

PROJECT MANUAL

Village of Oak Park
123 Madison Street,
Oak Park, IL 60302

Police Department Firing Range Ventilation Improvements

Date: July 22, 2020

Request for Proposals

Clark Dietz: Project No. 00400020

Clark Dietz, Inc.
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Professional Consulting and Design Services

Clark>Dietz
Engineering Quality of Life™

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POLICE DEPARTMENT FIRING RANGE VENTILATION IMPROVEMENTS
OAK PARK, IL**

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REQUEST FOR PROPOSALS
INSTRUCTIONS AND SPECIFICATIONS FOR:

Village of Oak Park Police Department Firing Range Ventilation Improvements
Proposal Number: 20-135
Issuance Date: 7/22/2020

The Village of Oak Park will receive proposals from qualified mechanical HVAC contractors to install an upgraded ventilation system for the Oak Park Police Department firing range. In-person delivery of proposals is not available at this time. Proposals may be submitted via US mail to the Public Works Center, 201 South Blvd., Oak Park, IL 60302, or electronically to vics@oak-park.us and are due by 10:00 a.m. local time on Friday, August 14th, 2020. Proposals will be reviewed by Oak Park staff and the design firm and the results of the review will be presented to the Village Board of Trustees of the Village of Oak Park.

There will be a pre-bid meeting on Thursday, July 30th, 2020 at 9:00 a.m. at the Oak Park Police Dept. main lobby in the lower level of Village Hall located at 123 Madison St., Oak Park, IL 60302.

Specifications and proposal forms may be obtained by calling 708-358-5710 or by e-mail request to vics@oak-park.us.

The Board of Trustees reserves the right to accept or reject any and all proposals or to waive technicalities, or to accept any item of any proposal.

Do not detach any portion of this document. Upon formal award to the successful contractor, a written agreement will be executed in substantially the form attached.

In responding to this Request for Proposals, the official logo of the Village of Oak Park is not to be used in any form. Use of the Village logo is strictly prohibited by law and such use could subject the proposer to disqualification.

Submission of Proposals

The proposal shall be submitted on the proposal form included herewith. The proposal shall be submitted in a sealed envelope and shall bear the return address of the contractor, and shall be addressed as follows:

TO: Vic Sabaliauskas, Building Maintenance Superintendent
Department of Public Works
201 South Blvd.
Oak Park, IL 60302

SECTION I
PROPOSAL INSTRUCTIONS, TERMS AND CONDITIONS and REFERENCES

Preparation and Submission of Proposal

All proposals must be submitted by the specific day and time indicated on the cover page. Proposals arriving after the specified time will not be accepted. Mailed proposals that are received by the Village after the specified hour will not be accepted regardless of the post-marked time on the envelope. Proposals must be signed by an officer of the company who is authorized to enter into agreements on behalf of the company. Proposals shall be sealed in an envelope and marked as stated on the cover page.

Proposal Bond

The contractor shall provide a proposal bond in the amount of ten percent (10%) of the total proposal price. The attached form may be used or the contractor may provide cash or a certified check in the amount specified. The proposal bonds, cash or checks will be returned once the selected contractor has entered into an agreement for this work and provided the Contract bond in an amount of one hundred percent (100%) of the total approved proposal price.

Contract Bond

The successful contractor shall, within ten (10) calendar days after award of the Proposal, furnish a contract bond in the amount of one hundred percent (100%) of the contract price. The bond shall ensure faithful performance of the work, and the payment for materials, labor and of the subcontractors. The bond shall be with a surety or sureties with a rating of "A" or better by A.M. Best and Company and such sureties shall be approved by the Village. Bonds in the form of certified or cashier's check shall be made payable to the Village of Oak Park, Illinois. The contract bond shall be furnished in the same number of copies as the number of copies of the agreement to be executed.

Award of Agreement

The agreement will be awarded in whole or in part to the responsible contractor whose proposal, conforming to the request for proposals, will be most advantageous to the Village; price and other factors considered.

Costs of Preparation

The Village will not be responsible for any expenses incurred in preparing and submitting a proposal or entering into the applicable agreement.

Taxes not Applicable

The Village of Oak Park as an Illinois municipality pays neither Illinois Sales Tax nor Federal Excise Tax (State Tax Exemption Identification Number E9998-1823-06). Contractors should exclude these taxes from their prices.

Withdrawal of Proposals

Any contractor may withdraw its proposal at any time prior to the time specified in the advertisement as the closing time for the receipt of proposals, by signing a request therefore. No contractor may withdraw or cancel its proposal for a period of sixty (60)

calendar days after the advertised closing time for the receipt of proposals. The successful contractor may not withdraw or cancel its proposal after having been notified that the proposal was accepted by the Village Board of Trustees.

