved by the Engineer of Record, Inspector, and/or Project Manager.

B. Safety and Security Lighting: Provide 5 foot candles outside.

C. Noise Control: Muffle all equipment to a maximum of 85 Dba at 5' from equipment.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Protection for Products, including District - Provided Products, After Installation.

B. Protection of Existing Utilities and Interference.

1.02 EXISTING UTILITIES

A. The known existing utilities are shown on the drawings in their approximate location and the Prime Trade Contractor shall exercise care in avoiding damage to these facilities as the Prime Trade Contractor will be held responsible for their repair if damaged. Hand excavation shall be utilized when digging in close proximity to existing utilities. The City's Architectural Team does not guarantee that all utilities or obstructions are shown or that the locations indicated are accurate.

B. No work shall be performed on energized electrical equipment unless scheduled with the City Inspector of Record. The City Inspector of Record reserves the right to specify specific conditions for all work involving energized high voltage electrical equipment, and its scheduled modification proposal.

C. If interferences occur at locations other than the general locations shown on the plans, and such utilities are damaged before their locations have been established, or create an interference, the Prime Trade Contractor shall notify the City's Construction/Project Manager and a method for correcting said interference shall be supplied by the City's Engineering representatives. Payment for additional work due to interferences not shown on the plans shall be in accordance with the General Conditions.

D. Drawings showing location of equipment, piping, etc., are diagrammatic and job conditions will not always permit their installation in location shown. When this situation occurs, bring to the City Engineer of Record, and/or Inspector's attention immediately to determine relocation in joint conference.

E. Information shown relative to existing power and signal service is based

upon available records and data but shall be regarded as approximate only. Minor deviations found necessary to conform to actual locations and conditions shall be made without extra cost to the City.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 PROTECTION AFTER INSTALLATION

A. Adequately protect all installed equipment and materials until completion and acceptance by the Engineer of Record, Inspector, and Project Manager.

B. Protect installed products and control traffic in immediate area to prevent damage in subsequent operations.

C. Provide protective coverings at walls, projections, corners, and jambs, sills, and stiff openings in and adjacent to traffic areas.

D. Cover walls and floors of elevator cabs, and jambs of cab doors, when elevators are used by construction personnel. Protect elevator area until final acceptance.

E. Protect finished floors and stairs from dirt, wear, and damage:
   1. Secure heavy sheet goods or similar protective materials in place, in areas subject to construction foot traffic, and/or material deliveries.
   2. Lay planking or similar rigid materials in place, in areas subject to movement of heavy objects over existing surfaces.
   3. Lay planking or similar rigid materials in place in areas where storage of products will occur.

F. Protect waterproofed and roofed surfaces:
   1. Restrict use of surfaces for traffic of any kind, and for storage of products.
   2. When an activity is mandatory, obtain recommendations for protection of surface from manufacturer. Install protection and remove on completion of activity. Restrict use of adjacent unprotected areas.

G. Restrict traffic of any kind across planted lawn and landscape areas

through the use of temporary barricades, fencing, signage, and until final acceptance and maintenance period.

H. Care shall be exercised to prevent damage to adjacent facilities including walks, curbs, and gutters, etc. Where equipment will pass over these obstructions, suitable planking and protection shall be placed, and damaged facilities, due to the Contractor(s) operations, shall be removed and replaced at the Prime Trade Contractor's expense.

I. Prime Trade Contractor shall be responsible for overloading of any part or parts of structures beyond their safe calculated carrying capacities by placing of materials, equipment, tools machinery or any other item thereon.

J. All existing improvements and facilities shall be protected from damage of any type resulting from the operations, equipment or workers of the Contractor(s) during the time the project.

K. All damaged work shall be replaced, repaired and restored to its original condition with no additional cost to the City.

L. Where existing utilities are damaged or disrupted on account of any act, omission, neglect or misconduct by the Contractors in the manner or method of executing the work, or due to non-execution of work, such damage shall be immediately repaired to maintain operation regardless of the time of occurrence with no cost to the City.

M. Provide temporary construction necessary for protection of the building and their parts. Close buildings as soon as possible as protection from the weather and vandalism. Protect existing buildings and controlled temperature areas from excessive temperature variances below 68 degrees Fahrenheit, and above 76 degrees Fahrenheit, and from any damage.

N. Protect doors, millwork and mill counters and cases and hardware from damage, including abrading and scratching of finishes.

O. Protect doors and frames and hardware from mechanical damage and damage to finish coatings.

P. Remove protective coatings, wrappings, temporary coverings, etc., as

required to leave work in condition for painting and finishing, final cleaning, etc.

Q. Protect all exterior work, including existing asphalt paving, concrete flatwork, common sidewalk, and City curb, gutter, and aprons. Protect all existing and newly placed landscaping and irrigation systems.

R. Repair or replace all damaged work promptly as directed by City Construction/Project Manager, City IOR, or City Engineer of Record at no cost to the City.

END OF SECTION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Security Program.

B. Entry Control.

C. Personnel Identification.

D. Miscellaneous Restrictions

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 SECURITY PROGRAM

A. Protect work, existing premises, and operations from theft, vandalism and unauthorized entry.

B. Security of the job area shall be strictly maintained. The Prime Trade Contractor shall be responsible for keeping areas involved in the work locked and secure at all times when work is not in progress, and no Contractor representative is on site.

3.02 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities under construction. Allow entrance only to authorized persons with proper identification, and appropriate footwear, and hard hats, as determined by the Contractor Project Safety Inspector, and/or District Inspector.

B. Prime Trade Contractor shall control entrance of own persons and vehicles related to construction operations in accordance with the conditions during work, and not allow intrusion by others.

3.03 BADGES AND ESCORT REQUIREMENTS

A. All personnel shall wear badges distinguishing personnel requiring an escort (YELLOW badges) to areas of the work from those not requiring an escort (GREEN badges).

B. The Contract and Pre-Construction meeting wording lays out the appropriate procedures for Contractor and Subcontractor personnel in working on the City site.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Procedures for closing-out Project.

1.02 RELATED SECTIONS

A. Closeout Submittals: See Respective Specification Sections.

1.03 GENERAL

A. As a prerequisite for final payment release, Contractor shall complete the work of this Section.

B. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.04 PRE-FINAL INSPECTION; SUBSTANTIAL COMPLETION

A. Pre-final Inspection:
   1. Upon "substantial completion" of the Work AS AGREED TO BY Contractor, Architect/Engineer, City Inspector of Record and City Project Manager, Contractor shall notify Architect/Engineer, and request a "pre-final inspection" of the Work.
   2. If Architect/Engineer, Inspector, and Project Manager concur that work of the contract project/phase is "substantially complete", he will review and list any items that need to be corrected on a punch list. List will be amended as required to include items on the correction or punch list subsequently observed.

B. Substantial Completion Defined: "Substantial Completion" of the Work is the status, as approved by the Engineer of Record when construction is sufficiently complete, in accordance with the Contract Documents, so the City/Owner can occupy or utilize the Work for the use for which it is intended.

1.05 FINAL INSPECTION

A. Reference: See Supplementary Conditions.

B. Final Inspection: When Contractor has complied with above Article at the end of the final phase, Engineer of Record and City Inspector and Project Manager will review the Work and list any items that are not completed or need to be corrected.

C. Contractor shall complete and/or correct the Work in a timely manner as outlined in the contract documents.

1.06 GUARANTEES

A. General: Contractor shall guarantee in writing to City/Owner that:

"Contractor will repair or replace any or all of such work, together with any other adjacent work which may be displaced in connection with such replacement, that may prove to be defective in workmanship or material within a period of one year from the date of acceptance of the above mentioned structure by the City of Tulsa, ordinary wear and tear, and unusual abuse or neglect excepted."

B. Format: Contractor shall submit guarantees typed in the format indicated in "Guarantee Form".

C. Number of Copies: Submit in triplicate (3) to Engineer of Record with one electronic pdf.

D. Required Guarantees:
1. General: Submit all guarantees listed herein or required by various Spec. Sections.
2. General Guarantee:
   a. By General Contractor; For the Entire Work: 1 Year.
3. Specific Guarantees:

	SPEC DIVISION	ITEM	TIME PERIOD
a.	Division 6	Custom Casework	2 Years (nic)
b.	Division 7	Built-up Roofing	10 Years (nic)
		All Flashing & Sheet Metal, in connection with roof coverings	5 Years (nic)
		All Joint Sealants	5 Years
		Damp proofing	2 Years
c.	Division 8	Hollow Metal Doors & Frames	2 Years
		Wood Doors	Lifetime (nic)

d. Division 9 Acoustical Ceiling Systems.....2 Years (nic)
e. Division 10 Porcelain Enamel Liquid
Marker Board Surfaces .....Lifetime (nic)
Toilet Compartments .....Lifetime (nic)
Operable Walls.....3 Years (nic)
Toilet Accessories .....1 Years (nic)
f. Division 11 Equipment
Projector Screen.....1 Years (nic)
Laboratory Equipment and
Cabinets .....Lifetime (nic)
g. Division 12 Furnishings
Vertical Blinds .....Lifetime (nic)
h. Division 14 Hydraulic Elevator.....1 Year (nic)
Wheelchair Lift.....1 Year (nic)
I. Division 22 Plumbing .....1 Year (nic)
HVAC Systems .....1 Year (nic)
Temperature Controls for
HVAC Systems .....1 Year (nic)
j. Division 26 All Electrical Work.....1 Year

1.07 WARRANTIES

A. General: Comply with Section 017836. Submit all warranties required by various Specification Sections.

1.08 CERTIFICATES

A. General: Submit in triplicate (3) all certificates required by various Specification Sections or listed herein, notarized as required.

B. Certificates:
1. Division 8: Finish Hardware installation acceptance.
2. Division 28: Fire Alarm System testing and approval.

1.09 OPERATION AND MAINTENANCE DATA

A. General: Submit all manuals required by various Specification Sections or listed herein; three (3) copies each, and one electronic pdf. Provide durable binders, no less than 8-1/2" x 11" in size and provide the following information:

1. Identification on, or readable through, the front cover stating general nature of the manual.
2. Neatly typewritten index at the front of the Manual, furnishing immediate information as to location in the Manual of all data or equipment included.
3. Complete instructions regarding operation and maintenance of all equipment included.
4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.
5. Copy of all Guarantees and Warranties issued.
6. Copy of the approved Shop Drawings with all data concerning changes made during construction.

B. Extraneous data: Where contents of Manuals include Manufacturers' catalog pages, clearly indicate the precise items included in this installation by clouding, or highlighting, and delete, all manufacturers' data with which this installation is not concerned.

1.10 RECORD DRAWINGS

A. Procedures:
1. Promptly following contract award, General Contractor shall secure from the City one complete set of Drawings. Identify the set as "Record."
2. Timing of Entries: Make entries within 24 hours after receipt of information on any changes by Contractor or Sub Contractors.
3. Contractor shall be responsible for maintaining and recording the changes on the set, and by affixing any related RFI, COR, and/or ASI applicable to the changes.
4. Do not use the "Record" set for any purpose except entry of new data and for review by the Engineer of Record. Maintain separate job sets for subcontractors and workers daily use.
5. Maintain the "Record" set at the job site where designated by the Engineer of Record, in conjunction with the City Inspector.
6. Use all means necessary to protect the "Record" set from deterioration, loss or damage until completion of the work.

7. Making entries on Drawings: Using an erasable colored pencil, other than blue or black, not ink or indelible pencil, and clearly describe the change by note and by graphic line as required. Date all entries. Call attention to the entry by a "cloud" around the area or areas affected. In the event of overlapping changes, different colors may be used for each of the changes.
   a. Changes due to approved change orders may be indicated by referencing the change order number and scope of change in lieu of revising the Drawings.
   b. The location and depth below finish grade or above ceilings and attic spaces of utilities shall be fully dimensioned and indicated on Drawings. Dimensions shall be taken to building lines or permanent landmarks.
8. The Engineer of Record's approval of the current status of the "Record" drawings will be a prerequisite to the Architect/Engineer's and City Inspector's approval of requests for progress payments and request for final payment release.
   a. Progress approvals: Prior to submitting each request for progress payments, secure the City, Inspector's approval of the status of the "Record" Drawings.
   b. Prior to submitting request for final payment and final inspection, General Contractor shall submit the "Record Drawing" set to the City Inspector, with transmittal letter, in duplicate, for approval and further processing through the Engineer of Record for their approval and acceptance, and delivery to the City.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:
   1. Remove designated items for abatement.
   2. Remove items to clear path for installation and construction of enclosure walls and structural support columns and beams.
   3. Remove any items within area to be cleared for new walls and structure.
   4. Encapsulate existing items cut to clear area for new walls per EPA standards, Oklahoma Department of Environmental Quality and Oklahoma Asbestos Control Act.

B. Related Work:
   1. Requirements in Addenda, Alternates, Conditions and Division 1 collectively apply to this work.

1.02 QUALITY ASSURANCE

A. Demolition shall be in compliance with IBC Regulations and conform to the IBC, 2015 edition.

B. Utilities disconnection, capping and re-installation shall be by workmen licensed to perform such work.

1.03 SUBMITTALS

A. Two (2) copies of permits and notices.

B. Upon completion of work in this Section, submit record documents recording the extent of active and abandoned underground utilities.

1.04 EXISTING CONDITIONS

A. Contractor shall field visit project site to familiarize with problem items to demo and abate.

B. Conduct demolition to minimize interference with adjacent structures, and properties.

C. Provide, erect and maintain temporary barriers and security devices.

D. Conduct operations with minimum interference to public or private thoroughfares. Maintain egress and access at all times.

E. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.

F. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements not indicated to be demolished and/or removed.
   1. Protect improvements on adjoining properties and on Owner's property.
   2. Restore damaged improvements to their original condition, as acceptable to property owners.

PART 2 - PRODUCTS
Not Used.

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that structures to be demolished are unoccupied and discontinued in use.

B. Prevent movement or settlement of adjacent structures. Provide bracing and shoring.

E. Mark location of disconnected utilities. Identify utilities and indicate capping locations on project record documents.

3.02 EXECUTION

A. Cease operations and notify Engineer of Record immediately if adjacent structures appear to be endangered. Do not resume operations until corrective measures have been taken.

B. Remove and promptly dispose of contaminated, vermin infested or dangerous materials encountered.

C. Do not burn or bury materials on Site.

D. Keep work sprinkled to minimize dust. Provide hoses and water main or hydrant connections for this purpose.

3.03 SITE CLEARING NOT APPLICABLE

3.04 DISPOSAL OF WASTE MATERIALS

A. Burning on Owner's Property: Burning is not permitted on Owner's property.

B. Removal from Owner's Property: Remove waste materials and unsuitable or excess materials from Owner's property.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

Forms for all cast-in-place concrete indicated on the drawings and subsequent removal of forms, except those earth forms described in this Section.

1.02 RELATED SECTIONS

A. Section 31 00 00 - Earthwork.

B. Section 03 21 00 - Steel Reinforcement.

C. Section 03 30 00 - Cast-in-place concrete.

D. Section 05 50 00 - Metal Fabrications.

1.03 QUALITY ASSURANCE

A. Qualifications of workmen: All workmen shall be experienced mechanics. Provide one person who shall be present at all time during execution of this portion of the work who shall be thoroughly familiar with the type of material being installed, the referenced standards and the requirement of this work and shall direct all work performed under this Section.

B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Recommended Practice for Concrete Form work," publication 347R-88 and SP-4 of the American concrete institute.

C. Where provisions of pertinent codes and standards conflict with the requirement of this Section, the more stringent provision shall govern.

1.04 PRODUCT HANDLING

A. Protection: Contractor is to protect all form work materials before, during and after installation.

B. Damaged Forms: In the event of damage or misalignment, immediately make all repairs and replacement necessary at no additional cost to the City.

PART 2- PRODUCTS

2.01 MATERIALS

A. Form lumber: All form lumber shall be new except as allowed for re-use of forms in Part 3 - EXECUTION of this Specification, and all form lumber shall be one of the following, a combination thereof, or an equal approved in advance by the Structural Engineer and Structural Safety Section.
   1. Plywood forms may be Plyform, Plyron, and bearing the label of the Douglas Fir Plywood Association.
   2. Form lumber may be fir, larch hemlock or approved equal, seasoned lumber surfaced four sides.
   3. Form sealers shall be liquid form oil.

B. Other form materials and/or forming systems may be used if approved by the Engineer of Record, Architect, and Structural Engineer, A complete list of materials, manufacturers and methods of application are to be submitted to the Engineer of Record, in accordance with Section 01 33 00 - Submittals and 01 25 13 - Product Options and Substitutions.

2.02 TIES AND SPREADERS

A. Form ties shall be of proven types and shall be a type which does not leave an open hole through the concrete and which permits patching at every hole.

B. When forms are removed, all metal ties shall be removed and shall be flush with the concrete surface. No metal ties shall be exposed on the exterior of the walls.

C. Wire ties and wood spreaders may be used only if approved by the Engineer of Record).

2.03 ALTERNATE FORMING SYSTEMS

Alternate forming systems may be used if approved by the Engineer of Record.

2.04 OTHER MATERIALS

All other form materials, not specifically described herein, but required for proper completion of concrete formwork, shall be as selected by the contractor subject to approval by the Engineer of Record.

PART 3- EXECUTION

3.01 INSPECTION

A. Contractor shall verify and be responsible for all existing dimensions and elevations before any work is done.

B. Inspect the installed work of all other trades; verify that all such work is complete and that the installation of Formwork may begin.

C. Verify that forms have been constructed in accordance with all pertinent codes and regulations, referenced standards and the design.

D. Discrepancies: Do not proceed with installation in areas of discrepancy. Notify the Engineer of Record of all discrepancies. All discrepancies are to be fully resolved before proceeding with installation.

3.02 CONSTRUCTION FORMS

A. Forms are to be constructed sufficiently tight to prevent leakage of concrete, and able to withstand excessive deflection when filled with wet concrete. Forms shall be braced, anchored and properly aligned.

B. Layout and form all required cast-in-place concrete to the required dimensions indicated on the drawings.

C. Care shall be exercised in the layout of forms to avoid the necessity for cutting, patching or repair of concrete after it is in place.

D. Make provisions for all openings, offsets, recesses, anchorage, blocking and other requirements of the work.

E. Perform all forming required for work of other trades and do all cutting and repairing of forms required to permit such installations.

F. Carefully examine the drawing and specifications and verify with other trades for openings, reglets, chases, and other items that are required in the forms.

G. Forms for precast concrete shall be constructed to provide for shrinkage of the concrete, and shall be adequately braced. All edges shall have chamfer strips except as noted on drawings.

H. Construct all forms true, plumb, and square within a tolerance of 1/8" in 12 feet.

3.03 EMBEDDED ITEMS

Provide, install and check all required steel frames, angles, grilles bolts, inserts and other such items required to be anchored in the forms before the concrete is placed.

3.04 BRACING

A. Properly brace and tie the forms together so as to maintain size, shape, and alignment, and to provide safety to personnel.

B. Construct all bracing and supporting members of ample size and strength to safely support, without excessive deflection, all dead and live loads to which they may be subjected.

3.05 PLYWOOD FORMS

A. Plywood forms shall be designed for loads imposed. Nail the plywood panels directly to studs and apply in a manner to minimize the number of joints.

B. Make all panel joints tight butt joints with all edges true and square, if necessary, use tape to prevent excessive leakage.

3.06 FOOTING FORMS

A. Foundation forms are to be wood unless otherwise approved by the Engineer of Record

3.07 REUSE OF FORMS

A. Reuse of forms shall be subject to approval of the Engineer of Record.

B. Reuse of forms shall not delay of change the schedule for placement of concrete from the schedule if all forms were new.

C. Reuse of forms shall not affect the structural stability of the forms nor the appearance of the finished concrete.

3.08 REMOVAL OF FORMS

A. Side forms of foundations may be removed 48 hours after placement of concrete. Where foundations are supporting lateral loads, forms shall not be removed until approved by the Engineer of Record.

B. Use care and diligence, and protect workmen, passers-by, and the installed work and materials of other trades. Forms shall not be removed until the concrete can support all loads.

C. Cut nails, tie wires and form ties off flush, leave all surfaces smooth and clean.

D. Remove metal spreader ties and fill in the resulting pockets to match the surrounding areas with grout or dry pack. Sack all exposed faces.

E. Fill all holes resulting from the use of bolts, ties, spreaders and sleeve nuts with cement grout applied under pressure by means of a grouting gun; grout shall be one part portland cement, to two parts sand; apply grout immediately after removing forms.

3.09 CLEANING

A. Remove all forming material from the site and dispose of in approved dumps.

B. Clean area of all left over debris including stakes, ties, form boards, wires, concrete spills, etc. Leave area in a neat clean condition.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Cast-in-place concrete for the following:
      a. Foundation walls and footings.
   2. Formwork.
   3. Curing and protection.
   4. Finishing.

B. Related Work:
   1. Requirements in Addenda, Conditions and Division 1 collectively apply to this work.
   2. Concrete Formwork: Section 03 11 00.
   6. Steel Reinforcement: Section 03 21 00.
   7. Metal Fabrications: Section 05 50 00.

1.02 SUBSTITUTIONS

Only written approval of Engineer of Record, by Addenda or Construction Change Document, will permit substitutions for materials specified. Refer to Section 01 25 13 - Product Options and Substitutions for procedure.

1.03 REFERENCES

A. ASTM C33/C33M-13 - Concrete Aggregates.

B. ASTM C94/C94M-13a - Ready-Mixed Concrete.

C. ASTM C150/CM150-12 - Portland Cement.

D. ASTM C260/C260M-10a - Air-Entraining Admixtures for Concrete.

E. ASTM C494/C494M-13 - Chemical Admixtures for Concrete.

1.04 QUALITY ASSURANCE

A. Design Criteria for Formwork:
   1. Contractor shall be solely responsible for formwork and shall:
      a. Design, construct and maintain formwork to safely support loads.

b. Obtain governing agency approval.

B. Testing Agency:
1. On-Site Work: Engineer of Record designated Testing Laboratory.
2. Off-Site Work: Governing agency approved Testing Laboratory.

C. Requirements of Regulatory Agencies:
1. Codes: Conform to Title 24 of the IBC and conform to IBC, 2015 Edition.
2. Off-Site Work:
a. Conform to local governing agency requirements.
b. Obtain and pay for permits, licenses and fees.
c. Arrange for tests and inspections.

D. Tests and Inspections: See Section 01 45 00, Quality Control and Testing Services.

E. Allowable Tolerances for Concrete Surface Smoothness: 1/8" maximum permissible variation from a true plane measured from a 10' straight edge placed anywhere on the surface.

F. Source Quality Control:
1. Testing Laboratory shall provide continuous inspection at concrete batch plant for structural concrete, defined as follows: Footings, foundation walls, floor slabs-on-grade, and exterior reinforced slabs.
2. Furnish Weighmaster's Certificates for all concrete.

1.05 SUBMITTALS

A. Concrete Design Mix: Reviewed by Testing Laboratory.
1. Per ACI 318, Section 5.2 and 5.3.

B. Test Reports: Source and Field Quality Control tests.

C. Certificates:
1. Weighmaster's Certificates: Per Engineer of Record requirements.
2. Certificate for Off-Site Work: Provide for off-site work, per Section 01 77 00, Project Closeout.

D. Provide product data for specified products, under provisions of Section 01 33 00.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage:
   1. Cement: Store in weather-tight enclosures and protect against dampness, contamination and warehouse set.
   2. Aggregates:
      a. Stockpile to prevent excessive segregation or contamination with other materials or other sizes of aggregates.
      b. Use only one supply source for each aggregate stockpile.
   3. Admixtures:
      a. Store to prevent contamination, evaporation or damage.
      b. Protect liquid admixtures from freezing or harmful temperature ranges.
      c. Agitate emulsions prior to use.

B. Deliver Ready-Mixed Concrete in conformance with Title 24, Section 1905A.8 (which refers to ACI 318 Section 5.8).

C. Formwork Materials:
   1. On delivery to Site, place materials in area protected from weather.
   2. Store materials above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
   3. Handle materials to prevent damage.

1.07 JOB CONDITIONS

A. Environmental Requirements:
   1. Allowable Concrete Temperatures:
      a. Cold Weather: When depositing concrete in freezing or near-freezing weather, concrete mix temperature shall be between 50°F and 90°F when cement is added. Maintain a concrete temperature of 50°F minimum for 72 hours after placing, or until concrete has thoroughly hardened. When necessary, heat concrete materials before mixing. Take necessary precautions to protect transit-mix concrete.
      b. Hot Weather: 90°F maximum.

B. Protection:
   1. Do not place concrete during rain, sleet, or snow unless protection is provided.
   2. After placement, protect from injury by elements, traffic, construction operations and other causes.