Investigation of Contractors

The Village will make such investigations as are necessary to determine the ability of the contractor to fulfill proposal requirements. If requested, the contractor should be prepared to present evidence to the Village of Oak Park of ability and possession of necessary facilities and financial resources to comply with the terms of the attached specifications and proposals. In addition, the contractor shall furnish the Village with any information the Village may request, and shall be prepared to show completed work of a similar nature to that included in its proposal. The Village reserves the right to visit and inspect the premises and operation of any contractor.

Rejection of Contractor

The Village will reject any proposal from any person, firm or corporation that appears to be in default or arrears on any debt, agreement or the payment of any taxes. The Village will reject any proposal from a contractor that failed to satisfactorily complete work for the Village under any previous agreement.

Conditions

Contractors are advised to become familiar with all conditions, instructions and specifications governing the work. Contractors shall be presumed to have investigated the work site, conditions and scope of the work before submitting a proposal.

Compliance with Applicable Laws

The contractor will strictly comply with all ordinances of the Village of Oak Park and Village Code and laws of the State of Illinois.

Governing Law

All agreements entered into by the Village of Oak Park are governed by the laws of the State of Illinois without regard to conflicts of law. Any action brought to enforce an agreement with the Village of Oak Park must be brought in the state and federal courts located in Cook County, Illinois.

Subletting of Agreement

No agreement awarded by the Village of Oak Park shall be assigned or any part sub-agreement without the written consent of the Village of Oak Park or as noted in the contractor's proposal. In no case shall such consent relieve the contractor from its obligations or change the terms of the agreement.

Interpretation of Agreement Documents

Any contractor with a question about this proposal may request an interpretation thereof from the Village. If the Village changes the proposal, either by clarifying it or by changing the specifications, the Village will issue a written addendum, and will mail a copy of the addendum to all prospective contractors. The Village will not assume responsibility for receipt of such addendum. In all cases, it will be the contractor's responsibility to obtain all

addenda issued. Contractors will provide written acknowledgment of receipt of each addendum issued with the proposal submission.

Minority Business and Women Business Enterprise Requirements

The Village of Oak Park, in an effort to reaffirm its policy of non-discrimination, encourages the efforts of contractors and subcontractors to take affirmative action in providing for Equal Employment Opportunity without regard to race, religion, creed, color, sex, national origin, age, handicap unrelated to ability to perform the job or protected veteran's status.

Licenses and Permits

The contractor shall be responsible for becoming a licensed contractor in the Village. The contractor shall also be responsible for obtaining any and all required permits from the Village's Development Customer Services Department (Building Permits Division). The Village shall waive all permit fees.

Agreement

The selected contractor shall enter into an agreement with the Village to complete the work in a form substantially similar to the agreement attached hereto. The agreement shall be executed by the contractor and returned, together with the agreement bond within ten (10) calendar days after the agreement has been mailed to the contractor. The contractor shall execute three copies of the agreement. One fully executed copy will be returned to the contractor.

Notice to Proceed

Work shall begin within fourteen (14) days from the Notice to Proceed from the Village's Building Maintenance Superintendent. All work shall be completed in accordance with the detailed specifications set forth herein, unless the Building Maintenance Superintendent grants an extension.

Fees and Cost

In the event any action is brought to enforce any agreement entered into by the Village of Oak Park, or to collect any unpaid amount from the Village of Oak Park, each party bears the responsibility of paying its own attorneys' fees and costs.

Dispute Resolution

The Village of Oak Park does not agree to the mandatory arbitration of any dispute.

SECTION II

DETAILED SPECIFICATIONS

The selected contractor shall furnish all labor, supervision, supplies, tools, equipment, vehicles and other means necessary or proper for performing and completing the work. The selected contractor shall be responsible for the cleaning up of the job site and shall repair or restore all structures and property that may be damaged or disturbed during performance of the work to the satisfaction of the Village of Oak Park.

The agreement and work shall be carried out in conformance with the laws and regulations of the Village of Oak Park and these specifications. All work will be performed according to the standards set forth in the applicable building codes and standards, including mechanical, fire, plumbing, electric, accessibility, or any other applicable codes in force in the Village of Oak Park and State of Illinois.

Alterations, Omissions and Extra Work

The Village of Oak Park reserves the right to increase or decrease the quantity of any item or portion of the work, or to omit portions of the work as may be deemed necessary.

Job Site Conditions

To the fullest extent possible, the contractor will not allow its work to interfere with the critical operations of the Police Department. Contractor will take all necessary actions as directed by the Village in that regard.

Material Storage: The contractor shall be responsible for the storage and safety of his own materials. The Village assumes no liability whatever for any material damaged or stolen on the premises. Any damage to, or loss by theft or vandalism of any material, appurtenance, or appliance, after such has been applied, connected or installed on Village property, shall be the sole responsibility of the contractor until the project is completed and accepted by the Village.

Safety Precautions: The contractor is solely responsible for implementing effective safety precautions on and around the work site to protect workers and other persons who might be affected and shall exercise every precaution at all times for the protection of the property. The contractor shall not leave any combustible materials or other fire hazards overnight or allowed them to accumulate. The contractor shall abide by all applicable laws, standards, and regulations that apply to the completion of the work, including EPA and OSHA safety standards and regulations.

Damage to Property: Contractor shall repair, at no additional cost to the Village, all damage to Village property caused by the contractor resulting from his work. Where repair of existing work is called for, such patching and replacement shall be made to blend with existing work so that the patch or replacement will be inconspicuous after finishing.

Daily Clean-up: The contractor shall keep the premises clean and orderly during the course of the work and all debris shall be removed on a continuous basis.

Method of Payment

The Village of Oak Park will pay monthly all undisputed invoices billed at the rates set forth in the contractor's proposal within 30 days of approval as provided in the Local Government Prompt Payment Act, 50 ILCS505/4. The maximum interest rate for any payment not made within 30 days of approval is 1%.

Change Orders

Change Orders: Changes in the Work may be agreed to after execution of the agreement, and without invalidating the agreement, if the change order is in writing and signed. Any changes to the scope of work which result in an increase in the agreement price will be subject to an agreement addendum which must be signed by both parties. Any such change order will be prepared by the Village. The contractor may only proceed with the change upon receipt of the written change order signed by the Village.

Emergency Changes: Contractor may perform work not included in the scope of work if necessary to remedy a condition that poses an immediate threat to persons or property. Work of this nature shall be carried out only to the extent of bringing the condition under control. The Village shall be notified immediately. A change order will then be negotiated and executed for the work performed, and for work remaining, if any.

Minor Changes (Field Orders): The Village may verbally authorize minor changes in the scope of work in order to prevent a delay in the progression of the work. These field orders may not involve a change in the agreement price or be inconsistent with the scope of work.

Changes Due to Unknown Conditions: The contractor is not responsible for changes in the work that are due to conditions that were not reasonably observable or conditions that have changed. In such cases, the contractor shall notify the Village and a change order will be negotiated.

Any change which results in a total agreement price in excess of \$10,000 must be approved by the Village of Oak Park Board of Trustees.

Correction of Work Prior To Final Payment

The Village has the right to stop work if the contractor fails to carry out the work in a manner acceptable to the Village. If the Village deems the contractor's work unacceptable, at the Village's election, the contractor shall do one of the following:

1. Promptly repair or replace the defective work, without expense to the Village, including costs associated with repairing any damage to property caused by the replacement work; or;
2. If the Village deems it unacceptable to have the contractor correct work which has been incorrectly done, a deduction from the agreement price shall be made based on the costs to the Village to have the work repaired. Such a deduction from the agreement price shall in no way affect the Village's other remedies or relieve the contractor from responsibility for defects and related damage occurring as a result of defective or unacceptable work.

Contractor's Representative

The contractor shall have at all times a competent foreman or superintendent on the job that shall have full authority to act for the contractor, and to receive and execute orders from the Director of Public Works or appointed representative. Any instructions given to such superintendent or person executing work for the contractor shall be binding on the contractor as though given to him personally. Contractor's representative must be proficient in the use and interpretation of the English language.

Workers

The contractors shall employ competent laborers and shall replace, at the request of the Building Maintenance Superintendent any incompetent, unfaithful, abusive or disorderly workers in their employ. Only workers expert in their respective branches of work shall be employed where special skill is required. Inappropriate behavior or examples of unproductive work effort will not be tolerated. The Village has the right to require a contractor's employee to be immediately removed from the work crew if the above behavior is exhibited.

Dispute Resolution

All disputes, including collection disputes, shall be brought in the Circuit Court of Cook County, Illinois. This agreement shall be interpreted in accordance with the laws of the State of Illinois. In any dispute resolution process, each party shall bear its own costs, including attorney's fees. Any purported agreement between the parties that states terms contrary to this paragraph M will be deemed per se invalid.

Mandatory Qualifications for Contractor's Personnel

Crews shall include at least one (1) supervisor during any given shift.

1. No more than 50% of the crew may be trainees at any one time.
2. Supervisors must be fluent in the English language and capable of reading and writing English.
3. Technicians employed by the contractor selected shall be fully trained and skilled in safe and proper techniques. Specific training required must follow the OSHA standards (see *below*).
4. The contractor selected shall provide sufficient documentation, if requested by the Village, to demonstrate adequate training has been provided upon commencement of the agreement. Contractor selected shall submit statement outlining training program and method of verifying employee competency. Failure to do so may be ample cause for rejection of proposal. The use of technicians who are not adequately trained may be sufficient grounds for termination of the agreement.
5. The Village reserves the right to require immediate removal of any employee of the contractor selected deemed unfit for service for any reason. This right is non-negotiable and the contractor selected agrees to this condition by accepting this agreement. The contractor

selected shall have enough qualified personnel to replace a terminated employee within 24 hours. Failure to do so can result in the termination of the agreement.