C. Sequencing, Scheduling: Coordinate work with earthwork, trenching for foundations, underground utilities, plumbing, electrical, mechanical, imbedded items, steel reinforcement and related work of other sections.

PART 2 - PRODUCTS

2.01 MATERIALS; GENERAL
Conform to Codes and additional requirements stated herein.

2.02 BASIC CONCRETE MATERIALS

A. Portland Cement:
   1. Type II; per Title 24, Section 1903A.5 and modified ACI 318 Section 3.3.2.
   2. Use tested cement only per Section 1903A. Use same cement brand for all exposed work.
   3. Recycled content shall be maximum 15% (15% flyash per DSA IR 19-3 and 10% reclaimed aggregate).

B. Water: Clean, fresh, free of injurious amounts of minerals, organic, substances, salts, acids or alkali.

C. Aggregates:
   1. General: Per Title 24, Section 1903A.
   2. Aggregates: Per CBC Section 1903A.3.3.
      a. Fine: Sand; well graded from coarse to fine.
         1) 15% Flyash: Per IBC Section 1903A.4, ACI 318-05, ASTM C618-12a, ASTM C311/C311M-13 and ASTM C94/C94M-13a.
      b. Coarse: Uniformly graded from 1/4" to maximum permissible size. Maximum size per Title 24, Section 1903A.3, but not to exceed 1-1/4". See Structural Drawings.
      c. Combined grading shall meet Table 19A-J, Title 24, Part 2.
   3. The nominal maximum size of coarse aggregate shall not be larger than one-fifth the narrowest dimension between sides of forms, nor

one-third the depth of slabs, nor three-fourths the minimum clear spacing between individual reinforcing bars or wires, bundles of bards, or Pre-stressing tendons or ducts.

2.03 ADMIXTURES

A. Inclusion of admixtures in concrete mix is at Contractor's Option and expense. Types shall conform to the following:
   1. Conform to Title 24, Section 1903A.5. Admixtures shall increase workability and reduce water demand.
   2. Acceptable Products:
      a. Floor slabs-on-grade: Red Label or Anti-Hydro International Inc. or approved equivalent. Mix per manufacturer's recommendations.

2.04 CONCRETE SURFACE TREATMENTS

A. Liquid Curing Compounds:
   1. General: Conform to ASTM C309-11.
   2. Acceptable Manufacturers: Hunt Process Co., Edoco/Burke Construction Chemicals, Scofield, Sonneborn (Degussa Construction Chemicals); US Spec (US Mix Products Co.).
   3. "Clear", Oxidizing Type (For exterior areas): Hunt "Clear #ARB" as a standard of quality.

B. Liquid Curing Compound (for interior slabs):
   1. General: Penetrating curing compound.
   2. Acceptable manufacturers: Curranseal, Innerseal.
   3. Acceptable Products:
      a. Curranseal PM 3300 (714) 641-1121.
      b. Innerseal DPS; 800-999-9385.
      c. No other substitutions allowed.
   4. Apply penetrating sealer within 24 hours of slab placement while concrete is still "green."
   5. Application of compound shall be by a trained applicator acceptable to the compound manufacturer.
   6. Provide manufacturer's standard 10 year warranty covering both labor and materials necessary to repair floor slab, repair or replace floor finish if repairs cannot be made.
   7. Repair all cracks in interior slabs with "crack chaser" saw, fill crack with sealant. This requirement shall be provided prior to application

of finish floor materials and is required to validate manufacturer's 10 year warranty.

2.05 WOOD FORMWORK

A. Grade Marks and Rules for Lumber and Plywood: Per Specifications Sections 03 11 00 - Concrete Formwork and 06 10 00 - Rough Carpentry.

B. Boards For Unexposed Concrete and Basic Forms: Douglas Fir, S4S; Standard Grade or better.

C. Form Coatings and Release Agents:
   1. Per manufacturer's recommendations, suitable for type of form materials and finished concrete surface.
   2. Materials shall not stain or change color of exposed concrete.
   3. Materials shall be compatible with finishes to concrete.

2.06 ACCESSORIES AND MISCELLANEOUS

A. Non-Shrink Grout (Drypack Under Base Plates): Five Star high early strength grout by U.S. Grout Corporation. The grout shall be mixed and installed in accordance with manufacturer's recommendations. Tensile strength (ASTM C307-03(2012)): 2000 psi; Flexural strength (ASTM C580-02(2012)): 4000 psi.

B. Epoxy Adhesive: Simpson Epoxy-Tie ET-High Strength Adhesive or Hilti Equal. Two component solid epoxy system meeting minimum requirements of ASTM C881/C881M-10 specification for Type I, II, IV, and V, Grade 3, Class B and C.
   1. Compressive Yield Strength: 13,390 psi minimum at 7 days per ASTM D695-10.
   2. Heat Deflector Temperature: 168° (76°C) minimum per ASTM D648-07.
   3. Bond Strength: 4,420 psi at 14 days per ASTM C882/C882M-13.
   4. Codes: ESR-3372; SBCCI-94145; City of Los Angeles RR25185, RR25120.

C. Concrete Stair Nosing: Refer to Section 05 50 00 - Metal Fabrications.

D. Vapor Barrier Membrane under interior concrete slabs:

1. Membrane shall be Stego Wrap 15 mil as manufactured by Stego Industries (949) 257-4100.
   a. Acceptable Manufacturer: Vaporguard by Reef Industries.
2. Vapor barrier membrane shall have the following properties.
   a. Permeance as tested after mandatory conditioning (ASTM E154/E154M-08a(2013)e1, Section 8, 11, 12, 13) less than 0.01 Perms.
   b. Strength: ASTM E1745 Class A.
   c. Thickness: 15 mils minimum.
   d. Installation shall be in accordance with ASTM E1643-11 and manufacturer's instructions.

2.07 MIXES, CONCRETE

A. Mix Proportioning:
   1. General:
      a. Non-designed Mix, per Title 24, Section 1905A.8 which refers to ACI 318 Section 2.
      b. Design shall include admixtures and/or additives. Use as approved by DSA.
      c. Do not add salt, chemicals, or other materials to prevent freezing.
   2. Strengths, Proportions and Criteria: Typical for all locations; except where higher strengths are indicated on the Drawings.
      a. Strength: 3,000 psi at 28 days; 1,800 psi at 7 days.
      b. Cement Content: Minimum 6 sacks (94#) cubic yard.
      c. Slump: Maximum four inches.

B. Mixing:
   1. General: Per Title 24, Section 1905A.8 which refers to ACI 318 Section 5.8 and Section 5.2.
   2. Batch Mixed: Use ASTM C94 batch mixer; or capacity to handle one or more full sack batches. No split-sack batches.
   3. Transit Mixed: Per CBC 2013 edition Section 1905A.9 which refers to ACI 318 section 5.9.
   4. Mix concrete only in quantities necessary for immediate use.
   5. Do not retemper concrete.
   6. Discharge wash water from mixer before reloading.
   7. Include additives and admixtures.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine excavations for foundations, footings, and structures and examine earthwork operations and subgrade for defects that will adversely affect the execution and quality of work.

B. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

C. Do not start work until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Layout: Accurately layout work to properly position elements to lines and levels.

B. Joining To Previous Pours or Existing Work: Sandblast, roughen and clean existing joining concrete and rebar surfaces to provide a proper bond to new work.

C. At locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with epoxy cement.

D. Slabs-on-Grade:
   1. Refer to Section 31 00 00, Earthwork.
   2. Moisten surface sufficiently to prevent suction of water from concrete mix, except where a membrane is used.
   3. All interior slabs-on grade shall be poured over 6 mil visqueen vapor barrier membrane protected with 1" of sand overlay over crushed rock porous fill. Vapor barrier shall conform to ASTM E1745-09.

3.03 FORMWORK ERECTION

A. Scope:
   1. General: Concrete shall be cast in forms.

B. Form Face Types: Plywood or horizontal boards.

C. General Construction:
   1. Forms shall be substantial, unyielding, true to line and level; sufficiently tight to prevent leakage; adequately tied and braced; and conform exactly to dimensions of finish concrete.
   2. Forms shall provide adequate work clearances, temporary access openings necessary for concrete placement, provisions for attachment to previous work; and provide for stripping without injury to concrete work.
   3. Cleanouts: Provide continuous cleanouts on one side at bottom of vertical work (such as walls), and other openings as necessary to facilitate cleaning and inspection of the work.

D. Fabrication:
   1. Nail form faces securely to studs. Space studs to adequately support form faces and prevent bulging. Provide stud or solid backing at joints.
   2. Install chamfer strips at exposed corners and edges.
   3. Securely fasten chamfers, control joints and other detail work.

E. Erection:
   1. Erect formwork plumb and level; double walls; adequately brace, shore and support; set so finished concrete surfaces will drain.
   2. Footings and Foundation Walls: Form both sides; secure to stakes.

F. Form Coatings and Release Agents: Apply per manufacturer's recommendations to evenly coat contact surfaces.

3.04 EMBEDDED ITEMS

A. General:
   1. Install per Title 24, Section 1906A.
   2. Place accurately; anchor securely to prevent displacement.
   3. No wood to be permanently embedded in concrete, except where indicated.
   4. Coordinate, notify, and provide access for other Specifications Sections to set their required work.
   5. Install doweling with epoxy adhesive per manufacturer's recommendations.
   6. Install safety treads and nosing specified in Section 05 50 00 - Metal Fabrications, embedded in wet concrete mix per the

manufacturer's recommendations in the exterior, cast-in-place concrete steps as located on the Drawings.

3.05 CONCRETE PLACEMENT

A. General: Comply with Title 24, Section 1905A.10 which refers to ACI 318, Section 5.10.

B. Notify Architect and the Engineer of Record minimum 48 hours prior to commencement of all concreting operations.

C. Preparation and Inspection Prior to Concrete Placement:
   1. Do not place concrete until:
      a. Footing excavations are clean and dry.
      b. Steel reinforcement is correctly positioned, securely anchored and cleaned.
      c. Forms are cleaned, coated, and ties are tightened.
      d. Embedded items are positioned and anchored.
      e. Construction joints are cleaned and prepared.
      f. Subgrade is prepared and moistened.
      g. Preparations for a pour are completed.
      h. Work has been inspected.
   2. Inspection: Formwork, steel reinforcement, footing excavations and preparation work, as stated above, to be examined by the IOR and/or Architect/Engineer, prior to pouring concrete.

D. Placement (per IBC Section 1905A.10):
   1. Convey concrete from mixer to final position by method which will prevent separation or loss of material and cause minimum handling.
   2. Place concrete continuously between predetermined construction and control joints.
   3. Regulate rate of placement so concrete remains plastic and flows into position.
   4. Do not use partially hardened or contaminated concrete; and do not use concrete which has been remised after initial set.

E. Consolidation:
   1. Use hand rodding, spading and tamping.
   2. Vertically insert and remove hand-held tools.

3. Work concrete thoroughly around reinforcement, embedded items and into all parts of forms.
4. Consolidate to a dense, uniform mass without voids, rock pockets, or entrapped air. Consolidate each layer.
5. Mechanically powered vibrators may be used. Such use shall be limited to vertical consolidation of concrete over 8" thick and all walls. Do not use to move concrete laterally or in any other means that may cause aggregate separation.

F. Slabs, Walks and Flatwork:
1. Lift reinforcement at placement progresses to proper position in slab.
2. Tamp and screed to required lines and levels.
3. Depress coarse aggregate with grille-blade tamper.

3.06 FINISHING

A. Provide concrete formed surfaces to be left exposed with smooth rubbed finish.

B. Interior Flatwork (Floor slabs):
1. Smooth trowel finish surface texture unless otherwise indicated to receive ceramic tile, terrazzo, a concrete topping, or other surfacing which would benefit from the additional bonding of a comparatively rough surface.
2. Grind smooth any irregularities or improper levels in finished work.

3.07 FINISHING WALLS AND VERTICAL CONCRETE SURFACES

A. Scope: Finish walls and vertical concrete surfaces as specified herein, except for school name and office signs. Provide concrete formed surfaces, to be left exposed, with smooth rubbed (sacked) finish.

B. Exposed Concrete At Tops of Forms:
1. Strike concrete smooth and level.
2. Float and/or trowel to texture comparable to formed surfaces.

C. Preparation, Formed Surfaces:
1. Remove fins and irregularities while concrete is green.
2. Tie Holes: Fill full and flush with compacted drypack.
3. Surface Defects:

a. Cut out blemished and defective areas as directed by Architect.
b. Patch flush with drypack, typically, or as directed by Architect.

D. Cleaning:
1. Exposed Surfaces:
a. Remove form coatings, bond breakers and other surface coatings.
b. Scrub formed surfaces with solution of 1-1/2 lbs. caustic soda to one-gallon water.
c. Scrub smooth wood or waste mold areas with 20% muriatic or hydrochloric acid solution.
d. Wash surfaces clean with clear water, immediately after scrubbing.
e. If above methods fail to remove all substances, lightly sandblast surfaces clean as directed by Architect.
2. Surfaces With Finish Materials Applied Directly to Concrete: Clean as stated for Exposed Surfaces, except where uncleaned surface will not affect application, bond, performance, or appearance of finish materials.

E. Sacked Finish on Exposed Concrete:
1. General: Schedule work to complete entire panel, element, or area in one continuous operation.
2. Application:
a. Wet surface to control suction of water from grout.
b. Apply grout mix; uniformly spread and scour to fill depressions.
c. While still plastic, sponge rubber float finish surface, and remove excess grout.
3. Sacking: Allow surface to dry, but not completely harden. Then rub vigorously with clean dry burlap to remove loose excess material. Finished surface to have a smooth slick burnished finish (similar to a steel trowel finish) which is free of defects and blemishes.

3.08 PROTECTION AND CURING OF CONCRETE

A. Protection: Protect work from damage and defacement during construction operations.

B. Curing:
1. Keep concrete surfaces wet until curing medium is applied.
2. Flatwork:

a. Spray apply specified liquid curing compounds to exterior flatwork (slabs, walks, and similar work).
b. Application: Apply uniform, continuous, tightly adhered film, free from pinholes or defects at rate of 1 gallon per 250 sq. ft. Brush out puddles and runs.

3. The length of time, temperature and moisture conditions for curing concrete shall be in accordance with Section 1905A.11 which refers to ACI 318 Section 5.11.

3.09 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 45 00, Quality Control and Testing Services.

B. Inspections:
1. Steel reinforcement.
2. Structural concrete.

C. Tests:
1. Concrete slump.
2. Making concrete compression test cylinders.
3. Core tests of defective work.

3.10 ADJUSTMENT AND CLEANING

A. Correction of Defective Work:
1. Work not conforming to Contract requirements shall be removed and replaced except where patching or other remedial work is specifically permitted by Architect. Contractor shall bear costs of correction of defective work.
a. Surface patching materials and methods shall be as approved by Architect.
b. Structural concrete replacement, strengthening, and repair methods and materials shall be as approved by Architect/Engineer.

B. Clean exposed joint surfaces to receive joint sealant per Section 07 92 00.

C. Clean exposed surfaces prior to acceptance.

3.11 CONSTRUCTION JOINTS

A. Comply with Section 1906A.4, IBC, latest edition.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

B. Sections 09 90 00 - Painting and Paint Materials List.

1.02 DESCRIPTION OF WORK

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice for Steel Buildings and Bridges", Section 2.1, embedded steel parts in poured concrete required for the attachment of structural steel and as otherwise shown on drawings.

C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

D. Refer to Structural Drawings.

1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:
   1. IBC I series 2015 Edition.
   2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
   3. AISC "Specifications for Structural Joints using ASTM A325-10e1 or A490-12 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
   4. AWS D1.1-98, "Structural Welding Code".
   5. ASTM A6/A6M-13a, "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".
   1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
   2. If recertification of welders is required, retesting will be Contractor's responsibility.

1.04 SUBMITTALS

A. Shop Drawings:
   1. Submit shop drawings in accordance with AISC "Code for Standard Practices for Steel Buildings and Bridges" except Section 4.2 as amended as follows:
      a. Where the word "approval" is used, it shall be deleted and replaced with "review for compliance with Contract Documents."
      b. The second sentence of Section 4.2, "The fabricator includes…return of shop drawings" is deleted. See Division 1 of the Specifications for submittal review time requirements.
      c. The second sentence of Section 4.2.1, "The approval constitutes….these shop drawings" is deleted.
   2. Include complete details and schedules for fabrication and assembly of structural steel members procedures and diagrams.
      a. Include details of cuts, connections, camber, holes, and other pertinent data.
      b. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.
   3. Shop drawing shall be prepared under the supervision of a registered professional structural engineer with a currant Oklahoma license. All shop drawings shall be signed by engineer.

B. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

C. Testing and Inspection:
   1. Testing and inspection of Structural Steel shall be in accordance with IBC I series 2015 edition section 1705.2.1
   2. Testing and inspection of welding shall be in accordance with IBC I series 2015 edition section 1704.2 per table 1704.2.

3. Costs of tests to be paid by Owner. Owner pays for tests of unidentifiable materials and for re-tests of disapproved materials or workmanship, with costs back-charged to Contractor.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time not to delay work.

C. Store materials to permit easy access for inspection and identification.

D. Keep steel members off ground, using pallets, platforms, or other supports.

E. Protect steel members and packaged materials from erosion and deterioration.

F. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Structural Steel: All structural steel is to contain the minimum recycled content:
   1. Basic Oxygen Furnace (BOF) provided steel; 16% total recycled content with 16% post consumer recycled content.
   2. Electric ARC Furnace (EAF) provided steel; 67% total recycled content with 76% post consumer recycled content.

B. Metal Surfaces, General: Structural steel that will be exposed to view shall be fabricated and erected in accordance to Section 10 "Architecturally Exposed Structural Steel" of the AISC Code of Standard Practice for Steel Buildings and Bridges. For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by

welding and grinding, prior to cleaning, treating and application of surface finishes.

C. Structural Steel Shapes, Plates and Bars: ASTM A36/A36M-12.
D. Structural Steel Miscellaneous Angles, Plates, and Bars: ASTM A36/A36M-12.

E. Cold-Formed Steel Tubing: ASTM A500/A500M-13, Grade B. (46 ksi)

F. Anchor Bolts: ASTM A307-12, Grade A headed type unless otherwise indicated, or threaded ASTM A36/A36M-12 rods as detailed. Use A490 anchor bolts where shown on the Drawings.

G. Unfinished Threaded Fasteners: ASTM A307-12 Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.

H. High-Strength Threaded Fasteners: Heavy hexagonal structural bolts, heavy hexagon nuts, and hardened washers, ASTM A325-10e1.

I. Welded Headed Studs:
1. Material: Automatic end welded studs shall be Nelson Granular Flux-filled Shear Connector or Anchor Studs (or approved equal).
2. Studs shall be manufactured of Grade C-1010 through C-1020 cold rolled steel which conforms to ASTM A108-13.
3. Installation: The studs shall be automatically end-welded in accordance with the manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and the plate. There should be no porosity or evidence of lack of fusion between the welded end of the stud and the plate. The stud shall decrease in length during welding approximately 1/8" for 5/8" and under, and 3/16" for over 5/8" diameter. Only qualified welders approved by the welding inspector shall do welding.
4. Inspection and Tests: Inspection of all the shop and field welding operations for the automatic end-welded studs shall be made by a qualified welding inspector. The type and capacity of the welding equipment shall be in accordance with the manufacturer's recommendations and shall be checked and approved by a welding inspector.
5. At the beginning of each day's work, a minimum of two test stud welds shall be made with the equipment to be used to metal which is the same as the actual work piece. The test studs shall be

subjected to a 90° bend test by striking them with a heavy hammer. After the above test, the weld section shall not exhibit any tearing out or cracking.

J. Electrodes for Welding: Comply with AWS Code, Class E70, low hydrogen.

K. Structural-Steel Primer Paint: Use only primers that are listed and acceptable to Underwriters' Laboratories. Refer to Sections 09 90 00 and 09 90 00.1.

L. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621. Subject to compliance with requirements, provide one of the following:
1. Euco N.S.; Euclid Chemical Co.
2. Crystex; L&M Construction Chemicals.
3. Masterflow 713; Master Builders.
4. Five Star Grout; U.S. Grout Corp.
5. Upcon; Upco Chem. Div., USM Corp.
6. Propak; Protex Industries, Inc.

2.02 FABRICATION

A. Shop Fabrication and Assembly:
1. Fabricate and assemble structural assemblies in shop to greatest extent possible.
2. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
3. Provide camber in structural members where indicated. Refer to Drawings for cambering of beams and trusses.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

D. Connections:
   1. Weld or bolt shop connections, as indicated.
   2. Bolt field connections, except where welded connections or other connections are indicated.

E. Provide high-strength threaded fasteners where indicated, and unfinished bolts elsewhere.

F. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

G. Steel Wall Framing: Select members which are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square and true members in completed wall framing.

H. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.

I. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.

J. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
   1. SP-2 "Hand Tool Cleaning".
   2. SP-3 "Power Tool Cleaning".

C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils. Use painting

methods which result in full coverage of joints, corners, edges and exposed surfaces.

PART 3 - EXECUTION

3.01 ERECTION

A. Surveys: Employ a registered professional engineer or land surveyor for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Owner. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Owner / Structural Engineer.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guide lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Anchor Bolts:
   1. Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
   2. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations.
   3. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete.
   4. Refer to Division 4 of these Specifications for anchor bolt installation requirements in masonry.

E. Setting Bases and Bearing Plates:
   1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces.

2. Clean bottom surface of base and bearing plates.
3. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
4. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
5. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
6. For proprietary grout materials, comply with manufacturer's instructions.

F. Field Assembly:
1. Set structural frames accurately to lines and elevations indicated.
2. Align and adjust various members forming a part of complete frame or structure before permanently fastening.
3. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.
4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
5. Level and plumb individual members of structure within specified AISC tolerances.
6. Splice members only where indicated and accepted on shop drawings.

G. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

H. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

I. Do not enlarge holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Gas Cutting: Do not use gas-cutting torches in field for correcting fabrication errors in primary structural framing.

K. Touch-Up Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint.
2. Apply paint to exposed areas using same material as used for shop painting.
3. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

3.02 QUALITY CONTROL

A. Owner will engage an independent testing and inspection agency to inspect welded connections and to perform tests and prepare test reports.

B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations there from.

C. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

D. Testing agency will inspect structural steel at plant before shipment; however, Owner reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

E. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements.

F. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Principal Work Items Are: Provide light gauge metal framing, metal studs, joist, furring, blocking and/or back-up, and accessories as indicated on the Drawings and specified herein.

B. Related Work Specified Elsewhere:
   1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
   2. Cast-in Place Concrete: Section 03 30 00.
   3. Structural Steel: Section 05 12 00.

1.02 STANDARDS

A. ASTM A90/A90M-13 - Test method for weight of coating on zinc-coated (galvanized) or steel articles.

B. ASTM A653/A653M-11 - Steel Sheet, zinc-coated (galvanized) by hot-dip process, physical, (structural) quality.

C. ASTM A1011/A1011M-13 - Hot rolled Steel Sheet and Strip. Structural quality.

D. ASTM A1008/A1008M-13 - Steel, cold-rolled sheet, carbon, structural.

E. ASTM C1002-10 - Steel drill screws for application of gypsum board to light gauge steel studs.

F. AWCI (Association of Wall and Ceiling Industries) - Specifications Guide for Cold Formed Steel Structural Members.

G. AWS D1.1 - Structural Welding Code.

H. AWS D1.3 - Structural Welding Code - Sheet Steel.

I. SSMA - Street Stud Manufactures Association.

1.03 QUALITY ASSURANCE

A. Steel shall be designed, fabricated and erected in accordance with the latest edition, and/or amended to date, of the following:
   1. Specifications for the Design Fabrication and Erection of Structural Steel for buildings by American Institute of Steel Construction.
   2. Specifications for the Design and Cold-Formed Steel Structural Members, of the American Iron and Steel Institute.
   3. Recommended Practices for Resistance Welding of the American Welding Society.
   4. Qualification of Welders:
      a. All welding Work to be done by qualified welders.
      b. Welding Inspector shall check welders' qualifications and ability to perform satisfactory Work.
      c. Procedure: Per "Qualification Procedure" of American Welding Society.
   5. IBC 2015 Edition, Section 2210A.

1.04 SUBMITTALS

A. Submit five copies of Shop Drawings and manufacturer's product data.

B. Indicate on Shop Drawings, component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners and accessories or items required of other related work.