OSHA Requirements

1. Material Safety Data Sheets – Contractor selected shall furnish the Village of Oak Park copies of Material Safety Data Sheets (MSDS), for all products used, prior to beginning service at Village facilities. In addition, each time a new chemical is introduced, a copy of that product's MSDS must be provided to the Building Maintenance Superintendent prior to the product being used. The Material Safety Data Sheets must be in compliance with OSHA Regulation 1910.1200, paragraph g.
2. Labeling of Hazardous Materials – Contractor selected shall comply with OSHA regulation 1919.1200, paragraph f, concerning labeling of all chemical containers.
3. Caution Signs – Contractor selected shall use “caution signs” as required by OSHA Regulation 1910.44 and 1910.145 at no cost to the Village. Caution signs shall be on-site upon commencement of agreement.

Proof of compliance with OSHA regulation 1920.1200, Hazard Communication, shall be provided to the Building Maintenance Superintendent upon commencement of this agreement, if requested.

Failure of the contractor selected or his/her employees to comply with all applicable laws, regulations and rules shall permit the Village to immediately terminate this agreement without liability.

Prevailing Wages

Contractor and any applicable subcontractor shall pay prevailing wages as established by the Illinois Department of Labor and determined by the Village for each craft or type of work needed to execute the contract in accordance with the Illinois Prevailing Wage Act, 820 ILCS 130/0.01 et seq. (“Act”). Contractor shall prominently post the current schedule of prevailing wages at the Project site(s) and shall notify immediately in writing all of its subcontractors of all changes in the schedule of prevailing wages. Any increases in costs to Contractor due to changes in the prevailing rate of wage during the terms of any Contract shall be at the sole expense of Contractor and not at the expense of the Village, and shall not result in an increase to the Contract Price. Contractor shall be solely responsible to maintain accurate records as required by the Act and shall submit certified payroll records to the Village evidencing its compliance with the Act on no less than a monthly basis as required by the Act. Contractor shall be solely liable for paying the difference between prevailing wages and any wages actually received by laborers, workmen and/or mechanics engaged in the Work for the Project.

Contractor shall indemnify, hold harmless, and defend the Village, its officers, officials, employees, agents and volunteers (“Indemnified Parties”) against all regulatory actions, complaints, damages, claims, suits, liabilities, liens, judgments, costs and expenses, including reasonable attorney's fees, which may in any way arise from or accrue against the

Indemnified Parties as a consequence of noncompliance with the Act or which may in any way result therefrom, including a complaint by the Illinois Department of Labor under Section 4(a-3) of the Act, 820 ILCS 130/4(a-3) that any or all of the Indemnified Parties violated the Act by failing to give proper notice to the Grantee or any other party performing work on the Public Improvements that not less than the prevailing rate of wages shall be paid to all laborers, workers and mechanics performing Work on the Project, including interest, penalties or fines under Section 4(a-3). The indemnification obligations of this section on the part of Contractor shall survive the termination or expiration of this Agreement. In any such claim, complaint or action against the Indemnified Parties, Contractor shall, at its own expense, appear, defend and pay all charges of reasonable attorney's fees and all reasonable costs and other reasonable expenses arising therefrom or incurred in connection therewith, and, if any judgment or award shall be rendered against the Indemnified Parties in any such action, Contractor shall at its own expense, satisfy and discharge such judgment or award.

SECTION III
SCOPE OF WORK

See attached detailed specs and design documents as submitted by the design firm of Clark Dietz, Inc.

SECTION IV
PROPOSAL FORM (Pricing)

The undersigned proposes to furnish all labor and materials required to complete the Work in accordance with the attached specifications and at the price indicated below.

Total Lump Sum Cost: \$ _____

24-Hour Emergency Call-back Number:

(____) _____

Printed Name: _____

Proposal Signature: _____

State of _____) County of _____)

_____,
(Type Name of Individual Signing)

being first duly sworn on oath deposes and says that the contractor on the above proposal is organized as indicated below and that all statements herein made on behalf of such Contractor and that their deponent is authorized to make them, and also deposes and says that deponent has examined and carefully prepared their proposal from the agreement specifications and has checked the same in detail before submitting this proposal; that the statements contained herein are true and correct.

Signature of contractor authorizes the Village of Oak Park to verify references of business and credit at its option.

Signature of contractor shall also be acknowledged before a Notary Public or other person authorized by law to execute such acknowledgments.