C. Provide component framing; layout.

D. Describe method for securing component to component framing connections.

E. Provide product data on standard framing members. Describe materials and finish, product criteria and limitations.

F. Submit manufacturer's installation instructions.

1.05 DELIVERY, STORAGE AND HANDLING

Do not bend framing metal. Store off ground with one end elevated for drainage. Cover stack with waterproof material.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal studs shall be of the size indicated on the Drawings and the material listed below and as required on metal stud manufacture published literature per span lengths and sizes.
   1. Metal studs for ceiling drops and miscellaneous light interior framing: 20 gauge galvanized sheet metal per ASTM/C955-10.
   2. 18 gauge or 16 gauge metal studs: Galvanized metal per ASTM C955-10, Grade D, 33ksi minimum yield. Note: All exterior metal studs shall be a minimum of 16 gauge or thicker as indicated on drawings.

B. Metal Joists: Size and gauge indicated on Drawings; galvanized metal per ASTM C955-10, Grade D, 50 ksi minimum yield, 50ksi for 14 and 16 gauge.

C. Metal Track: Gauge and size corresponding to studs except 2" deep leg top runners for partitions extending to structure; galvanized metal per ASTM C955-10, Grade A, 33 ksi minimum yield. 50 ksi for 14 and 16 gauge.

D. Furring channels: Nominal 1-1/2" and 7/8" deep "hat" section channels, fabrication from 25 gauge galvanized metal, per ASTM C955-11c, and other furring as indicated on the Drawing.

E. Resilient channels: Nominal 1/2" deep hat section fabricated from 25 gauge galvanized metal per ASTM C955-11c.

F. Fasteners: Self-drilling, self-tapping fasteners as approved by stud manufacturer for type of connection to be executed. Screws shall be used typically at interior metal stud framing unless noted otherwise as welded.

G. Welding shall be used exclusively for connections involving 18 gauge or heavier materials unless noted otherwise on Drawings. Welding rod and amperages used shall be selected based on thickness of metals involved. Welding operations that visually decrease the section of framing members shall require welded reinforcement of the member. Only qualified welders shall be used. Refer to 1.03, Quality Assurance.

H. Miscellaneous Materials:

1. 3/4" and 1-1/2" furring channels cold-rolled from 16 gauge sheet metal.
2. Pre-formed wire clips or tie wire, as approved by furring manufacturer, for attachment of "hat channels" to supporting grid, assembly of 3/4" and 1-1/2" CR channel suspension grid and similar connections.

I. Finish shall be G60 galvanized coating class.

J. Heavy-duty purlins shall be 16 gauge galvanized as manufactured by Dale Industries or equal.

2.02 TOUCH-UP PAINT FOR GALVANIZING
Primer: FS TT-P-645A, Touch up for galvanized surfaces.

2.03 WELDING MATERIALS AND EQUIPMENT

A. General: Section 2204A and 2210A, IBC 2015 Edition.

B. Arc Welding Electrodes: American Welding Society specifications, Iron and Steel are welding electrodes; match to metal being welded.

C. Equipment: Acceptable to Welding Inspector, and Architect/Engineer. Welding generators to be recognized brand, with adequate regulation of current and voltage.

D. Fabrication:
1. Light gauge metal framing shall be fabricated in accordance with the manufacturer's recommendations, minimum 18 gauge.
2. Studs shall be cut squarely to bear evenly on runners or track. Studs splices shall not be permitted.
3. At 18 and 20 gauge or lighter framing, horizontal or diagonal bracing members shall be attached to vertical members by:
   a. Screws anchoring framing and bracing members back-to-back, back-to-flange or flange-to-flange.
   b. Short sections or runner, used as splice plate or clip angle, securely screwed to connection members. Cut flanges and bend runner to match angle formed by intersecting framing.

c. Members: Re-working ends of horizontal or diagonal members to permit screwed connection to vertical member as described above for short section of runner.

4. At 16 gauge or heavier, framing components shall be cut squarely against abutting members. All welds shall be fillet, plug, butt or seam.

2.04 ACCEPTABLE MANUFACTURER

A. Any member of the Metal Stud Manufacturer's Association (SSMA).

B. Dietrich Industries, Inc.; Pittsburgh, PA; 412-281-2805.

C. The Steel Network, Inc., Bakersfield, CA; 661-831-4300

D. Cemco, City of Industry, CA; 800-775-2363.

PART 3 - EXECUTION

3.01 ERECTION

A. Lay out framing as indicated on the Drawings and anchor to structure. Locate fasteners approximately 2" from the end of each section of runner and at 24" o.c. maximum spacing along length of member.

B. Metal framing at exterior walls and fascias, shall be anchored to structure as required to withstand wind load per 2013 CBSC, but not less than 15 psf.

C. Install stud framing at 16" o.c. unless otherwise indicated. Studs shall be seated squarely in the track with the stud web and flanges abutting the track web, plumbed or aligned and securely attached to both flanges of both the upper and lower tracks.
1. Framing subjected to wind load only:
   a. Up to 10'-0" in length or height: One row of bridging at mid-height.
   b. Over 10'-0" in length or height: Bridging rows spaced at 5'-0" o.c. minimum.
2. Framing Subjected to Axial Load:
   a. Up to 10'-0" in length or height: Two rows equally spaced.

b. Over 10'-0" in length or height: Bridging rows spaced at 4'-3" o.c. maximum.

D. Provide cross members as required for attachment of panels at horizontal joints.

E. Frame around all penetrations through plywood panels when penetrations are larger than 6" in least dimension.

F. Furring installed on irregular surfaces shall be shimmed as required to maintain a true plane for gypsum drywall or other finish material.

G. Double stud openings for doors and borrowed lights according to stud manufacturer's recommendations for wide and/or heavy doors with 20 gauge minimum. Double studs shall be screwed or welded, as applicable, together at 24" on center. Double studs at fire rated door jambs and doors exceeding 36" wide shall be 20 gauge.

H. Provide additional stud at each gypsum board or cement plaster control joint, expansion joint, or seismic joint, with doubled Type X gypsum board insulation per USG System Folder SA-923, at all fire-rated partitions.

I. Provide horizontal blocking members as required for attachment of gypsum drywall at all horizontal joints between boards.

J. Provide a minimum of three 16 gauge studs at 16" o.c. and 8" x 16 gauge unpunched track backing at all walls to receive cabinets, shelves, and handrails. Cut backing plate track legs to fit flush at studs. Refer to structural drawings for typical cabinet backing.

K. Provide framing for all recessed item such as, but not limited to, fire extinguisher cabinets, restroom accessories, electrical devices, plumbing devices, and access doors or hatches.

L. Provide 8" - 20 gauge metal studs at all restroom walls not indicated to receive double chase walls. Refer to wall type in drawings.

M. Connections: Provide all clips, brackets, plates, bars, tracks, bridging, channels, load-resistant angles and any other connections as may be required by the Architect and/or Structural Engineer.

3.02 ADJUSTMENT AND CLEANING

A. Touch-up paint of galvanized work.

B. Contractor to bear all cost.

C. Methods used shall be approved by Architect/Engineer, prior to starting any correction Work.

D. Members which are bent, twisted, out-of-line, or damaged shall be replaced, or may be straightened and/or repaired when specifically approved by Architect/Engineer.

END OF SECTION

PART 1 – GENERAL

This guide specification discusses the application of GacoWallFoam 183M, a 2 pound, closed cell spray polyurethane foam for use as a building envelope insulation and Air Barrier system. GacoWallFoam 183M is also used for insulating buildings. This guide specification is intended as a starting point for professionals to develop more complete specifications. Each project should be assessed on an individual basis.

1.01 SCOPE OF WORK

Furnish all labor, materials, tools and equipment necessary for the application of Gaco Western's polyurethane foam. This includes accessory items subject to the general provisions of the contract.

1.02 RELATED SECTIONS

A. Unit Masonry Division 6 Section 042000
B. Metal Decking Division 5 Section 053100
C. Rough Carpentry Division 6 Section 061000
D. Thermal Insulation, Other Division 7 Section 072100
E. Foamed-In-Place Division 7 Section 072119
F. Waterproofing Division 7 Section 071400
G. Weather Barriers Division 7 Section 072500
H. Fireproofing Division 7 Section 078100
I. Metal Support System Division 9 Section 09110
J. Gypsum Board Division 9 Section 09250

1.03 References

1. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials. (Also known as, NFPA 255, and UL 723)
3. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
4. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through
5. Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
6. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.
7. ASTM D1622 - Standard Test Method for Apparent Density of Rigid Cellular Plastics.
8. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging

9. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials
10. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
11. NFPA 259 - Standard Test Method for Potential Heat of Building Materials

Product Data: Submit 4 copies of manufacturer's technical information brochure with thermal efficiency tables, recycled content and Greenguard Certifications per 1.03 Quality Assurance.

12. NFPA 285 - STANDARD FIRE TEST METHOD FOR EVALUATION OF FIRE PROPAGATION CHARACTERISTICS OF EXTERIOR NON-LOAD-BEARING WALL ASSEMBLIES CONTAINING COMBUSTIBLE COMPONENTS
13. NFPA 286 - Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Wall and Ceiling Interior Finish.
14. IRR-1002 – Intertek Research Report 1002, Gaco Western, Gaco WallFoam 183M Spray Applied Polyurethane Foam Insulation.

1.04 PERFORMANCE REQUIREMENTS

A. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/m2 @ 75 Pa.) when tested according to ASTM E 2178.
B. System Performance. Substantiate that air barrier material used as/in a system, will have an air permeance not to exceed 0.2 L/m2 @75 Pa. when tested according to ASTM E 2357.
C. Connections to Adjacent Materials: Provide connections to prevent air leakage migration at the following locations:

1. Foundation and walls, including penetrations, ties and anchors.
2. Walls, windows, curtain walls, storefronts, louvers or doors.
3. Different wall assemblies, and fixed openings within those assemblies.
4. Wall and roof connections.
5. Floors over unconditioned space.
6. Walls, floor and roof across construction, control and expansion joints.
7. Walls, floors and roof to utility, pipe and duct penetrations.
8. Seismic and expansion joints.
9. All other leakage pathways in the building envelope.

1.05 QUALITY ASSURANCE

All work is to be performed by applicators skilled in the application of Gaco Western polyurethane foam systems. Applicators shall have completed 5 similar projects over the last 5 years and shall provide a list of these projects to the owner or owner's representative upon request.

1.05 SUBMITTALS

1.1 A. SUBMITTALS

A. Submittals: Submit in accordance with Division 1 requirements.

B. Quality Assurance Program: Submit evidence of current Contractor accreditation and Installer certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program (QAP). Submit accreditation number of the Contractor and certification number(s) of the ABAA Certified Installer(s).

C. Product Data: Submit material Manufacturer's Product Data, material manufacturer's instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, Technical Data, and tested physical and performance properties.

1. Submit letter from primary air barrier material manufacturer indicating approval of materials that are proposed to be used that are not currently listed in the accessories section of this specification for that manufacturer's material.

2. Include statement from the primary air barrier material manufacturer that the materials used in their air barrier assembly which will be used to adhere to the underlying substrate are chemically compatible to the substrate material.

3. Samples: Submit clearly labeled samples, three (3) inch by four (4) inch [75 mm by 100 mm] minimum size of each material specified. G2.01

D. Shop Drawings of Mock-Up: Submit Shop Drawings of proposed mock-ups showing plans, elevations, largescale details, and air barrier transitions and terminations.

E. Field Test Results of Mock-Up: Submit test results of air leakage test and water leakage test of mock-up in accordance with specified standards, including retesting if initial results are not satisfactory.

F. Shop Drawings: Submit Shop Drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated, how materials that cover the materials are secured with air-tight condition maintained, and how miscellaneous penetrations such as conduits, pipes, electric boxes and similar items are sealed.

1. Include VOC content of each material, and applicable legal limit in the jurisdiction of the project.

2. Include statement that materials are compatible with adjacent materials proposed for use.

3. Include required values for field adhesion test on each substrate in accordance with ASTM D4541 (modified), using a type II pull tester.

G. Compatibility: Submit letter from primary material manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials proposed for use. Submit letter from material manufacturer stating that cleaning materials used during installation are chemically compatible with adjacent materials proposed for use.

H. Air Barrier Subcontractor Qualifications: Air barrier Subcontractor(s) shall be accredited at the time of bidding and during the complete installation period by the Air Barrier Association of America (ABAA) whose Installer(s) are certified in accordance with the site Quality Assurance Program used by ABAA.

1. Closed cell, medium density sprayed polyurethane foam air barrier Installer(s) shall be certified by BPQI (Building Performance Quality Institute) for the ABAA Quality Assurance Program in accordance with the requirements outlined in the QAP program used by ABAA. Installers shall have their photo-identification air barrier certification cards in their possession and available on the project site, for inspection upon request.

I. Manufacturer: Obtain primary ABAA Evaluated Materials from a single ABAA Evaluated Manufacturer regularly engaged in manufacturing specified closed cell, medium density spray polyurethane foam. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

J. Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).

K. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.

L. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, air barrier materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction and chemical/fire safety plans. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

M. Field Quality Assurance: Implement the site Quality Assurance Program requirements used by ABAA. Cooperate with ABAA Auditors and any independent testing and inspection agencies engaged by the Owner. Do not cover the air barrier assembly until it has been inspected, tested and accepted.

N. Mock-Ups: Build mock-up representative of primary air barrier assemblies and glazing assemblies including backup wall and typical penetrations as acceptable to the Architect.

Mock-up shall be dimensioned no less than eight (8) feet long by eight (8) feet high [2.50 meters long by 2.50 meters high] and include the air barrier materials and air barrier accessories proposed for use in the exterior wall assembly. Mock-ups shall be suitable for testing as specified in the following paragraph. GacoWallFoam 183M Page 4 Made in the USA • gaco.com • 800.331.0196 SPEC NOTE: COORDINATE TESTING WITH PROJECT REQUIREMENTS. DELETE PARAGRAPH BELOW IF NOT REQUIRED, OR IF OWNER'S INDEPENDENT TESTING AGENT WILL PERFORM TESTING.

O. Mock-Up Tests for Air and Water Infiltration: The third party testing agency shall test the mock-up for air and water infiltration in accordance with ASTM E1186 (air leakage location), ASTM E783 (air leakage quantification) at a pressure differential of 1.57 lb/ft² (75 Pa) and ASTM E1105 (water penetration). Use smoke tracer to locate sources of air leakage. If deficiencies are found, the air barrier Contractor shall reconstruct mock-up at their cost for retesting until satisfactory results are obtained. Deficiencies include air leakage beyond values specified, uncontrolled water leakage, unsatisfactory workmanship.

1. Perform the air leakage test and water penetration test of mock-up prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements.

P. Mock-Up Tests for Spray Polyurethane Foam Adhesion: The third party testing agency shall test the mock-up for spray polyurethane foam adhesion in accordance with ASTM D4541 (modified) using a type II pull tester except that the spray polyurethane foam shall be cut through to separate the material attached to the disc from the surrounding material. Perform test after curing period recommended by the material manufacturer. Record mode of failure and area where the material failed in accordance with ASTM D4541. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the material manufacturer has not declared a minimum adhesion value for their product/substrate combination, the value shall simply be recorded.

Q. Air Barrier Assembly Testing: Verify air barrier assembly testing by the material Manufacturer by visiting the ABAA website to ensure a ASTM E2357 test has been completed and to obtain results. Visit the ABAA website for the reported air barrier assembly leakage rate and illustrations or CAD details which includes the methods in which the assembly test mock-ups shall be assembled.

1.07 MATERIALS, DELIVERY AND STORAGE

A. Materials shall be delivered in the manufacturers original, tightly sealed containers or unopened packages clearly labeled with the manufacturer's name, product identification, safety information, approvals, and lot numbers where applicable.

B. Containers shall be stored out of the weather and away from direct sunlight in a cool dry place at temperatures between 50 and 70 degrees F within the limits specified by the materials manufacturer.

C. All materials shall be stored in compliance with local fire and safety codes.

1.08 ENVIRONMENTAL CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Do not install spray polyurethane foam before the roof assembly has been sufficiently installed to prevent an accumulation of water in the interior of the building.

B. Do not apply the polyurethane foam when substrate or ambient air temperatures are below 40 degrees F (4.4 degrees C)

C. Or above 120 degrees F (49 degrees C) and relative humidity is greater than 85 percent unless advance means and methods are recommended by the manufacturer.

D. Do not apply polyurethane foam when wind velocity exceeds 15 miles per hour unless advance means and methods are recommended by the manufacturer. Use precautions to prevent damage to adjacent areas from fugitive overspray. GacoWallFoam 183M Page 5 Made in the USA • gaco.com • 800.331.0196

1.09 SEQUENCE OF SCHEDULING

In new construction projects, Gaco Western sprayed in place insulation system is installed when the primary structure of the walls and roof are in place to prevent the accumulation of water in the interior of the building and in coordination with other building trades.

1.10 SAFETY REQUIREMENTS

1. All non-essential personnel are restricted from access to the area where the Gaco Western Sprayed in place Insulation is applied.
2. Fire extinguishers shall be provided in the spray foam equipment area and the area where the spraying is being performed.
3. Review MSDS's with spray foam personnel and be familiar with chemicals and their hazards.
4. Post warning signs at all work area entrances to restrict entry by unauthorized personnel.
5. There shall be no welding or open flame within 100 feet of sprayer.
6. Attention should be paid to ground equipment to prevent sparking.
7. Seal off work area from adjacent rooms and ventilation ducts.
8. Restrict access of non-application personnel including other trades using caution tape.

9. All personnel involved with spraying shall wash hands thoroughly before eating or drinking.
10. Do not eat, drink, or smoke in work area.
11. Use engineering controls to ventilate the area if possible.
12. Wear Personal Protective Equipment (PPE) for breathing, body, exposed skin and eye protection during application.
13. Ventilation shall be provided in confined areas as needed for 24 hours minimum after the spraying has been completed.
14. Contact Gaco Western for guidance on ventilation time and re-occupancy for the formulation you are using.
15. Be aware of general safety regulations and recommendations when working around Electric, Hydraulic, Pneumatic and combustion equipment such as portable generators.
16. Apply Thermal Barriers and Vapor Retarders (if required) in accordance with local building code requirements.

PART 2 – PRODUCTS

2.01 Spray Polyurethane Manufacturer

A. Acceptable Manufacturer: Gaco Western LLC, which is located 1245 Chapman Drive, Waukesha WI, 53186
B. Substitution not permitted without approval
C. Requests for substitutions will be considered in accordance with provisions of section 016000.

2.02 POLYURETHANE FOAM

A. The GacoWallFoam 183M sprayed in place insulation shall be a two component system made by combining an isocyanate (A) component with a polyol (B) component and shall possess the following typical physical properties:
B. GacoWallFoam 183M Physical Properties
a. Material Air Permeance: @ 1inch thickness (ASTM E283) 0.000 cfm/ft2 @ 1.57 psf. (0.000 L/sec/sq·m2 @ 75Pa)
b. Material Air Permeance: 1 inch (25mm) (ASTM E2178) 0.0003 cfm/ft2 @ 1.57 psf (0.0013 L/(s·m2) @ 75 Pa)]
c. Water Vapor Premeance: (ASTM E96) Desiccant Method @ 2 inches (50 mm) 0.628 US perms (35.6 ng/(Pa·s·m2) Water Method @ 2 inches (50 mm) 1.1 US perms (63 ng/(Pa·s·m2)
d. Nominal Density: Sprayed-in-Place (ASTM D1622): 2.0±10% lbs/ft3
e. Compressive Strength: Parallel to Rise (ASTM D1621): 32.0 psi
f. Closed Cell Content (ASTM D2856): 97.8%

g. Aged R Value (ASTM C518), tested at 75°F (23.9°C): R at 1 Inch: 6.4 R at 3.5 Inches: 23.3

C. Fire Performance Testing

a. Surface Burning Characteristics (ASTM E84): Flame Spread Index 10 Smoke Developed Index 400
b. Report potential heat value per NFPA 259
c. Report testing and approved assemblies per NFPA 285
d. Report alternative thermal barrier performance per NFPA 286 – as applicable
e. Report ignition barrier performance in accordance with ICC-ES AC377, Appendix X – as applicable

D. Indoor Air Quality:
GREENGUARD Gold Certified (29167-410, 29167-420) This program demands strict certification criteria and considers safety factors to account for sensitive individuals (such as children and the elderly), and ensures that a product is acceptable for use in environments such as schools and healthcare facilities.

E. Fire Safety Requirements: See API Bulletin AX-119, "MDI - Based Polyurethane Foam Systems: "Guidelines for Safe Handling and Disposal."

F. Code Compliance: See Intertek Research Report IRR 1002 and consult with authority having jurisdiction.

2.03 RELATED PRODUCTS

A. Single Component Polyurethane Foam Sealants and caulks for use around windows, doors, etc. shall be as approved by Gaco Western. Transitional membranes in solid and liquid form shall be approved by Gaco Western.
B. ACCESSORY MATERIALS
a. Membrane at Transitions in Substrate and Connections to Adjacent Elements: One of the following as acceptable to the Spray Polyurethane Foam Air Barrier Manufacturer: Air Shield by W. R. Meadows, Inc. Blueskin SA by Henry. CCW-705 TWF by Carlisle Coatings and Waterproofing. ExoAir 110 by Tremco, Inc. Perm-A-Barrier Flashing by Grace Construction Products. Poly Wall Self Adhering Flashing by Polyguard Products, Inc.
b. Transition Membrane between Air Barrier Material, Roofing and Other Adjacent Materials: Comply with both air barrier material manufacturer's instructions and other material manufacturer's instructions.
c. Counter-flashing for Masonry Through-Wall Flashing: One of the following and as acceptable to the Spray Polyurethane Foam Air Barrier Material Manufacturer: Blueskin TWF by Henry. CCW-705 TWF by Carlisle Coatings and

Waterproofing. Detail Strip by W. R. Meadows, Inc. ExoAir TWF by Tremco, Inc. Perm-A-Barrier Flashing by Grace Construction Products. Poly Wall Self Adhering Flashing by Polyguard Products, Inc.

d. Primers, GacoFlex E5320 when required on various substrates to be coated with spray polyurethane foam.

e. Substrate Joint Treatment Materials: Prepare the substrate joints with the following materials: Air Shield by W. R. Meadows, Inc. Blueskin SA by Henry. CCW-705 TWF by Carlisle Coatings and Waterproofing. ExoAir 110 by Tremco, Inc. Perm-A-Barrier Flashing by Grace Construction Products. Poly Wall Self Adhering Flashing by Polyguard Products, Inc.

f. DC315 intumescent water based coating manufactured by Paint to Protect

PART 3 – EXECUTION

3.01 APPLICATION OF PRODUCTS

The products intended for use in the building envelope insulation system must be applied within the manufacturer's guidelines for temperature, humidity and other atmospheric conditions. In addition, they must be sequenced so as to take into consideration substrate preparation, proper cure times and inter-pass adhesion. GacoWallFoam 183M Page 8 Made in the USA • gaco.com • 800.331.0196

3.02 Examination

The spray foam contractor shall examine substrates, areas, and conditions under which the air barrier assembly will be installed, with General Contractor, for compliance with the following requirements.

A. Confirm site access logistics and scheduling requirements, including but not limited to use of scaffolding, lifts and staging.

B. At the end of each working day the General Contractor shall provide weather protection at the top of parapet walls and non finished roofs to prevent moisture migration into walls and damage to installed air barrier systems.

C. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

D. Ensure that the following conditions are met:

a. Surfaces are sound, dry, even, and free of excess mortar or other contaminants.

b. Inspect substrates to be smooth without large voids or sharp protrusions. Inform General Contractor if substrates are not acceptable and need to be repaired by the concrete sub-trade.

c. Inspect masonry joints to be reasonably flush and completely filled, and ensure all excess mortar sitting on masonry ties has been removed. Inform General Contractor if masonry joints are not acceptable and need to be repaired by the mason sub-trade.Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263 and take suitable measures until substrate passes moisture test.

E. Verify sealants are compatible with the proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.

F. Notify Architect in writing of anticipated problems using closed cell, medium density spray

3.03 SURFACE PREPARATION

A. The spray foam contractor shall ensure the substrate is clean, dust-free, dry and prepared in accordance with the air barrier material manufacturer's written instructions. The General Contractor shall be notified if this is not the case.

a. Ensure that penetrating work by other trades is in place and complete.

b. Prepare surfaces by brushing, scrubbing, scraping, grinding or compressed air to remove loose mortar, dust, oil, grease, oxidation, mill scale, rust and other contaminants which will affect adhesion of the closed cell, medium density spray polyurethane foam.

c. Wipe down metal surfaces to remove release agents or other non-compatible coatings using clean sponges.

d. Prime substrate for installation of sheet membrane transition strips if required by material manufacturer and as follows:

i. Prime masonry, concrete, glass-fiber surfaced gypsum sheathing, wood, metal, structural steel, sheet metal, and painted substrates with primers.

ii. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and protrusions.

e. Protection from Spray Polyurethane Foam:

i. Mask and cover adjacent areas and materials that aren't being sprayed to protect from over-spray.

ii. Ensure any required foam stop or back up material are in place and complete to prevent over spray and achieve complete seal.

iii. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes are removed from the spray location to exterior of the building. Provide for make-up air.

iv. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

B. Substrate preparation for spray polyurethane foam:

1. Wood

a. Wood and wood structural panels shall contain no more than 18% water.
b. Most untreated and unpainted wood surfaces need not be primed. Spray polyurethane foam can be applied directly to the dry wood. Priming may be required in certain cases. Contact Gaco Western for further information.

2. Steel

a. Primed: If the primed metal surface is free of scale, rust or oils it normally does not require priming. Remove loose dirt or contaminants by power washing prior to application of Gaco Western's polyurethane foam. Stainless Steel requires primer. Contact Gaco Western for recommendations.
b. Previously painted: Clean the painted metal surface using hand or power tools to remove loose scale and rust. Grease, oil and other surface contaminants can be cleaned using a power washer.
c. Galvanized: Galvanized metals shall be clean and free of oils. Galvanized metal does not typically require primer. Where required primers shall be as recommended by Gaco Western.

3. Concrete and Masonry:

a. Must be cured, dry, and loose dirt and any other contaminants, including asphaltic materials removed. Where required primers shall be as recommended by Gaco Western.

4. Gypsum and other sheathing.

a. Most sheathing do not require priming; where required, primers shall be as recommended by Gaco Western.

3.04 EQUIPMENT

Equipment shall be capable of maintaining 1400 psi of pressure or higher and maintaining a minimum of 130 degrees at the A, B and Hose heaters. Equipment shall be capable of maintaining 1:1 ratio of A and B components on a continuous basis. Equipment shall be Graco, Gusmer, GlasCraft, PMC or other approved types of pumps and proportioners.

3.05 STORAGE OF MATERIALS

Materials shall be protected from freezing and should be stored in a controlled environment at a temperature of 50° - 70°F. A and B chemical drum temperatures must be 60° - 80°F before and during spraying for the drum to be serviceable (ready to spray).

Material temperatures below 60°F can result in proportioning errors and/or insufficient heat at the spray gun.

3.06 INSTALLATION

A. Transition Strip Installation: Install air barrier accessories and spray polyurethane foam to provide continuity throughout the building envelope. Install materials in accordance with manufacturer's instructions and the following (unless manufacturer requires other procedures in writing based on project conditions or particular requirements of their recommended materials):

a. Apply primer for transition membrane at rate recommended by material manufacturer. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.

b. Position subsequent sheets of membrane applied above so that it overlaps the membrane sheet below by a minimum of 2.0 inches (50 mm), unless greater overlap is recommended by material manufacturer. Roll into place with roller ensuring all transition membranes are free of fish-mouths, wrinkles, delaminations, bubbles and voids.

c. Overlap horizontally adjacent pieces of membrane a minimum of 2.0 inches (50 mm), unless greater overlap is recommended by material manufacturer. Roll all areas of membrane including seams with roller.

d. Seal around all penetrations with termination mastic, extruded silicone sealant, membrane counterflashing or other procedure in accordance with material Manufacturer's recommendations.

e. Connect air barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below grade structures, to windows, curtain wall, storefront, louvers, exterior doors and other intersection conditions and perform sealing of penetrations, using accessory materials and in accordance with the manufacturer's recommendations.

f. To bridge gaps >1/8" (3 mm) in wall construction at changes in substrate plane or changes in adjoining materials, provide transition membranes or other material recommended by spray polyurethane foam material manufacturer.

g. Provide transition membrane, sealant, mastic, membrane counter-flashing or other material recommended by spray polyurethane foam manufacturer at 90 degree inside or outside corners. Follow spray polyurethane foam manufacturer's instructions for instructions on how to treat interlocked CMU or structurally-attached 90 degree cast-in place concrete corners.

h. Provide mechanically fastened non-corrosive metal sheet to span gaps greater than 1.0 inch (25 mm) in substrate plane and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate.

i. At through-wall flashings, provide an additional 6.0 inch (150mm) wide strip of manufacturer's recommended membrane counter-flashing to seal top of through-wall flashing to membrane. Seal exposed top edge of strip with bead of mastic or as recommended by manufacturer.

j. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.

k. At expansion and seismic joints provide transition to the joint assemblies.

l. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer when membrane will be exposed to the elements.

m. At end of each working day, seal top edge of self-adhered membrane to substrate with termination mastic if exposed.

n. Do not allow materials to come in contact with chemically incompatible materials.

o. Do not expose membrane to sunlight longer than as recommended by the manufacturer.

p. Ensure that membranes at terminations have a pull adhesive of 16 psi or greater.

q. Inspect installation prior to enclosing assembly and repair damaged areas with closed cell, medium density spray polyurethane foam as recommended by manufacturer.

B. Installation of Spray Polyurethane Foam: Install materials in accordance with manufacturer's instructions and the following:

1. The Installer(s) and those within the work area shall use proper personal protective equipment (PPE) during the installation of material in accordance with US Government regulation 29 CFR 1910.134.

2. The Installer(s) shall follow all OSHA requirements when working on a job-site.

3. Warning signs shall be displayed on each job site in the spray area warning of health and safety hazards for those personnel who do not comply with the personal protective equipment as required by Federal law.

4. Equipment used to spray polyurethane foam shall comply with the manufacturer's instructions for the specific type of application and type of material being sprayed. Record equipment settings on the Daily Job Site Report.

5. Apply only when surfaces and environmental conditions are within limits instructed by the material manufacturer.

6. Apply in consecutive passes as required by material manufacturer to thickness as indicated on drawings. Passes shall be not less than ½ inch (12 mm) and not greater than 50 mm (2 inches). An additional pass of upto 2.0 inches (50 mm) shall only be done after the first pass has had time to cool down. At no time shall more than 4.0 inches (100 mm) be installed in a single day.

7. Do not install closed cell, medium density spray polyurethane foam within 3.0 inches (75 mm) of heat emitting devices such as light fixtures and chimneys.

8. Finished surface of foam insulation to be free of voids and embedded foreign objects.

9. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

10. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.

11. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.

12. Complete connections to other air barrier components and repair any gaps, holes or other damage using material in a manner approved by primary air barrier material manufacturer.

3.07 FIELD QUALITY CONTROL

A. Owner's Inspection and Testing: Cooperate with Owner's testing agency. Allow access to work areas and staging. Notify Owner's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted.

B. Air Barrier Association of America Installer Audits: Cooperate with ABAA's testing agency. Allow access to work areas and staging. Notify ABAA in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted. Arrange and pay for site audit by ABAA to verify conformance with the material Manufacturer's instructions, the site Quality Assurance Program used by ABAA, and this section of the project specification.

1. Audits and subsequent testing shall be carried out at the following rate:
   a. Up to 10,000 ft2 of air barrier contract requires one (1) audit.
   b. 10,001 – 35,000 ft2 of air barrier contract requires two (2) audits.
   c. 35,001 – 75,000 ft2 of air barrier contract requires three (3) audits.
   d. 75,001 - 125,000 ft2 of air barrier contract requires four (4) audits.
   e. 125,001 – 200,000 ft2 of air barrier contract requires five (5) audits.
   f. 200,001 ft2 and over of air barrier contract requires six (6) audits.

2. Forward written audit reports to the Architect within 10 working days of the audit and test being performed.

3. If the audit reveals any defects, promptly remove and replace defective work at no additional cost to the Owner.

3.08 PROTECTING AND CLEANING

A. Protect air barrier materials from damage during installation and the remainder of the construction period, according to material manufacturer's written instructions.

1. Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the air barrier material manufacturer.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: A firestopping system consisting of mineral wool insulation and a setting type sealing compound for penetrations in fire-rated floors and walls as follows:
   1. Cast-in-place concrete floors.
   2. Cast-in-place concrete walls.
   3. Masonry walls.
   4. Gypsum board partitions.
   5. Shaftwalls.

B. Related Sections:
   1. Cast-in-Place Concrete: Section 03 30 00.
   2. Gypsum Board: Section 09 29 00.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. E2336-04(2013), Test Method for Indentation Hardness of Preformed Thermal Insulations.
   2. C665-12, Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   3. E84-13a, Test Method for Surface Burning Characteristics of Building Materials.
   4. E119-12a, Standard Methods for Fire Tests of Building Construction and Materials. E814-13, Standard Methods for Fire Tests of Through-Penetration Fire Stops.

B. Underwriters' Laboratories, Inc. (UL):
   1. UL 263, Fire Tests of Building Construction and Materials.
   2. UL 723, Surface Burning Characteristics of Building Materials.
   3. ANSI/UL 1479, Fire Tests of Through-Penetration Fire Stops.

C. IBC Chapter 7 - Provisions.

1.03 SYSTEM DESCRIPTION

Performance Requirements: Provide firestopping systems that meet the requirements for an F Rating, for time periods equal to or exceeding the fire resistance ratings of the construction assemblies being penetrated, when tested in accordance with ASTM E814-13 or ANSI/UL 1479.

1.04 SUBMITTALS

A. Product Data: Manufacturer's specifications and installation instructions for each product specified.

B. Shop Drawings: Show materials and installation details for penetrations in each type of construction to be firestopped. Shop Drawings are not required for types of penetrations illustrated in the Product Data.

C. Quality Control Submittals:
   1. Test Reports: Showing that firestopping system has been tested and that it meets the specified Performance Requirements.
   2. Certificates:
      a. Manufacturer's certification that the products provided comply with local regulations controlling the use of volatile organic compounds (VOCs) and are nontoxic. Comply to Air Quality Management District, Adhesive and Sealant, current version.
      b. Contractor's certification that the installer has the specified experience.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Experience in the installation of firestopping that is similar in material, design, and extent to the firestopping indicated for this Project.

B. Mock-Ups:
   1. Install a mock-up of each type of floor and wall penetration fire stop to show materials used and quality of workmanship. Obtain the Architect's approval of mock-up locations.
   2. Do not start firestopping work until mock-ups are approved by the Architect. Remove mock-ups that are not approved and provide additional mock-ups, at the same location, as necessary to obtain approval.
   3. Approved mock-ups may be left in place as part of the Work.

C. Pre-Installation Conference: Prior to beginning of firestopping, hold a meeting at the job site with the firestopping materials manufacturer and installer to review the firestopping requirements. Notify the Owner and the Architect at least 3 days in advance of the meeting.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Shipping: Have materials shipped in manufacturer's original packages showing manufacturer's name and product brand name.

B. Storage and Protection: Store materials inside and protected from damage by the elements.

1.07 PROJECT CONDITIONS

Environmental Requirements: Install firestopping only after the building is enclosed and the permanent heating, ventilating, and air conditioning system is in operation. Maintain the temperature in the building at 50°F or above during installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: National Gypsum Co., Gold Bond Building Products; Gold Bond Sta-Smooth FS 90 Fire-Shield Compound Fire and Smoke Stop.

B. Acceptable Manufacturer: 3M Fire Protection Products.

2.02 MATERIALS

A. Insulation: A combination of mineral fibers manufactured from glass and thermosetting resins, with a min. density of 0.5 pcf, complying with ASTM C 665, Type I (blankets without membrane facing).

B. Sealing Compound: A lightweight, low density, vinyl based, non-asbestos setting compound formulated to mix easily with water (Gold Bond Sta-Smooth FS 90 Fire-Shield Compound Fire and Smoke Stop).

PART 3 - EXECUTION

3.01 INSTALLATION

A. In accordance with the manufacturer's recommendations:
   1. "Gypsum Construction Guide, latest Edition" and "Gold Bond Sta-Smooth FS 90 Fire-Shield Compound Fire and Smoke Stop," 110684 Rev. 1/94; National Gypsum Company.

3.02 PROTECTION

Protect firestopping installations from damage and deterioration until the date of Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant and backing.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements in Addenda, Alternates, General Conditions, and Division 1 collectively, apply to this section.

B. Firestopping: Section 07 84 00.

C. Refer to other sections in this specification for additional application requirements of sealants.

1.03 REFERENCES

A. ASTM C834-10 - Latex Sealing Compounds.

B. ASTM D1056-07 - Flexible Cellular Materials - Sponge or Expanded Rubber.

C. FS TT-S-227 - Sealing Compound: Elastomeric Type, Multi-Component.

D. FS TT-S-230 - Sealing Compound: Elastomeric Type, Single Component.

E. FS TT-S-1543a - Sealing Compound, Silicone Type.

F. FS TT-S1657 - Sealing Compound - Single Component, Butyl Rubber Based.

G. SWI (Sealing and Waterproofers Institute) - Sealant and Caulking Guide Specification.

1.04 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00 in duplicate.

B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color availability and shore hardness.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five (5) years experience.

B. Applicator: Company specializing in applying the work of this section with minimum three (3) years experience.

C. Conform to Sealant and Waterproofers Institute requirements for materials.

D. Shelf Life: Do not use materials whose shelf life has expired.

E. Low Emitting Materials: All products shall meet the VOC content requirements in the applicable category of South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealants, current version.

1.06 FIELD SAMPLES

A. Provide samples under provisions of Section 01 33 00.

B. Construct one field sample illustrating sealant type, color, and tooled surface, maximum 12" long, in each differing sealant application.

C. Do not proceed with remainder of sealant application until approved by the Architect.

D. Approved sample may remain as part of the Work. Disapproved sample shall be removed.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

B. Deliver materials in unopened containers, store in dry area.

1.08 GUARANTEE

A. See Specifications Section 01 77 00 - Project Closeout.

B. Maintain this work in a weather tight condition for a two (2) year period.

PART 2 - PRODUCTS

2.01 SEALANTS

A. Use sealants selected from the following types, as indicated on drawings or as appropriate to the joint being sealed. Refer to Paragraph 3.06 - Schedule for additional approved applications.
   1. Type 1: One-part moisture curing Polyurethane sealant. FS TT-S-230C, Type II, non-sag, Class A DYNATROL 1, manufactured by Pecora Corp., Harleysville, PA. SIKAFLEX-1a, manufactured by Sika Corp., Lyndhurst, NJ or equal.
      a. Movement Capability: 25%.
      b. Shore A Hardness Range: 20 to 40.
   2. Type 2: Multi-part Polyurethane Base. FS TT-S-227E, Type II, non-sag, Class A DYNATROL II, manufactured by Pecora Corp., Harleysville, PA. SIKAFLEX-2c N/A, manufactured by Sika Corp., Lyndhurst, NJ or equal.
      a. Movement Capability: 50%.
      b. Shore A Hardness Range: 20 to 35.
   3. Type 3: One-part moisture curing Polyurethane sealant. FS TT-S-230C, Type I, self-leveling, Class A UREXPAN NR-201, manufactured by Pecora Corp., Harleysville, PA. VULKEM 45, manufactured by MEMCO International Inc., Cleveland, OH or equal.
      a. Movement Capability: 25%.
      b. Shore A Hardness Range: 30 to 35.
   4. Type 4: Multi-part Polyurethane Base. FS TT-S-227, Type I, self-leveling, Class A, DYNATRED or UREXPAN NR-200, manufactured by Pecora Corp., Harleysville, PA. SIKAFLEX-2c S/L, manufactured by Sika Corp., Lyndhurst, NJ or equal.
      a. Movement Capability: 25%.
      b. Shore A Hardness Range: 40 to 45.
   5. Type 5: One-part Silicone Sealant. FS TT-S-1543a, Type S, non-sag, Class A, 860 ACETOXY Silicone Sealant, manufactured by Pecora Corp., Harleysville, PA. SCS 1200, manufactured by General Electric Co., Waterford, NY or equal.

a. Movement Capability: 25%.
b. Shore A Hardness Range: 25 to 30.

6. Type 6: One-part, non-sag, acrylic latex sealing compound, ASTM C834-10, AC-20, manufactured by Pecora Corp., Harleysville, PA. ACRYLIC LATEX No. 834, manufactured by Tremco, Beachwood, OH, or equal.
7. Type 7: One-part, non-sag, butyl rubber base acoustical sealant ASTM C834-10, BA-98, manufactured by Pecora Corp., Harleysville, PA. SHEETROCK ACOUSTICAL SEALANT manufactured by USG, Chicago, IL, or equal.

B. Fire Rated Sealant: Heat absorbing; water-based caulk; paintable.
1. Acceptable Manufacturers and Products:
a. Fire Dam 150 Caulk by 3M Fire Protection Products, Los Angeles, CA.
b. Other Manufacturers: Refer to Section 01 25 13 - Product Options and Substitutions.

C. Colors: Selected by the Architect from manufacturer's standard color range (six colors minimum) to harmonize with colors of adjacent materials.

2.02 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: ASTM D1056-07; round, closed cell polyethylene foam rod; oversized 50% larger than joint width; DENVERFOAM or GREENROD, manufactured by Pecora Corp., Harleysville, PA. SONOFOAM BACKER ROD, manufactured by Sonneborn Building Products, Minneapolis, MN, or equal.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application. Apply to bottom of joints, which are too shallow to receive foam backer rod.

E. Masking Tape: Adhesive paper tape.

F. Miscellaneous: As required per sealant manufacturer's recommendation.

2.03 FIRESTOP SEALANTS
Refer to Section 07 84 00, Firestopping.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

B. Beginning of installation means the installer accepts existing surfaces.

3.02 PREPARATION

A. Clean and prime joint in accordance with manufacturer's instructions.

B. Remove loose materials and foreign matter, which might impair adhesion of sealant. Remove dust with compressed air.

C. Verify that joint backing and release tapes are compatible with sealant.

D. Perform preparation in accordance with manufacturer's recommendations.

E. Protect elements surrounding the work of this Section from damage or disfiguration.

F. Mask adjacent surfaces, as necessary, to prevent staining and damage.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions, using hand-pointing tools, hand operated pressure guns or air operated guns with reciprocal pumps and hoses.

B. Measure joint dimensions and size materials to achieve required width/depth ratios.

C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width. Where sealant is applied to concrete. Concrete is to be fully cured.

D. Install bond breaker where joint backing is not used. Install removable masking material to maintain clean lines and protect adjoining surfaces.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges. Do not install sealant on wet or damp surfaces.
   1. Joint Size, Depth-to-Width Ratio
      a. Depth: 1/4" minimum
      b. Joints 1/2" and Smaller: Depth-to-Width ratio may vary from 1-to-1 to 1-to-2. Ratio may be greater for wide joints when specifically recommended by sealant manufacturer.

F. Install sealant free of air pockets, foreign embedded matter, ridges and sags.

G. Tool joints concave, channel-shaped or as detailed. Use slicking agent type recommended by manufacturer.

H. Completed sealant work to be watertight.

3.04 CLEANING AND REPAIRING

A. Clean adjacent soiled surfaces immediately before sealant cures.

B. Repair or replace defaced or disfigured finishes cause by work of this section.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished installation from the work of other sections.

B. Protect sealants until cured.

3.06 SCHEDULE

A. Exterior Joints, unless specified otherwise in individual sections:

1. Joints between metal frames and concrete or masonry: Sealant Type (1).
2. Joints between impervious materials: Sealant Type (1).
3. Vertical expansion and control joints: Sealant Type (2).
4. Joints in sheet metal flashings: Sealant Type (2).
5. Perimeters of window frames, door frames, louvers and similar openings, and where metal, wood, or other materials abut or join masonry, concrete or each other: Sealant Type (1).
6. Horizontal expansion, control and abutment joint in sidewalk, concrete floors: Sealant Type (4). Joints where a self-leveling sealant cannot be used because of slope: Sealant Type (2).
7. Glass glazing, cap beads (on glass), to metal and surfaces made of silica substance: Sealant Type (5).

B. Interior Joints, unless specified otherwise in individual sections:
1. Vertical expansion and control joints: Sealant Type (1).
2. Joints between impervious materials: Sealant Type (2).
3. Horizontal expansion, control, isolation and abutment joints: Sealant Type (3) or (4).
4. Window and door perimeters: Sealant Type (1).
5. Gypsum Board Joints: Sealant Type (1).
6. For sink, tub or bath areas including countertop joints: Sealant Type (5).
7. Other interior joints as indicated or shown: Sealant Type (1).
8. Intersection of wall surface and cap strip at resilient flooring integral cove: Sealant Type (1).
9. Intersections of metal or wood thresholds and floor substrate, where building components are mechanically attached and required sealing: Sealant Type (6).
10. Perimeter of sound-rated walls, at intersection of gypsum board and abutting surfaces, both sides of wall: Sealant Type (7).

C. Joints in Fire Rated Assemblies: Fire rated sealant. Refer to Section 07 84 00 - Firestopping.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Includes:
   1. Pressed steel frames for wood and hollow metal doors.
   2. Pressed steel frames for glazing.
   3. Hollow metal doors.
   4. Louvers for hollow metal doors.

B. Related Work:
   1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
   2. Framing openings to receive frames: Respective Sections.
   3. Wood Doors: Section 08 14 00.
   4. Door Hardware: Section 08 71 00.
   5. Glazing: Section 08 80 00.
   6. Painting: Section 09 90 00.

1.02 SUBSTITUTIONS

Only written approval of Architect will permit substitutions for materials specified. Refer to Section 01 25 13 - Product Options and Substitutions for procedure.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Conform to IBC, 2015 Edition.

B. Reference Standards: (HMMA) Hollow Metal Manufacturer's Association, a Division of National Association of Architectural Metal Manufacturer's recommended Specification for Custom Hollow Metal Doors and Frames.

C. Install frame and door assembly to conform to NFPA No. 80 for fire-rated class indicated on Drawings.

D. Fire rated doors and frames shall bear a permanent label indicating the fire rating as established per 2013 CBC.

E. Steel Door and Frame Supplier: Direct factory supplier who employs a Certified Door Consultant (CDC) or person with equivalent experience,

available at reasonable times during work for consultation with Owner, Architect, and Contractor.

F. Fire Test of Door Assemblies per UL10B-97.

G. Test Method for Positive Pressure Fire Tests for window assemblies per ASTM E2010-01.

1.04 SUBMITTALS

A. Shop Drawings: Submit for work; reference to Architect's Drawings and mark numbers. Submit four copies.
   1. Show frame sections, anchorage of frames in openings, preparation for hardware, metal gauges, field splice joints, and other data.
   2. Doors: Show construction, gauges, preparation for hardware, door lining materials, openings for louvers and glazing, and other data.
   3. Show wall sections/elevations of new rough framing of each door/jamb condition .
   4. Illustrate door opening criteria, elevations, sizes, types, swings, undercuts, special beveling, blocking for hardware in mineral core doors, identify cutouts.

B. Certificates: When requested, independent testing laboratory certification of fire-rating compliance.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery: Coordinate delivery to the appropriate locations (shop or field) for installation.

B. Storage of Doors: Doors shall be stored in an upright position under cover. Place the units on at least 4" (101.6 mm) wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters which create a humidity chamber and promote rusting. If the corrugated wrapper on the door becomes wet, or moister appears, remove the wrapper immediately. Provide a 1/4" (6.35 mm) space between the doors to promote air circulation.

C. Storage of Frames: Frames shall be stored under cover on 4" (101.6 mm) wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters, which create a humidity chamber and promote rusting. Assembled frames shall be stored in a

vertical position, five unit's maximum in a stack. Provide a 1/4" (6.35 mm) space between frames to promote air circulation.

D. Inspect delivered items for damage. Minor damage may be repaired provided repaired items are equal to new work and accepted by the Architect. Provide new items when directed. Comply with VOC regulations when repairing damage.

1.06 SEQUENCING AND SCHEDULING

A. Deliver doors and frames to the job site in a timely manner so not to delay progress of other trades.

B. Issue purchase orders to suppliers so as not to interfere with normal quoted deliver times.

C. Verify opening sizes, hardware, glazing, and doors with respective sections.

1.07 WARRANTY

Steel doors and frames supplied with a one (1) year warranty against defects in materials and workmanship.

1.08 ENVIRONMENTAL

Packaging and Disposal: Package in biodegradable packs, paper or cardboard boxes. Dispose of non-biodegradable packs, plastic, Styrofoam, polystyrene and polyurethane to a licensed or authorized collector for proper disposal. Comply with the applicable standards and laws for VOC.

1.09 ALTERNATIVES NOT APPLICABLE

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Securities Metal Products, Culver City, CA; 310-641-6690.
   2. Ceco Door, Milan, TN; 888-264-7474.
   3. Republic Doors and Frames, McKenzie, TN; 800-733-3667.
   4. Curries Company, Mason City, Iowa; 641-423-1334.
   5. Steelcraft, Cincinnati, OH; 800-930-8585.