Dated: _____/____/2020 _____

Organization Name
(Seal - If Corporation)
By:

Authorized Signature

Address

Telephone: _____
Subscribed and sworn to before me this _____ day of _____,
2020.

_____ in the State of _____. My
Commission
Notary Public

Expires on ____/____/____

Complete Applicable Paragraph Below

(a) Corporation

The contractor is a corporation, which operates under the legal name of _____ and is organized and existing under the laws of the State of _____. The full names of its Officers are:

President _____

Secretary _____

Treasurer _____

The corporation does have a corporate seal. (In the event that this proposal is executed by a person other than the President, attach hereto a certified copy of that section of Corporate By-Laws or other authorization by the Corporation that permits the person to execute the offer for the corporation.)

(b) Partnership

Names, Signatures, and Addresses of all Partners

The partnership does business under the legal name of _____, which name is

is registered with the office of _____ in the county of

_____.

(c) Sole Proprietor

The contractor is a Sole Proprietor whose full name is

_____. If the contractor is operating under

a trade name, said trade name is _____,

which name is registered with the office of _____

in the county of _____.

Signed: _____
Sole Proprietor

In compliance with the above, the undersigned offers and agrees, if his/her proposal is accepted within ninety (90) calendar days from date of opening, to furnish any or all of the items upon which prices are quoted, at the price set opposite each item, delivered at the designated point within the time specified above.

MUNICIPAL QUALIFICATION REFERENCE SHEET

MUNICIPALITY

ADDRESS

CONTACT

PHONE

WORK
PERFORMED

MUNICIPALITY

ADDRESS

CONTACT

PHONE

WORK
PERFORMED

MUNICIPALITY

ADDRESS

CONTACT

PHONE

WORK
PERFORMED

SECTION V
CONTRACTOR CERTIFICATION

_____, as part of its proposal on an agreement for construction Work
(Name of Contractor selected) for the Village of Oak Park, hereby certifies that said contractor selected
is not barred from proposing on the aforementioned agreement as a result of a violation to
either Section 33E-3 or 33E-4 of Article 33E of Chapter 38 of the Illinois Revised Statutes or
Section 2-6-12 of the Oak Park Village Code relating to "Proposing Requirement.

(Authorized Agent of Contractor selected)

Subscribed and sworn to before me this _____ day of _____, 2020.

Notary Public's Signature

- Notary Public Seal -

SECTION VI
TAX COMPLIANCE AFFIDAVIT

_____, being first duly sworn, deposes
and says:

that he/she is _____ of
(partner, officer, owner, etc.)

_____.
(Contractor selected)

The individual or entity making the foregoing proposal or proposal certifies that he/she is not barred from entering into an agreement with the Village of Oak Park because of any delinquency in the payment of any tax administered by the Department of Revenue unless the individual or entity is contesting, in accordance with the procedures established by the appropriate revenue act, liability for the tax or the amount of the tax. The individual or entity making the proposal or proposal understands that making a false statement regarding delinquency in taxes is a Class A Misdemeanor and, in addition, voids the agreement and allows the municipality to recover all amounts paid to the individual or entity under the agreement in civil action.

By:

Its:

(name of contractor if the contractor is an individual)

(name of partner if the contractor is a partnership)

(name of officer if the contractor is a corporation)

The above statement must be subscribed and sworn to before a notary public.

Subscribed and sworn to before me this _____ day of _____, 2020.

Notary Public's Signature

- Notary Public Seal -

Reporting Requirements

The following forms must be completed in their entirety, notarized and included as part of the proposal document. Failure to respond truthfully to any question on the list or failure to cooperate fully with further inquiry by the Village of Oak Park will result in disqualification of your proposal.

SECTION VII
ORGANIZATION OF PROPOSING FIRM

Please fill out the applicable section:

A. Corporation:

The contractor is a corporation, legally named _____ and is organized and existing in good standing under the laws of the State of _____. The full names of its officers are:

President _____

Secretary _____

Treasurer _____

Registered Agent Name and Address: _____

The corporation has a corporate seal. (In the event that this proposal is executed by a person other than the President, attach hereto a certified copy of that section of Corporate By-Laws or other authorization by the Corporation that permits the person to execute the offer for the corporation.)

B. Sole Proprietor:

The contractor is a Sole Proprietor. If the contractor does business under an assumed name, the

assumed name is _____, which is registered with the Cook County Clerk. The contractor is otherwise in compliance with the Assumed Business Name Act, 805 ILCS 405/0.01, et. seq.

C. Partnership:

The contractor is a partnership which operates under the name _____

The following are the names, addresses and signatures of all partners:

Signature

Signature

(Attach additional sheets if necessary.) If so, check here _____.

If the partnership does business under an assumed name, the assumed name must be registered with the Cook County Clerk and the partnership is otherwise in compliance with the Assumed Business Name Act, 805 ILCS 405/0.01, et. seq.