B. Other manufacturer's products: Under provisions of Section 01 25 13.

2.02 MATERIALS

A. Steel Requirements: Doors and frames manufactured of commercial quality, stretcher leveled flatness, and cold rolled steel per ASTM F2092-01 (2007) and A568/A568M-13ae1 general requirements. Galvanized doors and frames at exterior locations to have A60 minimum coating weight complying with ASTM F825-93(2010), zinc coating.

B. Core Materials:
   1. Doors: Non-toxic or vertical steel stiffened internal reinforcing manufactured of hot rolled, pickled, and oiled steel per ASTM A569/A569-98.
   2. Fire labeled doors with temperature rising rating: mineral fiber core, temperature rating per code.

C. Insulation:
   1. Typical Doors (Contractor's Option):
      a. Fiberglass: Semi-rigid compressed fiberglass board, 6 pcf density, R = 4.55 per inch.
      b. Urethane: Foamed-in-place, self-extinguishing, self-hardening, self-bonding, 25 psi minimum, 2 pcf minimum density, R = 6.25 minimum.
   2. Fire-Rated Doors: As required to provide required ratings; UL label.

D. Fastenings: #8 - 32 Phillips head thru-bolts with blank head on one side.

E. Glass Light Frames and Provisions:
   1. Provide frames flush with door face, fabricated of 18 gauge steel with 20 gauge glazing stops. Provide with glazing pockets to receive 1/4" thick glazing.
   2. Provide tempered glass where required at areas subject to human impact.
   3. Provide wire glass at rated doors.

F. Coating Materials:
   1. Primer: Manufacturer's standards rust inhibiting primer to ANSI A224.1.
   2. Refer to Section 09 90 00 for field paint.
   3. Bituminous Coating: Fibered asphalt emulsion.

G. Door Seal: Seal to be one piece with no break around full perimeter of door and to seal all around full opening at stop including threshold as it is the same section as head and jamb to provide an air tight unit when closed.

H. Plaster Guards: Provide 26 gauge steel plaster guards or mortar boxes, welded for frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

I. Anchors: Equip frames with one welded-in floor anchor in each jamb. Furnish 3 steel snap-in jamb anchors for field insertion at a maximum of 24" o.c. Anchors shall be of the proper type for particular construction involved (i.e. wood frame, masonry, concrete, or steel stub).

2.03 LOUVER MANUFACTURERS AND PRODUCTS NOT APPLICABLE

2.04 FABRICATION - DOORS

A. Classification: SDI (Steel Door Institute)
1. Exterior Doors:

Grade	Model	Gauge	Description	Cycles
III	2	16	Extra Heavy Duty, Full Flush	1,000,000

2. Interior Doors:

Grade	Model	Gauge	Description	Cycles
II	2	18	Heavy Duty, Full Flush	2,000,000

3. Vertical lock edges:
   a. Beveled 1/8" in 2".
   b. Exterior, seamless construction by tack welding and fill.
   c. Interior, manufacturers standard interlocking and glued edge.
4. Top and bottom channels:
   a. Not less than 16 gauge, flush or inverted.
   b. Welded to the face sheets.
   c. Exterior doors: flush steel top channel.
5. Astragals: flag security type or Z type per details.

B. Design:
1. Refer to Drawings for Door Design Types.

2. Flush faces: cutouts for louvers and/or glazing as indicated.
3. Refer to HVAC drawings for required louvers and sizes.

C. Construction: SDI-100, Grade III; Extra Heavy Duty, Model 2.
   1. Construct non-fire-rated doors by one of the following methods:
      a. Internal Stiffener Type: Face sheets welded at 5" on center maximum to 20 gauge vertical stiffeners spaced 6" on center maximum, and extending full height. Fill voids, completely, with fiberglass insulation.
      b. Urethane Core Type: Face sheets completely bonded to solid urethane foam insulation core, completely filling interior voids.
   2. Shop fabricate and weld into rigid assemblies with surfaces flat, edges and arises straight, and joints tightly butted; grind welds smooth and flush. Provide fully welded frames at rabbets, faces, soffits, and mullions at exterior sides of frames. Provide welding from fixed glass outward.
   3. At door edges, weld vertical seams continuous; grind; fill with mineral filler to conceal seams.
   4. At tops and bottoms of doors, weld continuous 16 gauge stiffener channels to face sheets.
   5. At top of exterior doors, provide flush filler channel, continuously welded and ground flush, to present a smooth, unbroken waterproof surface.
   6. Bevel lock edge of doors.
   7. Hardware Reinforcement:
      a. Provide concealed welded reinforcement of sheet or bar steel to receive mortise type hardware; drill, tap to template requirements for field insulation. Reinforcement shall include:
         1) Hinge Plates: 7 gauge minimum.
         2) Lock Reinforcement: 12 gauge minimum.
         3) Reinforcement for Surface Applied Hardware: 14 gauge minimum.
         4) Other Items: Conform to HMMA Standards.
      b. Hinge Reinforcement: Spot weld to doors in four places at top and bottom of each piece. Provide additional 2" long 14 gauge clip angle stiffener; weld to hinge reinforcement and face sheet of door.
   8. Louvers: Install face plates flush with door faces; weld in place.
   9. Openings for Glazing: Install integral stop at one face; furnish loose glazing stops at other face for field assembly with countersunk screws at 6" on center maximum.

10. Door Bottoms for Exterior Doors: As specified in Section 08 71 00.

2.05 FABRICATION - FRAMES

A. Construction:
   1. 16 gauge cold rolled steel at interior locations; 14 gauge galvanized at exterior locations.
   2. 12 gauge, full width, face and head reinforcement for non-labeled opening over 48" in width.
   3. Corner Construction: Weld full depth and face, grind smooth and re-prime. Weld includes faces, rabbets, soffit and stops. Knock-down frames are not acceptable.
   4. Provide temporary shipping spreaders to help protect frames from damage during transit and handling. Remove spreaders prior to setting frame.

B. Anchors
   1. Attachment to Masonry Construction:
      a. Galvanized.
      b. Adjustable, flat, corrugated or perforated T shaped with leg not less than 2" wide by 10" long, or wire type, not less than 3/16" in diameter.
   2. Attachment to Drywall Construction:
      a. Steel or Wood Stud type to accommodate frame jamb depth and face dimension on welded type frame.
   3. Provide one anchor for every 30" of jamb of fraction thereof.
   4. Floor Anchor: angle clip type.
      a. 16 Gauge.
      b. Two fasteners per jamb.
      c. Weld to bottom of each jamb.
   5. Masonry or Concrete
      a. 3/8" countersunk flat head bolt and expansion shields.
      b. Locate 6" from top and bottom of maximum 24" on center.
      c. Weld pipe spacers or other type of spacers, per manufacturer's standard design, in back of frame soffit.

C. Preparation for Hardware
   1. Reinforce per SDI 107
   2. Lock and Closer reinforcement: box type.
      a. Lock strike: 12 gauge.
      b. Closer: 7 gauge.

3. Door Hinge reinforcement: 7 gauge or equivalent, manufacturer's standard. Minimum size: 1-1/4" x 10".
4. Spot weld to doors in four places at top and bottom of each piece. Provide additional 2" long 14 gauge clip and angle stiffener, weld to hinge reinforcement and face sheet of door.
5. Punch strike jambs to receive three silencers; double leaf frames to receive manufacturer's standard preparation.
6. Reinforcement for surface applied hardware: 12 gauge.
7. Other items: Conform to HMMA Standards.
8. Hardware locations per "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames".
9. Provide welded in place guards for all hardware cutouts in frame.
10. Electrical preps: provide welded-in-place boxes, special designed anchor raceways and access panels as required.
11. Mounting Height for Lock sets: Heights are measured from centerline of lever to finish floor. Heights shall be 36" to 44" above finish floor, except where specifically indicated otherwise.
    a. 36" at elementary schools.
    b. 44" at high schools.

D. Welding: Conform to applicable standards of American Welding Society for high grade hollow metal work, with exposed beads ground smooth.

E. Filling: Mineral filler, use sparingly to conceal seams.

F. Spreader Bar: Provide removable bar at bottom of door frame openings.

2.06 FINISHES

A. Cleaning: After assembly, clean thoroughly, removing rust scale, grease, oil, and rough spots.

B. Prime Painting: After surfaces are clean, phosphatize and prime with one coat of rust inhibitive primer, baked on, one mil dry film thickness minimum. Prime finishes on all doors and frames shall conform to ASTM humidity, salt spray, impact and film adhesion test as required by ANSI A250-3-1993. Refer to Section 09 90 00 for acceptable ferrous metal primers.

C. Protective Coating: When frame is in contact with masonry, coat inside of frame profile with bituminous coating to a thickness of 1/16". Coating may be shop or field applied.

2.07 FIRE-RATED FRAMES AND DOORS

A. Rating: Provide required labels. Conform to governing agency requirements. The label of a nationally recognized independent fire testing laboratory, having re-examination service, shall cover design and construction.

B. Construction: Typical construction modified as required to meet Label requirements.

PART 3 - EXECUTION

3.01 SETTING FRAMES

A. Set frames in accordance with SDI 105.

B. Set welded frames in place prior to construction of adjacent partition work. Properly frame until permanent anchors are set.

C. Install frames plumb and true with only hairline seam at corner joints.

D. Install fire-rated frames in accordance with NFPA 80.

3.02 DOOR INSTALLATION

A. Clearances:
1. 1/8" between door and frame at head and jambs.
2. 1/8" at meeting edges of pairs.
3. 1/8" at transom panels, without transom bar.
4. 3/4" above finish floor at sills without threshold.
5. 1/4" at sill with threshold.

3.03 ADJUSTMENT AND CLEANING

A. Remove dirt and excess sealants, mortar, or glazing compounds from exposed surfaces.

B. Adjust moving parts for smooth operation. Use shims as required.

C. Fill dents, holes, etc. with metal filler and sand smooth and flush with adjacent surfaces. Paint to match adjacent surface. Any repair work that does not bring damaged surfaces back to their original factory condition shall be cause for replacement of door and/or frame.

END OF SECTION

SECTION 08 71 00
FINISH HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Door Hardware.
   2. Gate Hardware.
   3. Padlocks.
   4. Cylinders for doors fabricated with locking hardware.

B. Related Sections:
   1. Section 07 92 00 - Joint Sealers - exterior thresholds.
   3. Section 08 11 00 - Steel Doors and Frames.
   4. Section 28 31 00 - Fire Detection and Alarm Systems.

1.02 REFERENCES

A. Use date of standard in effect as of Bid date.

B. American National Standards Institute - ANSI 156.18 - Materials and Finishes.

C. ADA - Americans with Disabilities Act of 1990.

D. BHMA - Builders Hardware Manufacturers Association

E. DHI - Door and Hardware Institute

F. NFPA - National Fire Protection Association
   1. NFPA 80 - Fire Doors and Windows
   2. NFPA 101 - Life Safety Code
   3. NFPA 105 - Smoke and Draft Control Door Assemblies
   4. NFPA 252 - Fire Tests of Door Assemblies

G. UL - Underwriters Laboratories
   1. UL10C - Fire Tests of Door Assemblies (Positive Pressure)
   2. UL 305 - Panic Hardware

H. WHI - Warnock Hersey Incorporated

I. State of Oklahoma (Tulsa) International Building Code

J. Local applicable codes, e.g. municipal security codes, etc.

K. SDI - Steel Door Institute

N. NAAM - National Association of Architectural Metal Manufacturers

1.03 SUBMITTALS AND SUBSTITUTIONS

A. Submittals: Submit six copies of schedule per Division 1. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
   1. Type, style, function, size, quantity and finish of hardware items. Use BHMA Finish codes per ANSI A156.18.
   2. Name, part number and manufacturer of each item.
   3. Fastenings and other pertinent information.
   4. Location of hardware set coordinated with floor plans and door schedule.
   5. Explanation of abbreviations, symbols, and codes contained in schedule.
   6. Mounting locations for hardware.
   7. Door and frame sizes, materials and degrees of swing.
   8. List of manufacturers used and their nearest representative with address and phone number.
   9. Catalog cuts.
   10. Manufacturer's technical data and installation instructions for electronic hardware.

B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.

C. Make substitution requests in accordance with Section 01 25 13. Include product data and indicate benefit to the Project. Furnish operating samples on request. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.

D. Furnish as-built/as-installed schedule with closeout documents per Section 01 25 13, including keying schedule, wiring/riser diagrams,

manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

1.04 QUALITY ASSURANCE

A. Qualifications:
   1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of Work for project hardware consultation to Owner, Architect and Contractor.
      a. Responsible for detailing, scheduling and ordering of finish hardware.

B. Hardware: New, free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: In compliance with CBC 2010 (CCR) Title 24 and NFPA 80; Hardware UL10C/ULI0B-97 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, plus resilient and required intumescent seals. Furnish openings complete.
   1. Note: scheduled seals may exceed selected door manufacturer's requirements. See 2.06.E for clarification.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery: coordinate delivery to appropriate locations (shop or field).
   1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc.

1.06 PROJECT CONDITIONS

Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical as the same operation and quality as type specified, subject to Architect's approval.

1.07 SEQUENCING AND COORDINATION

A. Coordinate with concrete.

B. Reinforce walls.

C. Coordinate finish floor materials and floor-mounted hardware.

D. Conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.

E. Furnish manufacturer templates to door and frame fabricators.

F. Use hardware consultant to check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1.08 WARRANTY

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:
   1. Closers: Ten years mechanical, two years electrical.
   2. Exit Devices: Three years.
   3. Hinges: Life of Building.
   4. Other Hardware: Two years.

1.09 COMMISSIONING

A. Test door hardware operation with air pressurization system both at rest and while in full operation. For a maximum air sealed system at enclosure areas

B. Test hardware interfaced with fire/life-safety system for proper operation and release.

1.10 REGULATORY REQUIREMENTS

A. Locate operable latching hardware between 34" minimum and 44" maximum above the finished floor, per California Building Code, Section _____.

B. Adjust doors to open with not more than 5.0lbs pressure at exterior doors, 5.0lbs at interior doors. (The Authority having Jurisdiction may increase the maximum effort to operate fire-rated doors to achieve positive latching, but not to exceed 15.0lbs) International Building Code, Section 11B-404.2.9 (2015 IBC). Coordinate with Architect .

C. Panic hardware shall be mounted at 34" A.F.F. to the top of the horizontal bar. The unlatching force shall not exceed 15.0lbs applied in the direction of travel. Panic hardware shall comply with International Building Code Section 1008.1.10.

D. All hardware to meet International Building Code Sections 11B-404.2.7, 11B-404.2.8 and 1008.1.9. Regardless of occupant load served, exit doors shall be operable from the inside without the use of a key or any special knowledge or effort.

E. Thresholds: special condition to match head and jamb for maximum seal

1.11 MAINTENANCE
Extra Materials: See schedule under "Miscellaneous Material".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

ITEM	MANUFACTURER	ACCEPTABLE SUB
Hinges	(IVE) Ives	Hager, McKinney, Stanley

Continuous Hinges	(IVE) Ives	Pemko, Zero
Key System	(C-R) Corbin-Russwin	Owner's Standard
Locks	(C-R) Corbin-Russwin	Owner's Standard
Exit Devices	(VON) Von Duprin	Owner's Standard
Closers	(LCN) LCN	Owner's Standard
Auto Flush Bolts	(IVE) Ives	None available
Astragal Seals	(NGP) National Guard	
Products	Pemko	
Coordinators	(IVE) Ives	Trimco, Rockwood
Silencers	(IVE) Ives	Trimco, Rockwood
Vandal-Resistant Pulls	(IVE) Ives	Trimco
Push & Pull Plates	(IVE) Ives	Trimco, Rockwood
Kickplates	(IVE) Ives	Trimco, Rockwood
Stops & Holders	(IVE) Ives	Trimco
Overhead Stops	(GLY) Glynn-Johnson	None available
Thresholds	(PEM) Pemko	Zero, Reese
Seals & Bottoms	(PEM) Pemko	Zero, Reese

B. Provide hardware items required to complete the work in accordance with these specifications and manufacturers' instructions.
   1. Include items inadvertently omitted from this specification. Note these items in submittal for review.
   2. Where scheduled item is now obsolete, bid and furnish manufacturers updated item at no additional cost to the project.

2.02 HANGING MEANS

A. Conventional Hinges: Hinge open widths minimum, but, of sufficient throw to permit maximum door swing. Steel or stainless steel pins and concealed bearings.
   1. Three hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
   2. Extra heavy weight hinges on doors over 3 feet, 5 inches in width.
   3. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins.
   4. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
   5. Provide shims and shimming instructions for proper door adjustment.

B. Continuous Hinges:

1. Pinned steel/stainless steel type: continuous stainless steel ¼ inch diameter hinge.

2.03 LOCKSETS, LATCHSETS, DEADBOLTS

A. Mortise Locksets and Latchsets: As scheduled.
   1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
   2. Latchbolts: 3/4" throw stainless steel anti-friction type.
   3. Lever Trim: through-bolted, accessible design, cast levers as scheduled.
   4. Thumbturns: accessible design not requiring pinching or twisting motions to operate, to be used with dead bolts.
   5. Deadbolts: stainless steel 1-inch throw.
   6. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
   7. Scheduled Lock Series and Design: Corbin-Russwin ML2000 series, NSA design.
   8. Certifications:
      a. ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
      b. ANSI/ASTM F476-84 Grade 31 UL Listed.
   9. Accepted substitutions: None

2.04 EXIT DEVICES/PANIC HARDWARE

A. General features:
   1. Independent lab-tested 1,000,000 cycles.
   2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
   3. 3/4" throw deadlocking latchbolts.
   4. No exposed screws to show through glass doors.
   5. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
   6. The unlatching force shall not exceed 15.0lbs applied in the direction of travel and releasable with 32 lb. maximum pressure under 250 lb. load to the door.
   7. Panic hardware shall comply with CBC Section 1008.1.10.

B. Specific features:
   1. Non-Fire Rated Devices: cylinder dogging.
   2. Lever Trim: match lockset lever design.
   3. Rod and latch guards with surface vertical rod devices.
   4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
   5. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.
   6. Accepted substitutions: None

2.05 CLOSERS

A. General: One manufacturer for closer units throughout the Work, including surface closers, high security closers, overhead concealed closers, floor closers, low-energy door operators and electromagnetic hold-open closers.
B. Surface Closers:
   1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
   2. ISO 2000 certified. Units stamped with date-of-manufacture code.
   3. Independent lab-tested 10,000,000 cycles.
   4. Thru-bolts at wood doors unless doors are provided with closer blocking. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
   5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
   6. Opening pressure: See paragraph 1.10.B.
   7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
   8. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units.
   9. Exterior door closers: tested to 100 hours of ASTM B117-11 salt spray test, furnish data on request.
   10. Exterior doors do not require seasonal adjustments in temperatures from 120°F. to -30°F., furnish data on request.
   11. Non-flaming fluid will not fuel door or floor covering fires.

12. Accepted substitutions: None

2.06 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design, "LBR" type.

B. Overhead Stops: Stainless steel (300 series). Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops: Provide stops to protect walls, casework or other hardware.
   1. Unless otherwise noted in Hardware Sets, provide floor type with appropriate fasteners. Where floor type cannot be used, provide wall type. If neither can be used, provide overhead type. Comply with paragraph 1.10F.

E. Seals: Finished to match adjacent frame color. Resilient seal material: solid high-grade neoprene. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability. Proposed substitutions: submit for approval.
   1. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.
   2. Non-corroding fasteners at in-swinging exterior doors.
   3. Sound control openings: Use components tested as a system using nationally accepted standards by independent laboratories. Ensure that the door leafs have the necessary sealed-in-place STC ratings. Adhesive mounted components not acceptable. Fasten applies seals over bead of sealant.
   4. Fire-rated Doors, Resilient Seals: UL10C/UBC-7-2 compliant. Coordinate with selected door manufacturers and selected frame manufacturer's requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive mounted resilient seal, furnish rigid housed seal at minimum, or both the rigid housed seal and the adhesive applied seal if necessary to fulfill door manufacturer's requirement. Adhesive applied seal alone is deemed insufficient for this project where rigid housed seals are scheduled.

5. Fire-rated Doors, Intumescent Seals: Furnish fire-labeled opening assembly complete and in full compliance with UL10C/UBC-7-2. Furnished by selected door manufacturer, these seals vary in requirement by door type and door manufacture. Adhesive applied intumescent strips are not acceptable, use concealed-in-door-edge type or kerfed-in-frame type. Careful coordination required.

F. Automatic door bottoms: low operating force units. Doors with automatic door bottoms plus head and jamb seals cannot require more than two pounds operating force to open when closer is disconnected.

G. Thresholds: As scheduled and per details. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
1. Exteriors: Set in full bed of butyl-rubber or polybutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous ¼ inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
2. Sound control openings: Set in bed of mastic sealant.

H. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

I. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.07 FINISH

A. Generally BHMA 626 Satin Chromium.
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.08 KEYING REQUIREMENTS

A. Key System: Existing Corbin-Russwin keyway, non-interchangeable core. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system keyway(s) and structure, furnish Owner's written approval of the system.
   1. Existing factory registered master key system.
   2. Non-I.C. construction keying: inserted type partial key. At substantial completion, remove inserts in Owner's presence; demonstrate consequent non-operability of construction key. Give all removed inserts and all construction keys to Owner. Furnish 3 extractor tools.
   3. Furnish 20 construction keys.
   4. Furnish 4 keys per change key symbol.
   5. Furnish 0 Grand master keys.
   6. Recombinate entire project at no extra expense to Owner if missing construction keys.
   7. Stamp all keys "Do Not Duplicate" on No. 52 Key Blank.

B. Key Cylinders: 6-pin solid brass construction.

C. Locks and cylinders: keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.

D. Permanent keys: secured shipment direct from point of origination to Owner.

E. Bitting List: Secured shipment direct from point of origination to Owner upon completion.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

Factory trained, certified, and carries a factory-issued card certifying that person as a "Certified Installer". Alternative: can demonstrate suitably equivalent competence and experience.

3.02 PREPARATION

A. Ensure that walls and frames are square and plumb before hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
   1. Notify Architect of any code conflicts before ordering material.
   2. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

3.03 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
   1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
   2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.

B. Locate floor stops not more than 4 inches from the wall.

C. Drill pilot holes for fasteners in wood doors and/or frames.

D. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.04 ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
   1. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction.

B. Inspection: Use hardware supplier. Include suppliers with closeout documents.

C. Follow-up inspection: Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit Project with representatives of the manufacturers of the locking devices and door closers to accomplish following:
   1. Re-adjust hardware.
   2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
   3. Identify items that have deteriorated or failed.
   4. Submit written report identifying problems and likely future problems.

3.05 DEMONSTRATION

Demonstrate electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.06 PROTECTION/CLEANING

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.07 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Manufacturers and their abbreviations used in this schedule:

BOM	Bommer Industries
C-R	Corbin-Russwin Arch. Hdw.
GLY	Glynn-Johnson Hardware
IVE	H. B. Ives
LCN	LCN Closers
NGP	National Guard Products

PEM	Pemko Manufacturing
SCH	Schlage Lock Company
VON	Von Duprin

HW SET: 1
DOOR NUMBER:
Containment
room

EACH TO HAVE:

1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	STOREROOM LOCK	ML2057 NSA X M30	626	C-R
1	EA	DOOR PULL	VR900	630	IVE
1	EA	DOOR HOLDER	PAH-60	689	LCN
1	EA	SPECIAL THRESHOLD	FRAME SECTION MATCHING DOOR HEAD AND JAMB		
1	EA	SPECIAL AIR TIGHT DOOR SEAL			

END OF SECTION

PART 1 - GENERAL

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

1.2 SUMMARY

Interior wall over metal studs.

A. This Section includes the following:
1. Interior Fire rated gypsum board for walls and ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. B. Samples: For the following products: 1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory for use.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency
1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original, unopened protective packaging.

B. Store inside to keep products clean and free from damage due to water or other deteriorating elements. Do not store on ground.

C. Handle so as to prevent damage during storage and installation.

1.05 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Cold Weather: Maintain temperature in spaces at 55°F or above for 24 hours before, during, and after wallboard application and joint finishing.
   2. Ventilation: As necessary to remove excess moisture and aid drying of joint finishing.

B. Sequencing, Scheduling:
   1. Before concealing work of other Sections, ascertain that required inspections of such work have been made.
   2. Coordinate this work with related work of other Sections. Make cutouts to suit work of other Sections.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. United States Gypsum (USG) CO.; unless otherwise indicated.

B. Other Acceptable Manufacturers:
   1. Georgia Pacific Corp.; Atlanta, GA; 800-284-5347.
   2. National Gypsum Co.; Charlotte, NC; 800-628-4662.