D. Affiliates: The name and address of any affiliated entity of the business, including a description of the affiliation: _____

Signature of Owner

SECTION VIII
PROPOSAL BOND

WE _____
as PRINCIPAL, and _____
as SURETY, are held and firmly bound unto the Village of Oak Park, Illinois (hereafter referred to as "VOP") in the penal sum of Ten Percent (10%) of the total Proposal price, as specified in the invitation for Proposals. We bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly to pay to the VOP this sum under the conditions of this instrument.

WHEREAS THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that, the said PRINCIPAL is submitting a written Proposal to the VOP acting through its awarding authority for the completion of the work designated as the above section.

THEREFORE if the Proposal is accepted and an agreement awarded to the PRINCIPAL by the VOP for the above-designated section and the PRINCIPAL shall within fifteen (15) days after award enter into a formal agreement, furnish surety guaranteeing the faithful performance of the work, and furnish evidence of the required insurance coverage, all as provided in specifications then this obligation shall become void; otherwise it shall remain in full force and effect.

IN THE EVENT the VOP determines the PRINCIPAL has failed to enter into a formal agreement in compliance with any requirements set forth in the preceding paragraph, then the VOP acting through its awarding authority shall immediately be entitled to recover the full penal sum set out above, together with all court costs, all attorney fees, and any other expense of recovery.

IN TESTIMONY WHEREOF, the said PRINCIPAL and the said SURETY have caused this instrument to be signed by their respective officers this _____ day of A.D. 2020.

PRINCIPAL

(Company Name)

(Company Name)

By: _____ By: _____
(Signature & Title) (Signature & Title)

(If PRINCIPAL is a joint venture of two or more contractors, the company names, and authorized signatures of each contractor must be affixed)

Subscribed to and sworn before me on the

_____ day of _____, 2020.

Notary Public

NAME OF SURETY

By: _____
Signature of Attorney-in-Fact

subscribed to and sworn before me on the

_____ day of _____, 2020.

Notary Public

SECTION IX
CONTRACT BOND



Contract Bond

_____, as PRINCIPAL, and _____ as SURETY, are held and firmly bound unto the Village of Oak Park (hereafter referred to as "Village") in the penal sum of _____, well and truly to be paid to the Village, for the payment of which its heirs, executors, administrators, successors and assigns, are bound jointly to pay to the Village under the conditions of this instrument.

WHEREAS, THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that, the Principal has entered into a written contract with the Village, acting through its President and Board of Trustees, for the construction of work, which contract is hereby referred to and made a part hereof as if written herein at length, and whereby the Principal has promised and agreed to perform the work in accordance with the terms of the contract, and has promised to pay all sums of money due for any labor, materials, apparatus, fixtures or machinery furnished to such Principal for the purpose of performing such work, including paying not less than the prevailing rate of wages in Cook County, where the work is for the construction of any public work subject to the Prevailing Wage Act, and has further agreed to save and indemnify and keep harmless the Village against all liabilities, judgments, costs and expenses which may in any manner accrue against the Village in consequence of granting such contract or which may in any manner result from the carelessness or neglect of the Principal, his agents, employees or workmen in any respect whatever; and has further agreed that this bond will inure to the benefit of any person, firm, company, or corporation, to whom any money may be due from the Principal, subcontractor or otherwise, for any such labor, materials, apparatus, fixtures or machinery so furnished and that suit may be maintained on such bond by any such person, firm, company, or corporation, for the recovery of any such money.

NOW THEREFORE, if the Principal shall well and truly perform the work in accordance with the terms of the contract, and shall pay all sums of money due or to become due for any labor, materials, apparatus, fixtures or machinery furnished to it for the purpose of constructing such work, and shall commence and complete the work within the time prescribed in the contract, and shall pay and discharge all damages, direct and indirect, that may be suffered or sustained on account of such work during the time of performance thereof and until the work shall have been accepted, and shall save and indemnify and keep harmless the Village against all liabilities, judgments, costs and expenses which may in any manner accrue against the Village in consequence of granting such contract or which may in any manner result from the carelessness or neglect of the Principal, his agents, employees or workmen in any respect whatever; and shall in all respects fully and faithfully comply with all the provisions, conditions, and requirements of the contract, then this obligation will be void; otherwise it will remain in full force and effect.

IN WITNESS WHEREOF, the PRINCIPAL and the SURETY have caused this instrument to be signed by their respective officers this ____ day of _____, 2020.

NAME OF PRINCIPAL

By: _____
Signature

By: _____
Printed Name

Its: _____
Title

Subscribed to and Sworn before me on the
_____ day of _____, 2020.

Notary Public

NAME OF SURETY

By: _____
Signature of Attorney-in-Fact

Subscribed to and Sworn before me on the
_____ day of _____, 2020.

Notary Public

SECTION X
COMPLIANCE AFFIDAVIT

I, _____, (print name) being first duly sworn on oath depose and state:

1. I am the (title) _____ of the proposing company and am authorized to make the statements contained in this affidavit on behalf of the company;
2. I have examined and carefully prepared this Proposal based on the request and have verified the facts contained in the Proposal in detail before submitting it;
3. The proposing company is organized as indicated above on the form entitled "Organization of Proposing Company."
4. I authorize the Village of Oak Park to verify the company's business references and credit at its option;
5. Neither the proposing company nor its affiliates¹ are barred from proposing on this project as a result of a violation of 720 ILCS 5/33E-3 or 33E-4 relating to Proposal rigging and Proposal rotating, or section 2-6-12 of the Oak Park Village Code relating to "Proposing Requirements".
6. The proposing company has the M/W/DBE status indicated below on the form entitled "EEO Report."
7. Neither the proposing company nor its affiliates is barred from agreementing with the Village of Oak Park because of any delinquency in the payment of any debt or tax owed to the Village except for those taxes which the proposing company is contesting, in accordance with the procedures established by the appropriate revenue act, liability for the tax or the amount of the tax. I understand that making a false statement regarding delinquency in taxes is a Class A Misdemeanor and, in addition, voids the agreement and allows the Village of Oak Park to recover all amounts paid to the proposing company under the agreement in civil action.
8. I am familiar with Section 13-3-2 through 13-3-4 of the Oak Park Village Code relating to Fair Employment Practices and understand the contents thereof; and state that the proposing company is an "Equal Opportunity Employer" as defined by Section 2000(E) of Chapter 21, Title 42 of the United States Code Annotated and Federal Executive Orders #11246 and #11375 which are incorporated herein by reference. **Also complete the attached EEO Report or Submit an EEO-1.**
9. I certify that the contractor is in compliance with the Drug Free Workplace Act, 41 U.S.C.A, 702

Signature: _____

Name and address of Business: _____

Telephone _____ E-Mail _____

Subscribed to and sworn before me this _____ day of _____, 2020.

Notary Public

- Notary Public Seal -

¹ Affiliates means: (i) any subsidiary or parent of the agreementing business entity, (ii) any member of the same unitary business group; (iii) any person with any ownership interest or distributive share of the agreementing business entity in excess of 7.5%; (iv) any entity owned or controlled by an executive employee, his or her spouse or minor children of the agreementing business entity.

SECTION XI
M/W/DBE STATUS AND EEO REPORT

Failure to respond truthfully to any questions on this form, failure to complete the form or failure to cooperate fully with further inquiry by the Village of Oak Park will result in disqualification of this Proposal. For assistance in completing this form, contact the Department of Public Works at 708-358-5700.

1. Contractor Name: _____

2. Check here if your firm is:

- ☐ Minority Business Enterprise (MBE) (A firm that is at least 51% owned, managed and controlled by a Minority.)
- ☐ Women's Business Enterprise (WBE) (A firm that is at least 51% owned, managed and controlled by a Woman.)
- ☐ Owned by a person with a disability (DBE) (A firm that is at least 51% owned by a person with a disability)
- ☐ None of the above

[Submit copies of any W/W/DBE certifications]

3. What is the size of the firm's current stable work force?

_____ Number of full-time employees

_____ Number of part-time employees

4. Similar information will be requested of all sub-contractors working on this agreement. Forms will be furnished to the lowest responsible contractor with the notice of agreement award, and these forms must be completed and submitted to the Village before the execution of the agreement by the Village.

Signature: _____

Date: _____

EEO Report

Please fill out this form completely. Failure to respond truthfully to any questions on this form, or failure to cooperate fully with further inquiry by the Village of Oak Park will result in disqualification of this Proposal. An incomplete form will disqualify your Proposal. For assistance in completing this form, contact the Department of Public Works at 708-358-5700.

An EEO-1 Report may be submitted in lieu of this report

Contractor Name _____

Total Employees _____

					Males				Females				
Job Category	Total # of Empl.	Total Males	Total Females	Black	Hispanic	American Indian	Alaskan Native	Asian & Pacific Islander	Hispanic	American Indian	Alaskan Native	Asian & Pacific Islander	Total Minorities
Officials & Managers													
Professionals													
Technicians													
Sales Workers													
Office & Clerical													
Semi-Skilled													
Laborers													
Service Workers													
Management Trainees													
Apprentices													

This completed and notarized report must accompany your Proposal. It should be attached to your Affidavit of Compliance. Failure to include it with your Proposal will be disqualify you from consideration.

_____, being first duly sworn, deposes and says that he/she is the _____

(Name of Person Making Affidavit)

(Title or Officer)

of _____ and that the above EEO Report information is true and accurate and is submitted with the intent that it

be relied upon. Subscribed and sworn to before me this _____ day of _____, 2020.

(Signature)

(Date

SECTION XII
NO PROPOSAL EXPLANATION

If your company does not wish to propose on the attached specifications, the Village of Oak Park would be interested in any explanation or comment you may have as to what prevented your firm from submitting a Proposal.

Thank you.

Proposal Name: Project No. 20-135

Village of Oak Park Police Department Firing Range Ventilation Improvements

Comments:

Signed: _____

Phone: _____



SAMPLE ONLY
INDEPENDENT CONTRACTOR AGREEMENT

THIS INDEPENDENT CONTRACTOR AGREEMENT (“Contract”) is entered into on the ____ day of _____ 2020, by and between the Village of Oak Park, an Illinois home rule municipal corporation (hereinafter the “Village”), and _____, a _____ (hereafter the “Contractor”).

WHEREAS, the Contractor submitted a Proposal to design and install an upgraded ventilation system for the Police Dept. firing range (hereinafter referred to as the “Work”), pursuant to the Village’s Request for Proposals, attached hereto and incorporated herein by reference; and

WHEREAS, the Contractor represented in said Proposal that it has the necessary personnel, experience, and competence to promptly complete the Work and the work required hereunder; and

WHEREAS, the Contractor’s Proposal is attached hereto and incorporated herein by reference into this Agreement; and

WHEREAS, the Contractor shall perform the Work pursuant to the terms and conditions of this Contract..

NOW, THEREFORE, in consideration of the premises and the mutual promises contained in this Contract,, and other good and valuable consideration received and to be received, it is mutually agreed by and between the parties as follows:

1. RECITALS INCORPORATED

The above recitals are incorporated herein as though fully set forth.

2. SCOPE OF WORK

The Contractor shall perform the Work in accordance with its Proposal for an annual cost not to exceed \$_____ (“Contract Price”), complete the Work in accordance with any applicable manufacturers’ warranties and in accordance with the Village’s Request for Proposals, the Contractor’s Proposal and this Contract, all of which, together shall constitute the Contract Documents. The Contractor acknowledges that it has inspected the sites where the work is to be performed and that it is fully familiar with all of the conditions at the sites, and further that its Proposal has adequately taken into consideration all of the conditions at the sites. The Contractor hereby represents and warrants that it has the skill and experience necessary to complete this Work in a good and workmanlike manner. The Contractor further represents and warrants that the Work will be completed in a good and workmanlike manner in accordance with the Contract Documents, and that the Work will be free from defects. The Contractor shall achieve completion of all work required pursuant to the Contract Documents.

3. DESIGNATED REPRESENTATIVES

The Contractor shall designate in writing a person to act as its designated representative with respect to the Work to be performed under this Agreement. Such person shall have complete authority to transmit and receive instructions and information, interpret and define the Contractor's policies and decisions with respect to the Work governed by this Contract. The Village's Building Maintenance Superintendent shall have complete authority to transmit and receive instructions and information, interpret and define the Village's policies and decisions with respect to the Work governed by this Contract, or such other person as designated in writing by the Village Manager.

4. TERM OF CONTRACT

The Contractor shall perform the Work pursuant to this Contract beginning on the effective date as defined herein and ending on the date that the Work is completed as determined by the Village. The Contractor shall invoice the Village for the Work provided pursuant to this Contract the rates set forth in its Proposal.

5. PAYMENT SCHEDULE

The Contractor shall, as a condition precedent to its right to receive any payment, submit to the Village an application for payment and such receipts, vouchers, and other documents as may be necessary to establish the Contractor's payment for all labor and material and the absence of any interest whether in the nature of a lien or otherwise of any party in any property, work, or fund with respect to the Work performed hereunder. Such documents shall include, where relevant, the following forms, copies of which are attached hereto:

- (i) Contractor's sworn statement;
- (ii) Contractor's partial or final waiver of lien;
- (iii) Subcontractor's sworn statement(s); and
- (iv) Subcontractor's partial or final waiver of lien.

Payment by the Village shall be conditioned upon an inspection by the Village of the work completed and submission of required waivers by the Contractor. Payment by the Village shall in no way constitute a waiver of, or relieve the Contractor from, any defects in the work. All payments shall be made in accordance with the Illinois Local Government Prompt Payment Act, 50 ILCS 505/1 *et seq.* Final payment for any Work performed by the Contractor pursuant to an invoice by the Contractor shall be made by the Village to the Contractor when the Contractor has fully performed the work and the work has been approved by the Village and submission of required waivers and paperwork by Contractor. Approval of the work and issuance of the final payment by the Village shall not constitute a waiver of, or release the Contractor from, any defects in the work.

The Village shall have the right to withhold from any payment due hereunder