2.02 MATERIALS

A. Gypsum Wallboard: IBC, 2015 Edition, Table 2506.2 and ASTM C1396/C1396M-13.
   1. 5/8" and 1/2" thick, Type X; fiber rock abuse resistant fire-retardant; USG fire code; unless otherwise indicated. The 5/8" thick gypsum board shall be used in fire rating of structural members, such as columns and not in the general cladding of steel stud walls.
   2. 5/8" thick for ceiling.

B. Joint Treatment and Adhesives:
   1. Standards Tape and Joint Compound: IBC, 2015 Edition, Section 2506.2 (based on ASTM C475/C475M-12.
   2. General: Per wallboard manufacturer's recommendations for the particular use.

C. Metal Trim and Accessories:

1. Typical Edge Trim: USG No. 200-A, galvanized.
2. Typical Corner Trim: USG No. 103 Dur-A-Bead, 1-1/4" X 1-1/4" for outside corners.
3. 6" C-H studs at cavity shaft wall No. 600CH25 spaced at 24" on center with allowable deflection of 1/240. Comply with UL Designation No. U492.
4. Vinyl Fabric Tuck Trim by Gordon Interior Specialties; 800-747-8954 or approved equivalent.
   a. Fabric tuck reveal trim: No. 927-FR-12 with fabric wrapped FF Welt insert.
   b. Corner fabric/vinyl tuck trim: No. 966-FT-12. Use with No. 927-FR-12.

D. Fasteners:
1. General: Conform to IBC, 2015 Edition, Tables 2506.2, sizes and lengths as required for the particular application, and penetration into support.
2. Standards:
   a. Nails: ASTM C514-04; F547, FI667.
   b. Screws: IBC, 2015 Edition, Table 2506.2 (which is based on ASTM C954.1 and C1002.07(2013)).
3. Nail Sizes:
   a. 5/8" Wallboard: Annular-Ring, .098" diameter, 1-3/8" long or 13 gauge, 19/64" head, 1-5/8" long, or Cooler Nail, 6d, .092" diameter, 1/4" head, 1-7/8" long.
   b. 1/2" Wallboard: Annular-Ring, .098" diameter, 1-1/4" long or 13 gauge, 19/64" head, 1-3/8" long, or Cooler Nail, 5d, .086" diameter, 15/64" head, 1-5/8" long.
4. Screw Sizes: Self-drilling, self-tapping, bugle head, No. 6. Lengths to penetrate 5/8" minimum into wood or penetrate through metal and project 1/4" minimum beyond.
   a. Wood Framing: Type W.
   b. Metal Framing: Type S.
   c. Wallboard to Wallboard: Type G.
5. Fastener Sizes for Other Thicknesses and Conditions: Per Code, as required.

2.3 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Exterior Gypsum Soffit Board: ASTM C 1396/C 1396M / ASTM C 931/C 931M or

with manufacturer's standard edges.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Gypsum Co.

2. Regular Type:
   a. Thickness: 1/2 inch
   b. Long Edges: Tapered.

2.5 WALL SHEATHING

A. Paper-Surfaced Gypsum Wall Sheathing: ASTM C 1396/C 1396M / ASTM C 79/C 79M, exterior gypsum sheathing; with water-resistant-treated core and
- with water-repellent paper bonded to core's face, back, and long edges.

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

a. American Gypsum.

2. Type, Thickness, Size:
a. [Regular, 1/2 inch (12.7 mm), 24 inches in width (610 mm) for horizontal application, tongue and groove edges].
b. [Regular, 1/2 inch (12.7 mm), 48 inches in width (1219 mm) for vertical application, square edges].
c. [Type X, 5/8 inch (16 mm), 48 inches in width (1219 mm) for vertical application, square edges]. d. Acceptable Product: Exterior Gypsum Sheathing.

2.6 TRIM ACCESSORIES

Exterior Trim: ASTM C 1047.
1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
2. Shapes:
a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
C. 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.

3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS A. General: Comply with ASTM C 475/C 475M.
a. Joint Tape:

1. Exterior Gypsum Soffit Board: Paper

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable compound.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine framing and other work which supports or abuts wallboard.

B. Do not start work until unsatisfactory conditions are corrected.

3.02 APPLICATION

A. Codes: Conform to IBC, 2015 Edition, Chapters 7 and 25A and Section

2506.

B. Follow wallboard manufacturer's printed installation recommendations. Code requirements shall have precedence.

C. Use maximum practical lengths.

D. Erect single layer moisture-resistant board in most economical direction, with ends and edges occurring over firm bearing.

E. Erect single layer fire-rated gypsum board vertically, with edges and ends occurring over firm bearing.

F. APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

1. Apply panels perpendicular to supports, with end joints staggered and located over supports.
2. Install with 1/4-inch (6.4 mm) open space where panels abut other construction or structural penetrations.
3. Fasten with corrosion-resistant screws.

L. Apply boards to ceilings first, then walls.

M. Refer to respective finishes or cladding on Finish Schedule for gypsum board finishes.

3.03 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

3.04 TOLERANCES

Maximum Variation from True Flatness: 1/8" in 10' in any direction.

3.05 FINISH (PRE GA-21496)

A. Unexposed above ceiling, furr-downs and wall areas: Level 1

B. Unexposed ceramic tile and pinboard substrate: Level 2.

C. Exposed to view painted gypsum board: Level 3.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
B. Control Joints: Install control joints at locations indicated on Drawings and if not shown, according to ASTM C 840 or GA-216 and in specific locations approved by Owner for visual effect.
C. Exterior Trim: Install in the following locations: 1. Cornerbead: Use at outside corners. 2. LC-Bead: Use at exposed panel edges. E. Aluminum Trim:

Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840, GA-216 or GA-214: Locations to receive
E. Level 0 finish (no taping, finishing, or accessories required): Nonfire-rated , non-sound-rated, and non-smoke-rated assemblies in ceiling plenums and concealed areas, and in temporary construction
F. Locations to receive Level 1 finish (all joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable): Fire rated, sound rated, and smoke rated assemblies in plenum areas above ceilings, in attics, and in areas where the assembly would generally be concealed.
G. Locations to receive Level 2 finish (all joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin

coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound): Surfaces to receive moisture resistant gypsum board as a surfacing.

H. Locations to receive Level 3 finish (all joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound): Areas which are to receive heavy or medium-texture (spray or hand applied) before final painting, or where heavy-grade wallcoverings are to be applied as the final decoration. This level of finish is not recommended where smooth painted surfaces or light to medium wall coverings are specified.

3.06 ADJUSTING AND CLEANING

A. Adjustment:
   1. Nail Pop: Drive new nail 1-1/2" from existing nail, and reseat nail.
   2. Face Paper Punctures at Fasteners: Drive new fastener 1-1/2" from existing; remove defective fastener.
   3. Surface Damage: Fill finish flush with compound.

B. Clean-Up: Remove debris, excess material and equipment; clean droppings from adjacent materials and surfaces.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Surface preparation.
   2. Complete application of paint to interior and exterior surfaces.
   3. Application of finish coats to shop-primed metal surfaces.
   4. Surface finish schedule.

B. Related Work:
   1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
   2. Materials and items which receive: Respective Sections.
   3. Factory finished items: Respective Sections.
   4. Joint Sealers: Section 07 92 00.
   5. Finish Hardware removal and replacement in coordination with painting work: Section 08 71 00.
   6. Electrical fixture trim and plates removal and replacement in coordination with painting work: Division 26.

C. Definitions:
   1. DFT: Abbreviation for dry film thickness. The minimum thickness to be applied.
   2. Paint: A collective general reference to include materials of every component for finishing systems of every type, and preparation of surfaces for and application of said materials.

1.02 SUBSTITUTIONS

Only written approval of the Architect, will permit substitutions for materials specified. Refer to Sections 01 25 13 - Product Options and Substitutions.

1.03 QUALITY ASSURANCE

A. Applicator: Company specializing in commercial painting and finishing with five (5) years experience, and approved by paint manufacturer.

B. Products shall be V. O. C. compliant with local authorities, Air Quality Management District, Architectural Coatings, current version.

C. Regulatory Requirements: Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

1.04 SUBMITTALS

A. Submit according to the provisions of Section 01 33 00.

B. Samples:
   1. Number Required: Three each.
   2. Paints and Enamels:
      a. Typical: Each type, in each selected color; 8" x 10" size on stiff smooth material typical; on sandpaper for rough surfaces.
      b. Stipple Enamel: Each selected color Architect approved, roller texture on 12" x 24" piece of drywall.
   3. Stains, Varnishes, Lacquers: Each finish type on each specie and texture of wood; 8" x 10" size for plywood, 16" length for casing or boards, show clearly each step of finishing process.
   4. Make samples by same methods to be used to produce actual work. Samples will be examined for color, texture, and workmanship.
   5. Remake and resubmit samples when required for approval.

C. Product Data: Complete list of paint materials including compliance with Air Quality Management District, Architectural Coatings, current version; Safe Drinking Water and Toxic Enforcement Act of 1986; Proposition 65, OEHHA.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver in sealed containers with manufacturer, brand name, product, and use instructions clearly identified.

B. Store paint materials at minimum ambient temperature of 45°F and a maximum of 90°F, in well-ventilated area, unless required otherwise by manufacturer's instructions.

C. Handle to prevent damage during storage and use.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Follow manufacturer's printed recommendations for product when they are more stringent than limits stated herein.
2. Do not apply materials when temperature is below 50˚F or above 110˚F.
3. Do not apply materials when RH is above 90%.
4. Provide continuous ventilation as necessary to provide air movement, aid drying, and disperse noxious fumes.
5. Do not apply paint to wet-applied construction until such work is dry, and acceptable to Architect and paint manufacturer.
6. Do not apply exterior paint in rainy, damp, misty, smoggy, or excessively windy weather.
7. Do not apply paint in areas where dust is being generated.
8. Provide lighting level of 80 foot-candles measured mid-height at substrate surface during application.

B. Protection:
1. Cover or otherwise protect finished work of other trades, work not to be painted concurrently, landscaping, and adjacent property from damage.
2. When not in use, store paints in designated areas. Keep containers closed. At end of day's work, remove empty containers, paint soaked rags, and debris. Vent fumes. Take precautions to prevent fire.

C. Sequencing, Scheduling:
1. Coordinate removal and replacement of hardware, electrical fixtures and trim, and related work of other Sections.
2. Stain, prime, back paint, and pre-finish items before installation as required.

D. Do not use Project plumbing fixtures or piping systems for the following:
1. Cleaning painting equipment and utensils.
2. Disposal of waste from cleaning or disposal of paints.

1.07 EXTRA MATERIALS

A. Provide a one-gallon container of each color and surface texture to Owner.

B. Label each container with color, texture, and room locations, in addition to the manufacturer's label.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers shall verify that their products conform to latest California Air Resources Board regulations.

B. Materials used in the work of this Section shall be a proprietary brand of one of the following, unless otherwise specified below.
   1. ICI Dulux Paints (Ameritone, Glidden, Sinclair); Cleveland, Ohio 800-984-5444.
   2. Dunn-Edwards Corp.; Los Angeles, CA; 800-733-3866.
   3. Frazee.

C. Substitutions: Under provisions of Section 01 25 13.

2.02 ACCEPTABLE MANUFACTURERS AND PRODUCTS

A. Metal Primers:
   1. Rust-Inhibitive Primer (For Ferrous Metals):
      a. Bloc-Rust Red Oxide Primer 43-4, by Dunn-Edwards.
      b. Red Oxide Metal Primer #54, by Ameritone.
      c. Alkyd Metal Primer #4100, by Glidden.
   2. General Primer (For Ferrous Metals):
      a. Corrobar White Alkyd Primer 43-5, by Dunn-Edwards.
      b. Devguard 4160, by Devoe.
   3. Aluminum and Galvanized Metal Primer (For Non-Ferrous Metals):
      a. Galv-Alum Primer 43-7, by Dunn-Edwards.
      b. Devguard 4120, by Devoe.
      c. Coor-Tect #34, by Sinclair.

B. Wood Primers and Sealers:
   1. Water-Base Primer (Exterior):
      a. E-Z Prime, W708, by Dunn-Edwards.
      b. 2000-1200 Primer, by ICI Paints.
   2. Alkyd Primer (Interior):
      a. Cover-Stain Primer, 03500 Series, by Zinsser.
      b. Kilz Oil-Base Primer Sealer by Masterchem Industries.
   3. Pigmented Shellac Primer: Bin Shellac Base Primer Sealer, by Zinsser.
   4. Sanding Sealer: MC80-6200 (McClosky), by Dunn-Edwards.

C. Masonry Fillers and Sealer:
   1. Standard Concrete Block Filler: Bloc-Fil W305, by Dunn-Edwards.

2. Heavy Concrete Block Filler: Bloc-Fil W305, by Dunn-Edwards.
3. Masonry Sealer:
   a. Eff-Stop Acrylic Masonry Primer/Sealer W709, by Dunn-Edwards.
   b. Dulux Exterior Latex Primer 2001-1200, by ICI Paints.

D. Gypsum Board Sealer:
1. Vinylastic Interior Pigmented Sealer W101, by Dunn-Edwards.
2. Prep & Prime Gripper Multi-Purpose 3210-1200, by ICI Paints.

E. Acoustical Tile Sealer:
1. Cover-Stain Primer by Zinsser.
2. Kilz Oil Base Primer Sealer by Masterchem Industries.

F. Concrete Floor Sealer:
1. General: Penetrating acrylic, semi-transparent sealer.
2. Permaseal by Monochem, Los Angeles, CA; 818-500-8585.

G. Latex Enamel Paints:
1. Acrylic Latex Enamel - Semi-Gloss:
   a. Permasheen W901-1, by Dunn-Edwards.
   b. Dulux Professional Exterior 100% Acrylic, by ICI Paints.
2. Exterior Masonry – Flat:
   a. Evershield W701-1, by Dunn-Edwards.
   b. Masonry Flat Finish, 2220, by ICI.

H. Acoustical Tile Paint – Flat:
1. Acoustikote W615, by Dunn-Edwards.
2. 1802, by ICI Paints.

I. Polyurethane Coatings:
1. Water-Base Polyurethane, Satin Finish:
   a. MC8-6841(McClosky 6841 Series), by Dunn-Edwards.
   b. 1802, by ICI Paints.
2. Solvent-Base Polyurethane, Gloss Finish: Interthane 990HS, by International Protective Coatings, Houston, TX: 713-682-1711.

J. Solvent-Base Epoxy Paint: Interseal 670HS, by International Protective Coatings, Houston, TX; 713-682-1711.

K. Fire Retardant Coating: Flat Latex Intumescent Coating, 320A by Barnard Products Inc., Covina, CA; 800-232-1285.

2.03 MATERIALS

A. Each material type to be same manufacturer throughout. Materials in a coating system to be by a single manufacturer.

B. Ready mixed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

C. Coatings shall have good flow and brushing properties; capable of drying or curing free of streaks or sags.

D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.04 MIXES

A. Follow manufacturer's printed recommendations.

B. Mix paints thoroughly prior to application.

C. Mix only in Inspector's presence, in assigned spaces.

D. Except where thinning is specifically recommended by manufacturer, do not thin products.

2.05 FINISHES

A. Refer to schedule at end of Section for surface finish schedule.

B. Colors:
   1. As selected by Architect, from Manufacturer's standard and custom colors and finish selection charts.
   2. A number of colors (8 minimum to 12 maximum) will be selected, arranged in various combinations, used to accent trim and other architectural features, and colors and combinations will vary from exterior-to-interior, space-to-space, surface-to-surface, material-to-material, and feature-to-feature.
   3. Colors to be factory mixed, and to match approved samples.

4. Tint undercoats sufficiently different so they are readily distinguishable, in any light, from each other and the finish coat.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces for suitability to receive paint. 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 affect proper application.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   3. Interior Located Wood: 15 percent, measured in accordance with ASTM D2016.
   4. Exterior Located Wood: 19 percent, measured in accordance with ASTM D2016.
   5. Concrete Floors: 7 percent.

D. Beginning of installation means acceptance of existing surfaces.

3.02 PREPARATION - NEW SURFACES

A. General:
   1. Remove all manufacturer's labels, tags, electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
   2. All specified products are to be stored, handled, and used per manufacturer's printed instructions and recommendations.
   3. Correct all surface defects, which may adversely affect the finished work.
   4. Clean all surfaces prior to sealer or primer application. Surfaces to be free of all loose coating, dust, corrosion and other foreign matter.

B. Metal:
   1. Shop Primed Structural Steel:
      a. Thoroughly clean all surfaces utilizing SSPC-SP No. 2 Hand Cleaning or SSPC-SP No. 3 Power Brush Cleaning method.
      b. Sand all rough areas to provide smooth, uniform surface. Spot prime abraded, damaged, and unprimed areas with Rust Inhibitive Primer.
   2. Shop Primed Non-Structural Steel:
      a. Thoroughly clean all surfaces.
      b. Sand all rough areas to provide smooth, uniform surface. Spot prime abraded, damaged, or unprimed areas with Rust Inhibitive Primer.
   3. Galvanized Steel:
      a. Thoroughly clean all surfaces utilizing SSPC-SP No. 1 Solvent Cleaning method.
      b. Etch all surfaces with application of Dunn-Edwards Galva-Etch GE-123 solution as follows. Thinning: Use water. Do not reduce solution beyond three parts water to one part Galv-Etch. Application: Brush or mop apply in a thin even coat. After five minutes, remove excess solution with rags, squeegee or sponge. Drying Time: 1/2 hour minimum and 4 hours maximum before priming.
   4. Drinking Fountain Steel Pipe Guardrails (Powder Coating): Chemical conversion coating or sand blast all surfaces per Powder Coating manufacturer's printed guidelines.

C. Concrete:
   1. Remove all dirt, concrete dust and foreign matter from all surfaces. Remove rust stains with a solution of sodium metasilicate after thoroughly wetting with water.
   2. Remove curing compounds and release agents with light sand blast or high pressure power wash.

D. Drywall: Thoroughly clean all surfaces.

E. Concrete Floors (Receiving Coating):
   1. Patch all cracks and defects with thin-set concrete patch per Section 03 30 00.
   2. Thoroughly clean all surfaces per coating manufacturer's printed requirements.

I. Factory Finished Products and Equipment:
   1. Remove all incidental adhesive applied labels and label adhesive. Equipment information and data labels and plates to remain.
   2. Thoroughly clean all surfaces with mineral spirits.
   3. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.

J. Mildew Treatment: If mildew is present, treat mildew area with spray-on solution of 50% bleach and 50% water. Let surface dry. Spot prime area with Alkyd Primer.

K. Removal of Grease, Oil and Other Contaminants: Remove oil, grease and similar type contaminants with mineral spirits, ammonia-based cleaners or trisodium phosphate (TSP) solution. Provide adequate ventilation during use. Allow surfaces to dry prior to primer application.

3.03 PREPARATION - EXISTING SURFACES

A. General:
   1. Remove all electrical plates, hardware, light fixture trim and fittings prior to preparing surfaces or finishing.
   2. Correct all surface defects which may adversely affect the finished work.
   3. Clean all surfaces prior to primer or finish application. Surfaces to be free of all dust, corrosion and other foreign matter.
   4. Refer to Paragraph 3.02 for preparation of existing construction not previously finished.

B. Metal:
   1. Painted Iron and Steel:
      a. Power wash all exterior surfaces. Thoroughly clean all interior surfaces.
      b. Remove all loose, peeling or chalky paint and rust by scraping, hand brushing, power brushing, sanding and/or grit blasting to expose bare metal. Smooth exposed paint edges by sanding. Spot prime exposed metal surfaces with Rust Inhibitive Primer or General Metal Primer. Spot prime exposed galvanized surfaces with Galvanized Metal Primer. Primers to be applied same day that metal is exposed.
      c. At depressions and dents in steel hollow metal doors, door frames and window frames sand area completely and fill

depression or dent with body filler. Prime body filler areas with Rust Inhibitive Primer or General Metal Primer.

d. Sand all rough areas to provide smooth, uniform surface. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.

2. Galvanized Steel:
   a. Remove all rust by sanding or grit blast to expose bare metal. Spot prime exposed metal with Galvanized Metal Primer.
   b. Clean and etch all surfaces per Paragraph 3.02.
3. Aluminum: Thoroughly clean all surfaces.

D. Concrete and Masonry:
   1. Power wash all exterior surfaces. Thoroughly clean all surfaces.
   2. Remove all loose, peeling or chalky paint by scraping, hand brushing, power brushing and/or sanding. Patch all cracks, voids and spalled off areas in concrete with thinset concrete patch per Section 03 30 00. Patch all cracks, voids and spalled off areas in masonry with masonry patch. Patch to match texture of existing adjacent surface. Spot prime exposed concrete or masonry and patch areas with Concrete Sealer.
   3. Sand all rough areas to provide smooth, uniform surface. Dull glossy paint surfaces by sanding or application of liquid de-glossing surface conditioner.

E. Plaster:
   1. Power wash all exterior surfaces. Thoroughly clean all interior surfaces.
   2. Remove all loose, peeling or chalky paint by scraping, hand brushing, power brushing and/or sanding. Patch all cracks, voids and spalled off areas with plaster patch. Replace large areas of deteriorated or damaged plaster per Section 09 24 00 - Portland Cement Plaster. Patch to match texture of existing adjacent surface. Spot prime exposed plaster and patch areas with Concrete Sealer.

F. Drywall:
   1. Thoroughly clean all surfaces.
   2. Remove all loose, peeling, flaking and scaling paint by scraping and/or sanding. Provide fiberglass tape at cracks and finish with three (3) coats of Standard Tape and Joint Compound. Fill all holes,

G. Mildew Treatment: If mildew is present treat mildew area with spray-on solution of 50% bleach and 50% water. Let surface dry. Spot prime area with Alkyd Primer.

H. Removal of Grease, Oil, and Other Contaminants: Remove oil, grease and similar type contaminants with mineral spirits, ammonia-based cleaners or trisodium phosphate (TSP) solution. Provide adequate ventilation. Allow surfaces to dry prior to primer application.

3.04 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.05 APPLICATION

A. Workmanship:
1. Execute work with skilled craftsmen.
2. Evenly apply coats, with suitable equipment, well flowed on, free of laps, runs, skips, dead spots, and other imperfections. Last coat to present a uniform surface, color, and texture.
3. Stipple texture to be as approved by Architect.
4. Apply products in accordance with manufacturer's instructions if more stringent than limits specified herein.
5. Do not apply finishes to surfaces that are not dry.

B. Equipment: Brushes, rollers, and spraying equipment as required and suitable for material being applied; keep clean and in proper operating condition. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

C. General:
1. Paint and color areas per Architect's Color Schedules.

2. Mask and cut-in as required to accomplish the various color combinations. Make edges of paint clean and sharp (no overlaps) where they adjoin other colors or materials.
3. Paint entire surfaces, parts, and items including reveals, returns, rabbets, soffits, projections, openings, and ornamental features.
4. Allow applied coat to dry within paint manufacturer's recommended limits before next coat is applied.

D. Number Of Coats:
1. Specified number is the minimum number to be applied.
2. Contractor shall, at his expense, apply additional coats as directed by Architect if:
   a. Contractor does not produce full even coverage.
   b. Contractor does not meet required dry film thickness with specified number of coats.
   c. Contractor applies a coat before Inspector has examined previous coat.

E. Dry Film Thickness stated in Schedule of Paint Finishes must be increased to manufacturer recommended thickness when such exceeds the thickness stated herein.

F. Minimum drying time between coats shall be the most stringent of the following conditions:
1. Until coat is dry.
2. Manufacturer's printed recommendations.
3. Three (3) days for exterior work, two (2) days for interior work, except where other time requirements are specifically stated in manufacturer's printed recommendations.

G. Preparation Work Between Coats: Prepare each coat to receive succeeding coat.
1. General: Repair defects, sand, dust, wipe clean.
2. Wood, Enameled: When dry, lightly sand smooth.
3. Wood, Varnished or Lacquered: When dry, steel wool smooth.
4. Plaster and Concrete: Neutralize suction spots or hot spots; then touch-up so coat surface is uniform.

H. Back-Priming:
1. Immediately upon delivery to Project site, back prime surfaces which will be concealed after installation for following items:

Exterior and interior finish lumber and millwork, doorframes, trim, plywood wall lining and paneling.
2. Painted and Enameled Work: One coat clear sealer.
3. Wood With Stained Finish: One coat linseed oil.
4. Keep back-priming off exposed faces.

I. Priming:
1. General: Prime work as soon as possible after surfaces are prepared.
2. Ungalvanized Steel: Prime immediately after cleaning, on the same day.
3. Galvanized Sheet Metal: Prime immediately after erection.
4. Exterior and Interior Woodwork: Prime immediately after erection.
5. At Glazing: Paint glass beads, stops and rabbets, except for aluminum.

J. Application Methods: Apply by brush or roller, except as listed below.
1. Enamel to Doors: Roller only.
2. Enamel: Roller typically.
3. Stipple Enamel: Roller only, with Architect approved texture.
4. Varnish or Lacquer: Spray.
5. Exterior Wood Stains: Apply by brush or roller only. Work well into surface, especially on rough-surface woods.

K. Doors: Finish faces, edges, top, and bottom. On wood doors, apply first coat to all parts at the same time. At exterior doors, paint interior face with same material used on the exterior face.

L. Colors: Make color changes at inside corners typically. Paint to a clean straight line.

3.06 PAINTING OF MECHANICAL AND ELECTRICAL ITEMS AND EQUIPMENT

A. Painting of factory finished items and equipment is not required unless specifically called out herein or on the drawings.

B. Paint the following:
1. Interior exposed mechanical pipes ductwork, hangers, brackets, collars, and supports.
2. Interior surfaces of ductwork that are visible through grilles, registers, and louvers. Paint flat black. Paint exposed to view dampers behind grilles, registers, and louvers to face grilles, register, or louver color.

3. Exposed plumbing piping, hangers, fasteners, and supports visible from the ground.
4. Interior exposed electrical conduit, boxes, hangers, fasteners, and supports visible from the ground.
5. Electrical panel and telephone backboards. Paint both sides and all edges of backboards. Painting to occur prior to equipment installation.
6. All unfinished mechanical and electrical items and equipment.
7. All primed mechanical and electrical items and equipment.

C. Do not paint equipment nameplates, identification information, and/or labels.

D. Refer to Division 15 for pipe identification requirements.

3.07 FIELD QUALITY CONTROL

A. Notify Inspector of Record (IOR) when work is ready for examination. Examination of work shall occur at the following stages:
1. Surface preparation, prior to application of prime coat.
2. Each coat, prior to application of succeeding coat.
3. Final coat, and finished work.

B. Do not proceed with next operation until required examination has been made.

3.08 ADJUSTING AND CLEANING

A. Cleaning:
1. Clean surfaces as work progresses.
2. Remove paint spillage and droppings, and stains promptly.
3. Do not use tools or cleaners, which will mar finish of item being cleaned.
4. Leave work and paint storage area clean and free of unnecessary accumulation of tools, equipment, surplus materials, and debris resulting from this work.

B. Correction of Defective Work:
1. Repair abraded, damaged, or incomplete paint surfaces by methods acceptable to Architect. Spot repairs to be well blended into adjacent work. For large repairs, re-coat entire plane or building element in which damaged area occurs.

2. Defaced surfaces of work not to be painted, shall be cleaned and their original finish restored.

C. Collect cotton waste, cloths, and material, which may constitute a fire hazard. Place in closed metal containers and remove daily from site.

3.09 SCHEDULE OF PAINT FINISHES – NEW SURFACES

A. Metal:
1. Shop Primed Structural Steel (Exposed on Building Exterior):
   a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Total DFT: 3.0 mils.
2. Shop Primed Structural Steel (Exposed on Building Interior):
   a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Total DFT: 3.0 mils.
3. Shop Primed Non-Structural Steel:
   a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Total DFT: 3.0 mils.
4. Galvanized Metal:
   a. Coat 1: Galvanized Metal Primer. Apply Coat 1 within 4 hours of preparation work completed.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
   d. Total DFT: 5.0 mils.
5. Factory Finished Products and Equipment (See Respective Specification Sections).
   a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Total DFT: 3.0 mils.
6. Visible Roof-Top Equipment: Paint per requirements of Factory Finished Products and Equipment or per Metal type.
7. Gas Piping:
   a. Coat 1: Rust Inhibitive Primer.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
   d. Total DFT: 5.0 mils.
8. Drinking Fountain Steel Pipe Guardrails:

a. 1 coat TGIC polyester powder coating. Coating application to be per coating manufacturer's printed instructions and recommendations.
b. Total DFT : 2.0-4.01 mils.

C. Concrete:
1. Concrete (Exterior):
a. Coat 1: Masonry Sealer.
b. Coat 2: Exterior Masonry Latex Enamel, Flat.
c. Coat 3: Exterior Masonry Latex Enamel, Flat.
d. Total DFT: 4.5 mils.
2. Concrete (Interior):
a. Coat 1: Masonry Sealer
b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
d. Total DFT: 4.5 mils.

D. Masonry:
1. Masonry (Exterior):
a. Coat 1: Standard Concrete Block Filler. DFT: 8.0 mils.
b. Coat 2: Exterior Masonry Latex Enamel, Flat.
c. Coat 3: Exterior Masonry Latex Enamel, Flat.
d. Total DFT Coats 2 and 3: 3.0 mils.
2. Masonry (Electrical Switch & Transformer Enclosure Interior Side):
a. Coat 1: Heavy Concrete Block Filler.
b. Coat 2: Solvent-Base Epoxy. DFT: 4.0 – 8.0 mils.
c. Coat 3: Solvent-Base Polyurethane, Gloss Finish. DFT: 2.0 – 3.0 mils.
3. Masonry (Interior):
a. Coat 1: Standard Concrete Block Filler. DFT: 8.0 mils.
b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
d. Total DFT Coats 2 and 3: 3.0 mils.

E. Plaster:
1. Plaster (Exterior):
a. Coat 1: Masonry Sealer.
b. Coat 2: Exterior Masonry Latex Enamel, Flat.
c. Coat 3: Exterior Masonry Latex Enamel, Flat.
d. Total DFT: 4.5 mils.

2. Plaster (Interior):
   a. Coat 1: Masonry Sealer.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
   d. Total DFT: 4.5 mils

F. Drywall:
1. Drywall (Typical):
   a. Coat 1: Gypsum Board Sealer.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss, Stipple Roller Finish.
   c. Coat 3: Acrylic Latex Enamel, Semi-Gloss, Stipple Roller Finish.
   d. Total DFT: 4.5 mils.
2. Drywall Receiving Pinboard:
   a. Coat 1: Gypsum Board Sealer.
   b. DFT: 1.5 mils.

G. Concrete Floor Sealer:
1. Coat 1: Floor Sealer. One gallon per 230-360 square feet.
2. Coat 2: Floor Sealer. One gallon per 300-350 square feet.

H. Court Striping on Wood Sports Flooring:
1. White Striping: 2 coats Acrylic Latex Striping Paint.
2. Yellow Striping: 1 coat white and 1 coat yellow Acrylic Latex Striping Paint.
3. Red Striping: 2 coats Acrylic Latex Striping Paint.
4. Blue, Black, and Green Striping: 1 coat Acrylic Latex Striping Paint.

3.10 SCHEDULE OF PAINT FINISHES – EXISTING SURFACES

A. General:
1. Refer to Paragraph 3.09 for required paint finishes on existing unpainted materials, products and equipment.
2. Existing surface mounted conduit and electrical boxes on surfaces called out to be painted are to be painted also.
3. Existing air distribution diffusers and returns on surfaces called out to be painted are to be painted also.

B. Metal:
1. Previously Painted Steel:
   a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Total DFT: 3.0 mils.

2. Galvanized Metal:
   a. Coat 1: Galvanized Metal Primer. Apply Coat 1 within 4 hours of Preparation work completion.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
   c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
   d. Total DFT: 5.0 mils.
3. Aluminum:
   a. Coat 1: Aluminum Primer.
   b. Coat 2: Acrylic Latex Enamel, Semi-Gloss. Apply Coat 2 within 48 hours of Primer application.
   c. Coat 3: Acrylic Latex Enamel, Semi-Gloss.
   d. Total DFT: 5.0 mils.

C. Concrete and Masonry:
   1. Previously Painted Concrete and Masonry (Exterior):
      a. Coat 1: Exterior Masonry Latex Enamel, Flat.
      b. Coat 2: Exterior Masonry Latex Enamel, Flat.
      c. Total DFT: 3.0 mils.
   2. Previously Painted Concrete and Masonry (Interior):
      a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
      b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
      c. Total DFT: 3.0 mils.

D. Plaster:
   1. Previously Painted Plaster (Exterior):
      a. Coat 1: Exterior Masonry Latex Enamel, Flat.
      b. Coat 2: Exterior Masonry Latex Enamel, Flat.
      c. Total DFT: 3.0 mils.
   2. Previously Painted Plaster (Interior):
      a. Coat 1: Acrylic Latex Enamel, Semi-Gloss.
      b. Coat 2: Acrylic Latex Enamel, Semi-Gloss.
      c. Total DFT: 3.0 mils.

E. Previously Painted Drywall:
   1. Coat 1: Acrylic Latex Enamel, Semi-Gloss, Stipple Roller Finish.
   2. Coat 2: Acrylic Latex Enamel, Semi-Gloss, Stipple Roller Finish.
   3. Total DFT: 3.0 mils.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:
   1. Plastic Signs:
      a. International accessibility symbol signs.
      b. Room capacity signs.
      c. Exit signs, unlighted.
      d. Room identification signs.
   2. Metal Signs:
      a. International accessibility symbol signs.
      b. Accessible parking entrance signs.
      c. Evacuation Map Signs (Extruded Aluminum)
      d. On-Premise Traffic Control Signage.

B. Related Work:
   1. Requirements in Addenda, Alternates, Conditions, and Division 1 collectively apply to this work.
   2. Finish Carpentry: Section 06 20 00.
   3. Steel Doors and Frames: Section 08 11 00.
   4. Wood Doors: Section 08 14 00.
   5. Finish Hardware: Section 08 71 00.
   6. Painting: Section 09 90 00.
   7. Metal Letters and Plaques: Section 10 14 16.

1.02 SUBSTITUTIONS

Only written approval of Architect, by Addenda or Change Order, will permit substitutions for materials specified. Refer to General Conditions and Section 01 25 13 - Product Options and Substitutions for procedure.

1.03 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies; Codes:
   1. State Fire Marshal, Title 19.
   2. International Building Code 2015 Edition (IBC).
      a. All signage shall conform to IBC Sections 11B-703.
      b. Tactile exit signage shall be provided per 2015 IBC Section 1011.4.
   3. Conform to State Regulations for standard Accessibility sign.
   4. Refer to Drawings for additional standards and graphics.

1.04 DESIGN REQUIREMENTS

A. Braille Symbols:
   1. Character Type: Characters on signs shall be raised 1/32" minimum and shall be sans serif uppercase characters accompanied by contracted Grade 2 Braille (see Note 5 below).
   2. Character Size: Raised characters shall be a minimum of 5/8" and a maximum of 2" high.
   3. Finish and Contrast: Contrast between characters, symbols and their background must be 70% minimum and have a non-glare finish. CBC 11B-703.5.1.
   4. Proportions: Characters on signs shall have a width-to-height ratio of between 3:5 and 1:1 and a stroke width-to-height ratio of between 1:5 and 1:10. CBC Table 11B-703.5.5.
      All letters measured must be uppercase. After choosing a typestyle to test, begin by printing the letters I, X, and O at 1" height. Place the template's 1:1 square over the X or O, whichever is narrower. If the character is not wider that 1", nor narrower than the 3:5 rectangle, the proportions are correct. Use the 1:5 rectangle to determine if the stroke of the I is too broad, and the 1:10 rectangle to see if it is to narrow. If all the tests are passed, the typestyle is complaint with proportion code.
   5. Braille: Contracted Grade 2 Braille shall be used whenever Braille is required in other portions of these standards. Dots shall be spaced 1/10" on center in each cell, with 3/10" space between cells, measured from the second column of dots in the first cell to the first column of dots in the second cell. Dots shall be raised a minimum of 1/40" above background. CBC Table 11B-703.3.1.
   6. Provide rounded or domed Contracted Grade 2 Braille dots, each distinct and separate. Dots with straight sides and flat tops are not readable for many Braille users and are not acceptable.

B. Type Imagery:
   1. Type style: Sans Serif upper case.
      a. Letter Size: See signage drawings.
      b. Number Size: See signage drawings.
      c. Raised Letters: Letters shall be raised a minimum of 1/32" above background.
      d. Other Sizes: As specifically indicated.
   2. Arrangement: Use standard spacing between letters, words, numbers and lines; center text.

C. Symbol Style: Recognized standard International Symbols of Accessibility, such as those developed by the American Institute of Graphics, for the U. S. Department of Transportation.
   1. Accessible Restrooms shall include a 6" high wheelchair logo. Logo shall be raised a minimum of 1/32" above the background.
   2. On visual signs, characters and symbols shall be sized according – to view distance. Signs mounted 80" or more AFF shall have minimum 3" high characters.
   3. Pictographs and ISA's (International Symbol of Accessibility) on interior signs at eye level, shall be minimum 3 " high or twice as high as the height of text on the sign; whichever is greater. On signs where bottom is 72" or more AFF, minimum height shall be 6" or twice as high as the largest text on the signs; whichever is greater.

D. Colors:
   1. Background Colors: As selected by the Architect from manufacturer's standard color range (12 colors maximum); one color maximum, typically.
   2. Type Imagery: White or black, as selected by Architect to contrast with background colors; one color maximum, each, for interiors and exteriors.
   3. Code Required Colors for Symbols and Signs: Where colors are mandated by Codes or Regulations conform to their requirements.
   4. Other colors: Certain colors are specifically noted.

1.05 SUBMITTALS

A. Samples: Provide full-size, with colors, materials, graphics and type imagery as specified herein. Provide one sign of each type, for approval by the Architect.

B. Product Data: Four (4) copies of manufacturer's standard brochure describing all items and materials, including manufacturer's standard color range.

C. Shop Drawings: Reference shop drawings to Architect's Drawings and mark numbers. Shop drawings shall list sign styles, lettering and locations. Submit four (4) copies.

1.06 PROJECT CONDITIONS

A. Verify type of supporting construction; provide suitable attachments.

B. Room Identification Signs: Coordinate with installation of other door-mounted identifying devices.

C. Do not install adhesive applied signs when ambient temperature is below 70°F. Maintain this minimum during and 24 hours after, installation of signs.

PART 2 - PRODUCTS

2.01 PLASTIC SIGNS

A. Manufacturers:
   1. Specified Manufacturer:
      a. Architectural Sign Identity, Inc.; 1247 S. Buena Vista Street, Suite E, San Jacinto, California 92583; (951)-654-4350.
   2. Acceptable Manufacturers:
      a. Best Manufacturing, Montrose, Colorado; 800-235-2378.
      b. Mohawk Sign Systems Inc.; P.O. Box 966, Schenectady, NY 12301; 800-223-7708 or approved equivalent.

B. Materials:
   1. Plastic Sign Material:
      a. Type: Phenolic Resin Core with a three-ply melamine resin surface.
      b. Thickness: 1/8".
   2. Adhesive: Pressure sensitive, hi-tack transfer tape with peel-back paper backing. Structural grade silicone adhesive for mounting on glazing.
   3 Mounting Screws: Non corrosive, tamperproof screws. Match finishes to the door hardware for the door where the signs are mounted.
   4. Signs shall be non-static, fire retardant, and self-extinguishing.

C. No. SP125 Manufacturing Specifications per specified manufacturer:
   1. Material thickness: 1/8".
   2. Standard sheet size: 48" x 96".
   3. Weight: 1/8" = 1 lb/ square foot.

4. Maximum continuous operating temperature: 225°F (107°C).
5. Flexural strength flat: 21,497 psi.
6. Tensile strength: 22,000 psi.
7. Shear strength: 22,729 psi.
8. NEMA rated "self-extinguishing".

D. Graphic Process and Fabrication: All signs shall be manufactured using "Sand-Etched Process" or equivalent system, as per acceptable manufacturers stated methods, whereby characters are integral part of signage body.
   1. Tactile characters shall be raised the required 1/32" from sign face. Glue-on letters, images and/or symbols are not acceptable.
   2. Work to have sharp clean profiles.
   3. Text shall be accompanied by Contracted Grade 2 Braille. Braille shall be separated 3/8" min. and 1/2" max. from corresponding raised characters or symbols.
   4. Perimeter borders shall be 3/8" minimum.
   5. Edges: Finish edges smooth and clean, without chips or burrs.
   6. Corners: Provide radius corners; 1/8" diameter.
   7. Cut-outs For Hardware: Factory made, accurately, to templates.
   8. Mounting Holes: Factory drilled.
   9. Adhesive Backing: Completely cover rear surface of each sign.

E. Room Identification Signs:
   1. Refer to Drawings for names, numbers, identification symbols, sizes, configurations, and locations.
   2. Colors for Type Imagery:
      a. Room Name Signs:
         1) Type: Black or white, to be selected by Architect.
         2) Background: One color to be selected by the Architect from manufacturer's standard color range (12 colors, minimum) for interior signs, unless otherwise noted. Refer to signage schedule.
      b. Room Number Signs:
         1) Type: Black or white, to be selected by Architect.
         2) Background: One color to be selected by the Architect from manufacturer's standard color range (12 colors, minimum) for interior signs, unless otherwise noted. Refer to signage schedule.
      c. Architect shall select a second color for signs located on exterior.

F. Accessibility Symbol Signs:
   1. Refer to Drawings for identification symbols, sizes, configuration, and locations.
   2. Figure Symbols for Building Entrance Signs:
      a. Size: 6" x 6", typically.
      b. Refer to Drawings.
   3. Geometric Symbols for Toilet Rooms:
      a. For Men/Boys: An equilateral triangle, 10" on a side; 1/8" thick.
      b. For Women/Girls: A 12" diameter circle; 1/8" thick.
      c. For Both Sexes: An equilateral triangle, 10" on a side, inlayed in 12" diameter circle; 1/8 thickness.
   4. Directional Signs.
   5. International Symbol for Access for the hearing impaired.
   6. Colors for Symbols:
      a. International Accessibility Symbols:
         1) Symbols: White.
         2) Background: Blue, Color No. 15090 per Federal Standard 595B.
      b. Male and Female Symbols:
         1) Symbols: Blue.
         2) Background: White.

G. Room Capacity Signs:
   1. Wording for sign at Assembly Room at Multi-Purpose Building: See Plans and Signage drawings. Number to be on Drawings or provided by Architect.
   2. Refer to Drawings for identification.

2.02 EXIT SIGNS; FLOOR LEVEL, SELF-LUMINOUS

A. General:
1. Conform to State Fire Marshal, Title 19.
2. UL listed 924 Floor-level exit signs.
3. UL listed 1994 floor-level exit markers and exit path marking.
4. ICC No. ESR-14-09.

B. Refer to Drawings for identification, symbols, sizes, configuration, and location.

C. Mounting Locations: Single-face for flat-to-wall mounting.

D. Acceptable Manufacturer and Product: Active Safety; Murray, Utah; 800-657-6324; Model #16.000 SWMA stencil-faced Exit Marker, or approved equivalent.

2.03 METAL SIGNS

A. Materials: Reflectorized sign shall be porcelain on steel with beaded text, galvanized steel post, and concrete footing.

B. International Accessibility Symbol Signs:
1. Types:
a. Accessible Parking Stall Signs.
b. Building Entrance Signs.
2. Refer to Drawings for identification symbols, size, configuration, and locations.

C. Accessible Parking Entrance (Tow-Away) Signs: Refer to Drawings for size, text, configuration, and locations.

D. On-Premise Traffic Control Signs:
1. Stop Signs shall be 24" high x 18 gauge thick, flat non-reflective steel and sprayed with a baked-on polyester powder coated paint as manufactured by Street Signs U.S.A.; 800-234-8797 or approved equivalent.
2. Signs shall be provided with mounting holes, centered top and bottom. Contractor shall provide stainless steel mounting fasteners and brackets as may be required to attach signs. Mount where shown on the drawings.

E. Evacuation Map Signs:
1. Sign shall be PictoGlow EvacMap, vista modular curved frame casement as manufactured by PictoGraphix Inc., 800-504-3822 or approved equivalent.
2. Sign Components:
a. Extruded anodized brushed aluminum sign casement with a thickness of 2mm dimensional curved profile. Color to be natural mill finish.
b. Protective Cover: Clear non-glare plastic cover with Lexan or PETG with a 1mm thickness luminous insert.
c. Aluminum end-caps, pre-drilled with a 3mm thickness.
3. Refer to Drawings for sign locations and configuration.

4. Photo-luminescent pigment PVC vinyl compound sheet with adhesive back.
   a. Printing Method: Silkscreen printing.
   b. Luminescent Properties: Yellowish green glowing color with brightness of afterglow of 12 hours (according to DIN6210, Part 1)
   c. Flame Retardant: 27
   d. Thickness: 0.79mm (luminous film of 0.63mm plus self-adhesive backing of 0.04mm).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means installer accepts existing surfaces.

3.02 PREPARATION

Layout: Accurately lay out work to maintain proper lines, levels and spacing.

3.03 INSTALLATION

A. Mounting:
   1. Press tape firmly to mounting surface, and secure each plaque or sign with minimum two screws.
   2. When mounting on glazing, press silicone adhesive firmly to glazing. Clean excess adhesive from glazing.

B. Signs Mounted at Doors:
   1. Mount following signs on room doors.
      a. Toilet Rooms: Accessibility geometric symbol signs. Mount with centerline of sign 60" above finish floor.
   2. Mount following signs or plaques adjacent to latch-side of doors:
      a. Room Accessibility Sign.
      b. Room Identification signs mounted with centerline of sign 60" A.F.F.
      c. Room Capacity Signs: Mount on wall in visible location as directed by the Architect.
      d. Exit Signs, self-luminous: Mount on wall adjacent to the exit.

3.04 SCHEDULE

A. Plastic Accessibility Symbol Signs:
   1. Figure Symbols (Building Entrance Signs, Directional Signs and International Symbol of Access for the Hearing Impaired): Locate where indicated on the Drawings.
   2. Geometric Symbols (Toilet Room Signs): Locate one for each Accessible Toilet Room.

B. Room Capacity Sign: Locate one sign in Assembly Room at Multi-Purpose Building, and where indicated on Drawings.

C. Exit Signs (self-luminous): Locate at each exit door to the exterior and at each interior door when an exit light is shown.

D. Metal Accessibility Symbol Signs:
   1. Accessible Parking Stall Signs: Locate where indicated on the Drawings.
   2. Building Signs: Locate where indicated on the Drawings.
   3. Lockers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Standalone daylight-harvesting switching controls.
4. Indoor occupancy sensors.
5. Emergency shunt relays.

B. Related Requirements:

1. Section 26 27 26 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.
2. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

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

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Invensys Controls.
4. Leviton Mfg. Company Inc.
5. NSi Industries LLC; TORK Products.
6. Tyco Electronics; ALR Brand.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: DPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.
4. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
5. Astronomic Time: All channels.
6. Automatic daylight savings time changeover.
7. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

C. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration: DPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.

4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
5. Astronomic time dial.
6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
7. Skip-a-day mode.
8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2 DAYLIGHT-HARVESTING SWITCHING CONTROLS

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

1. Cooper Industries, Inc.
2. Eaton Corporation.
3. Hubbell Building Automation, Inc.
4. Leviton Mfg. Company Inc.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. NSi Industries LLC; TORK Products.
7. Sensor Switch, Inc.
8. Tyco Electronics; ALR Brand.
9. Watt Stopper.

B. Ceiling-Mounted Switching Controls: Solid-state, light-level sensor unit, with separate power pack, to detect changes in indoor lighting levels that are perceived by the eye.

C. Electrical Components, Devices, and Accessories:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Sensor Output: Contacts rated to operate the associated power pack, complying with UL 773A. Sensor is powered by the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac.

Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

5. General Space Sensors Light-Level Monitoring Range: 10 to 200 fc, with an adjustment for turn-on and turn-off levels within that range.
6. Atrium Space Sensors Light-Level Monitoring Range: 100 to 1000 fc, with an adjustment for turn-on and turn-off levels within that range.
7. Skylight Sensors Light-Level Monitoring Range: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
8. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling.
9. Set-Point Adjustment: Equip with deadband adjustment of 25, 50, and 75 percent above the "on" set point, or provide with separate adjustable "on" and "off" set points.
10. Test Mode: User selectable, overriding programmed time delay to allow settings check.
11. Control Load Status: User selectable to confirm that load wiring is correct.
12. Indicator: Two digital displays to indicate the beginning of on-off cycles.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS

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

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. Watt Stopper.

B. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.

1. Lighting control set point is based on two lighting conditions:

   a. When no daylight is present (target level).
   b. When significant daylight is present.

2. System programming is done with two hand-held, remote-control tools.

a. Initial setup tool.
b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.

C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with separate controller unit, to detect changes in lighting levels that are perceived by the eye.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Sensor Output: 0- to 10-V dc to operate electronic dimming ballasts. Sensor is powered by controller unit.
3. Power Pack: Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
4. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc.

2.4 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. Lightolier Controls.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. Lutron Electronics Co., Inc.
7. NSi Industries LLC; TORK Products.
8. RAB Lighting.
9. Sensor Switch, Inc.
10. Square D; a brand of Schneider Electric.
11. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied;

with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy .

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.

2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.5 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

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

1. Bryant Electric; a Hubbell company.
2. Cooper Industries, Inc.
3. Hubbell Building Automation, Inc.
4. Leviton Mfg. Company Inc.
5. Lightolier Controls.
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Lutron Electronics Co., Inc.

8. NSi Industries LLC; TORK Products.
9. RAB Lighting.
10. Sensor Switch, Inc.
11. Square D; a brand of Schneider Electric.
12. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 2100 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: SP, dual circuit. SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

D. Wall-Switch Sensor Tag WS2:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.

3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.6 EMERGENCY SHUNT RELAY

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

1. Lighting Control and Design; Acuity Lighting Group, Inc.
2. Watt Stopper.

B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual [**or automatic**]switching contacts; complying with UL 924.

1. Coil Rating: [**120**] [**277**] V.

2.7 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller thanNo. 14 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Lighting control devices will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.7 DEMONSTRATION

A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems specified in Section 26 09 43.13 "Addressable-Fixture Lighting Controls" and Section 26 09 43.23 "Relay-Based Lighting Controls."

B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 26 09 43.23
RELAY-BASED LIGHTING CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes: Lighting control panels using mechanically held relays for switching.

B. Section Includes: Networked lighting control panels using control-voltage relays for switching and that are interoperable with BAS.

1.03 DEFINITIONS

A. BAS: Building automation system.

B. IP: Internet protocol.

C. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

D. PC: Personal computer; sometimes plural as "PCs."

E. RS-485: A serial network protocol, similar to RS-232, complying with TIA-485-A.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for control modules, power distribution components, relays, manual switches and plates, and conductors and cables.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each relay panel and related equipment.
   1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
   2. Detail enclosure types and details for types other than NEMA 250, Type 1.
   3. Detail wiring partition configuration, current, and voltage ratings.
   4. Short-circuit current rating of relays.
   5. Include diagrams for power, signal, and control wiring.
   6. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.

1.05 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.
   1. Show interconnecting signal and control wiring, and interface devices that prove compatibility of inputs and outputs.
   2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices comply with interoperability requirements of the network protocol.

B. Qualification Data: For testing agency.

C. Field quality-control reports.

D. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.

E. Sample Warranty: For manufacturer's special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On magnetic media or compact disk, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Lighting Control Relays: Equal to 10 percent of amount installed for each size indicated, but no fewer than 24.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Handle and prepare panels for installation according to NECA 407.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Input signal from field-mounted manual switches, or digital signal sources, shall open or close one or more lighting control relays in the lighting control panels. Any combination of inputs shall be programmable to any number of control relays.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

D. Comply with UL 916.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Lighting control panels shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Component Importance Factor: 1.5.

B. BAS Interface: Provide hardware and software to enable the BAS to monitor, control, display, and record data for use in processing reports.
   1. Communication Interface: Comply with ASHRAE 135. The communication interface shall enable the BAS operator to remotely control and monitor lighting from a BAS operator workstation. Control features and monitoring points displayed locally at lighting panel shall be available through the BAS.

2.03 LIGHTING CONTROL RELAY PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Acuity Brands, Inc.; Lighting Control & Design, Inc.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Leviton Mfg. Company Inc.
   4. Lightolier Controls; a Philips Group brand.
   5. Siemens Energy & Automation, Inc.
   6. Touch-Plate Technologies.
   7. WattStopper; a Legrand Group brand.

B. Description: Standalone lighting control panel using UL 924 listed relays to control lighting and appliances.

C. Lighting Control Panel:
   1. A single enclosure with incoming lighting branch circuits, control circuits, switching relays, and on-board timing and control unit.
   2. A vertical barrier separating branch circuits from control wiring.

D. Control Unit: Contain the power supply and electronic control for operating and monitoring individual relays.
   1. Timing Unit:
      a. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.
      b. Clock configurable for 12-hour (A.M./P.M.) or 24-hour format.
      c. Four independent schedules, each having 24 time periods.
      d. Schedule periods settable to the minute.
      e. Day-of-week, day-of-month, day-of-year with one-time or repeating capability.
      f. 10 special date periods.
   2. Sequencing Control with Override:
      a. Automatic sequenced on and off switching of selected relays at times set at the timing unit, allowing timed overrides from external switches.
      b. Sequencing control shall operate relays one at a time, completing the operation of all connected relays in not more than 10 seconds.
      c. Override control shall allow any relay connected to it to be switched on or off by a field-deployed manual switch or by an automatic switch, such as an occupancy sensor.
      d. Override control "blink warning" shall warn occupants approximately five minutes before actuating the off sequence.
   3. Nonvolatile memory shall retain all setup configurations. After a power failure, the controller shall automatically reboot and return to normal system operation, including accurate time of day and date.

E. Relays: Electrically operated, single-pole switch, rated at 20 A at 120-V tungsten, 30 A at 277-V ballast, 1.5 hp at 120 V, and 3 hp at 277 V. Short-circuit current rating shall be not less than 14 kA. Control shall be three-wire, 24-V ac.

F. Power Supply: NFPA 70, Class 2, sized for connected equipment, plus 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, low-voltage inputs, field-installed occupancy sensors, and photo sensors.

G. Operator Interface:
   1. Integral alphanumeric keypad and digital display, and intuitive drop-down menus to assist in programming.
   2. Log and display relay on-time.
   3. Connect relays to one or more time and sequencing schemes.

2.04 NETWORKED LIGHTING CONTROL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Acuity Brands, Inc.; Lighting Control & Design, Inc.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Touch-Plate Technologies.
   4. WattStopper; a Legrand Group brand.
   5. Crestron

B. Description: Lighting control panels using UL 924 listed relays to control lighting and appliances. The panels shall be capable of being inter-connected with digital communications to appear to the operator as a single lighting control system.

C. Lighting Control Panels:
   1. A single enclosure with incoming lighting branch circuits, control circuits, switching relays, and on-board timing and control unit.
   2. A vertical barrier separating branch circuits from control wiring and between 120 volts and 277 volt circuits.

D. Main Control Unit: Installed in the main lighting control panel only; powered from the branch circuit of the standard control unit.
   1. Ethernet Communications: Comply with MS Windows TCP/IP protocol. The main control unit shall provide for programming of all control functions of the main and all networked slave lighting control panels including timing, sequencing, and overriding.
   2. Compliance with ASHRAE 135: Controllers shall support serial MS/TP and Ethernet IP communications, and shall be able to communicate directly via BAS RS-485 serial networks and Ethernet 10Base-T networks as a native device.

3. Web Server: Display information listed below over a standard Web-enabled server for displaying information over a standard browser.
   a. A secure, password-protected login screen for modifying operational parameters, accessible to authorized users via Web page interface.
   b. Panel summary showing the master and slave panels connected to the controller.
   c. Controller diagnostic information.
   d. Show front panel mimic screens for setting up controller parameters, input types, zones, and operating schedules. These mimic screens shall also allow direct breaker control and zone overrides.
4. Timing Unit:
   a. 365-day calendar, astronomical clock, and automatic adjustments for daylight savings and leap year.
   b. Clock configurable for 12-hour (A.M./P.M.) or 24-hour format.
   c. Four independent schedules, each having 24 time periods.
   d. Schedule periods settable to the minute.
   e. Day-of-week, day-of-month, day-of-year with one-time or repeating capability.
   f. 16 special date periods.
5. Time Synchronization: The timing unit shall be updated not less than every 12 hour(s) with the network time server.
6. Sequencing Control with Override:
   a. Automatic sequenced on and off switching of selected relays at times set at the timing unit, allowing timed overrides from external switches.
   b. Sequencing control shall operate relays one at a time, completing the operation of all connected relays in not more than 10 seconds.
   c. Override control shall allow any relay connected to it to be switched on or off by a field-deployed manual switch or by an automatic switch, such as an occupancy sensor.
   d. Override control "blinking warning" shall warn occupants approximately five minutes before actuating the off sequence.
   e. Activity log, storing previous relay operation, including the time and cause of the change of status.
   f. Download firmware to the latest version offered by manufacturer.

E. Standard Control Unit, Installed in All Lighting Control Panels: Contain electronic controls for programming the operation of the relays in the control panel, contain the status of relays, and contain communications link to enable the digital functions of the main control unit. Comply with UL 916.
   1. Electronic control for operating and monitoring individual relays, and display relay on-time.
   2. Nonvolatile memory shall retain all setup configurations. After a power failure, the controller shall automatically reboot and return to normal system operation.
   3. Integral keypad and digital-display front panel for local setup, including the following:
      a. Blink notice, time adjustable from software.
      b. Ability to log and display relay on-time.
      c. Capability for accepting downloadable firmware so that the latest production features may be added in the future without replacing the module.

F. Relays: Electrically operated, single-pole switch, rated at 20 A at 120-V tungsten, 30 A at 277-V ballast, 1.5 hp at 120 V, and 3 hp at 277 V. Short-circuit current rating shall be not less than 14 kA. Control shall be three-wire, 24-V ac.

G. Power Supply: NFPA 70, Class 2, UL listed, sized for connected equipment, plus not less than 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, low-voltage inputs, field-installed occupancy sensors, and low-voltage photo sensors.

H. Operator Interface: At the main control unit, provide interface for a tethered connection of a portable PC running MS Windows for configuring all networked lighting control panels using setup software designed for the specified operating system. Include one portable device for initial programming of the system and training of Owner's personnel. That device shall remain the property of Owner.

I. Software:
   1. Menu-driven data entry.
   2. Online and offline programming and editing.

3. Provide for entry of the room or space designation for the load side of each relay.
4. Monitor and control all relays, showing actual relay state and the name of the automatic actuating control, if any.
5. Size the software appropriate to the system.

2.05 MANUAL SWITCHES AND PLATES

A. Push-Button Switches: Modular, momentary contact, three wire, for operating one or more relays and to override automatic controls.
   1. Match color and style specified in Section 262726 "Wiring Devices."
   2. Integral green LED pilot light to indicate when circuit is on.
   3. Internal white LED locator light to illuminate when circuit is off.

B. Wall Plates: Single and multigang plates as specified in Section 262726 "Wiring Devices."

C. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

2.06 FIELD-MOUNTED SIGNAL SOURCES

A. Daylight Harvesting Switching Controls: Comply with Section 260923 "Lighting Control Devices." Control power may be taken from the lighting control panel, and signal shall be compatible with the relays.

B. Indoor Occupancy Sensors: Comply with Section 260923 "Lighting Control Devices." Control power may be taken from the lighting control panel, and signal shall be compatible with the relays.

2.07 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Digital and Multiplexed Signal Cables: Unshielded, twisted-pair cable with copper conductors, complying with TIA/EIA-568-B.2, Category 5e for horizontal copper cable and with Section 271500 "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.01 EXAMINATION

A. Receive, inspect, handle, and store panels according to NECA 407.

B. Examine panels before installation. Reject panels that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panels for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 WIRING INSTALLATION

A. Comply with NECA 1.

B. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
   1. Install plenum cable in environmental air spaces, including plenum ceilings.
   2. Comply with requirements for cable trays specified in Section 260536 "Cable Trays for Electrical Systems."
   3. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.03 PANEL INSTALLATION

A. Comply with NECA 1.

B. Install panels and accessories according to NECA 407.

C. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

D. Mount top of trim 90 inches above finished floor unless otherwise indicated.

E. Mount panel cabinet plumb and rigid without distortion of box.

F. Install filler plates in unused spaces.

3.04 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

C. Create a directory to indicate loads served by each relay; incorporate Owner's final room designations. Obtain approval before installing. Use a PC or typewriter to create directory; handwritten directories are unacceptable.

D. Lighting Control Panel Nameplates: Label each panel with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Acceptance Testing Preparation:
   1. Test continuity of each circuit.

E. Lighting control panel will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies lighting control panels and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.06 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Confirm correct communications wiring, initiate communications between panels, and program the lighting control system according to approved configuration schedules, time-of-day schedules, and input override assignments.

3.07 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.08 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.09 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the control unit and operator interface.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge-suppression units.
4. Isolated-ground receptacles.
5. Weather-resistant receptacles.
6. Wall-switch and exterior occupancy sensors.
7. Communications outlets.
8. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Service/Power Poles: One for every 10, but no fewer than one.
2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.
4. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; IG5362RN.
b. Hubbell; IG5362.
c. Leviton; 5362-IG.
d. Pass & Seymour; IG5362.

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; GFTR20.
b. Pass & Seymour; 2095TR.

2.5 TVSS RECEPTACLES

A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.

1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."

B. Duplex TVSS Convenience Receptacles:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 5362BLS.
b. Hubbell; HBL5362SA.
c. Leviton; 5380.Pass & Seymour; 5362BLSP.

2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.

C. Isolated-Ground, Duplex Convenience Receptacles:

1. Description:

a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; CWL520R.
b. Hubbell; HBL2310.
c. Leviton; 2310.
d. Pass & Seymour; L520-R.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:

1. Description:

a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Single Pole:

2) Cooper; AH1221.
3) Hubbell; HBL1221.
4) Leviton; 1221-2.
5) Pass & Seymour; CSB20AC1.

6) Two Pole:

7) Cooper; AH1222.
8) Hubbell; HBL1222.
9) Leviton; 1222-2.
10) Pass & Seymour; CSB20AC2.

11) Three Way:

12) Cooper; AH1223.
13) Hubbell; HBL1223.
14) Leviton; 1223-2.
15) Pass & Seymour; CSB20AC3.

16) Four Way:

17) Cooper; AH1224.
18) Hubbell; HBL1224.
19) Leviton; 1224-2.
20) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; AH1221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements,

a. Cooper; 1995L.
b. Hubbell; HBL1557L.

c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.8 DECORATOR-STYLE DEVICES

.

A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 6252.
b. Hubbell; DR15.
c. Leviton; 16252.
d. Pass & Seymour; 26252.

B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

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1. Products: Subject to compliance with requirements,:

a. Cooper; TR6252.
b. Hubbell; DR15TR.
c. Pass & Seymour; TR26252.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; TWRBR15.
b. Hubbell; DR15TR.
c. LevitonTRW15.
d. Pass & Seymour; TRW26252.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.

D. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; VGF15.
b. Hubbell; GF15LA.
c. Leviton; 8599.
d. Pass & Seymour; 1594.

E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; TWRVGF15.
b. Hubbell; GFTR15.
c. Pass & Seymour; 1594TRWR.

2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

F. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Cooper; 7621 (single pole), 7623 (three way).
   b. Hubbell; DS115 (single pole), DS315 (three way).
   c. Leviton; 5621-2 (single pole), 5623-2 (three way).
   d. Pass & Seymour; 2621 (single pole), 2623 (three way).

G. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.

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1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Cooper; 7631 (single pole), 7633 (three way).
   b. Hubbell; DS120IL (single pole), DS320 (three way).
   c. Leviton; 5631-2 (single pole), 5633-2 (three way).
   d. Pass & Seymour; 2625 (single pole), 2626 (three way).

2. Description: With neon-lighted handle, illuminated when switch is "off."

2.9 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for UTP cable complying with requirements in Section 27 15 00 "Communications Horizontal Cabling."

2.11 PREFABRICATED MULTIOUTLET ASSEMBLIES

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

1. Hubbell Incorporated; Wiring Device-Kellems.
2. Wiremold/Legrand.

B. Description:

1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: PVC.

D. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: 9 inches.

3. Wiring: No. 12 AWG solid, Type THHN copper, two circuit, connecting alternating receptacles.

2.12 SERVICE POLES

A. Description:

1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
2. Poles: Nominal 2.5-inch- square cross section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.
3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
4. Finishes: Satin-anodized aluminum.
5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.
6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.
7. Voice and Data Communication Outlets: Four RJ-45 jacks complying with requirements in Section 27 15 00 "Communications Horizontal Cabling."

2.13 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: White <**Insert color**> unless otherwise indicated or required by NFPA 70 or device listing.
2. TVSS Devices: Blue.
3. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 26 05 53 "Identification for Electrical Systems."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:

1. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 26 09 36 "Modular Dimming Controls" for architectural dimming systems.
3. Section 26 09 43.13 "Addressable-Fixture Lighting Controls" and Section 26 09 43.23 "Relay-Based Lighting Controls" for manual or programmable control systems with low-voltage control wiring or data communication circuits.
4. Section 26 27 26 "Wiring Devices" for manual wall-box dimmers for incandescent lamps.
5. Section 26 55 61 "Theatrical Lighting" for theatrical lighting fixtures and their controls.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast, including BF.
4. Energy-efficiency data.
5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.
b. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: For each lighting fixture indicated in the Interior Lighting Fixture Schedule. Each Sample shall include the following:

1. Lamps and ballasts, installed.
2. Cords and plugs.
3. Pendant support system.

D. Installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.
4. Ceiling-mounted projectors.
5. Structural members to which suspension systems for lighting fixtures will be attached.
6. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.

7. Perimeter moldings.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Fluorescent-fixture-mounted, emergency battery pack: One for every 20 emergency lighting unit.
4. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
5. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of fixtures for mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.

2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

H. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

I. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Section 23 37 00 "Diffusers, Registers, and Grilles."

1. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
2. Heat-Removal Units: Air path leads through lamp cavity.
3. Combination Heat-Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air-supply units.
4. Dampers: Operable from outside fixture for control of return-air volume.
5. Static Fixture: Air-supply slots are blanked off, and fixture appearance matches active units.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

1. Comply with UL 935 and with ANSI C82.11.
2. Designed for type and quantity of lamps served.
3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: Less than 10 percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Operating Frequency: 42 kHz or higher.
8. Lamp Current Crest Factor: 1.7 or less.
9. BF: 1.00 or higher.
10. Power Factor: 0.98 or higher.
11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T8 Lamps: Comply with ANSI C82.11 and the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.

D. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

1. Ballast Manufacturer Certification: Indicated by label.

E. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

F. Ballasts for Low-Temperature Environments:

1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.

2. Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.

G. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

H. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

2.4 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

2.5 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Operate one fluorescent lamp(s) continuously at an output of 1400 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Nightlight Connection: Operate one fluorescent lamp continuously.
3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
6. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, two for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
    g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.7 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.

B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.

C. Compact Fluorescent Lamps: 4-Pin, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 57 W: T4, triple tube, rated 4300 initial lumens (minimum).
7. 70 W: T4, triple tube, rated 5200 initial lumens (minimum).

2.8 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

D. Suspended Lighting Fixture Support:

E. adjustment.

F. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION

Appendix C

QAPP Amendment Log Form and Completed Forms

A & M Engineering and Environmental Services, Inc.
Consulting - Design - Construction - Remediation

QAPP Amendment Log Form

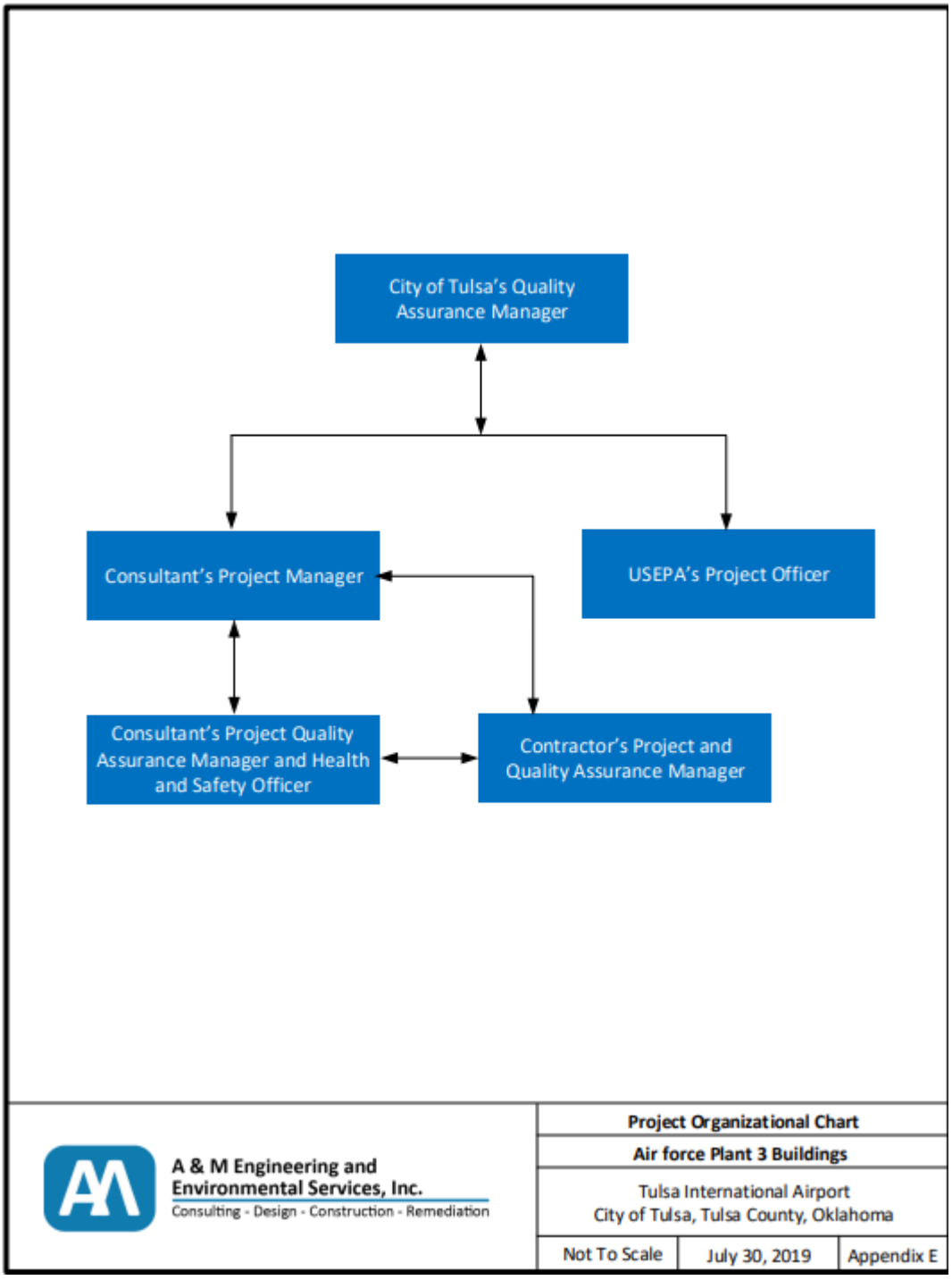
Asbestos Abatement
Air Force Plant 3, Building 6
Tulsa International Airport
City of Tulsa, Tulsa County, Oklahoma 74104

Number	Dates Completed	Descriptions	Amended By (Names)	Sections Affected	Approved by all Project Distribution Listed Individuals
1	Feb 2022	Modified for use with bid docs for Building 7 abatement	Michelle Barnett	Footer Section 3 App B	☒ Yes
2					☐ Yes
3					☐ Yes
4					☐ Yes
5					☐ Yes
6					☐ Yes
7					☐ Yes

Please attach amendment support documentation, as necessary.

Appendix D

Project Organizational Chart



A & M Engineering and Environmental Services, Inc.
Consulting - Design - Construction - Remediation

Project Organizational Chart
Air force Plant 3 Buildings
Tulsa International Airport
City of Tulsa, Tulsa County, Oklahoma

Not To Scale	July 30, 2019	Appendix E

Appendix E

Air Monitoring Data Form

Project: T Cass. Dia = 25 mm PF = 50 Field of View = 0.00785 Pg 1 OF 1

Pump Number	Sample Number	Date Sampled	Time 1 On-Off	Time 2 On-Off	Collection Information	TYP	Pers Exp.	Flow Rate (L/M) Pre	Post	Avg.	Fiber Count	Field Count	Ttl. Time (Min.)	Volume (Liters)	Fiber Density	Fibers Per CC	Det. Limit	LCL	UCL
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA #DIV/0!	NA	NA
										0.00			0	0.0	#DIV/0!	NA	NA	NA	NA

ANALYST PARTICIPATING IN LAB AIHA - 101532 NIOSH 7400 METHOD 7/1/2010

NC = Not Counted. Reasons: 1. Overload; 2. Damaged Filter; 3. Pump Failure; 4. Missing Filter REV 1

Rotometer Number:

Calibration Date:

I hereby certify that the above samples were collected and analyzed in compliance with applicable standards and regulations.

Technician:
Location:
Contractor:
Project Number: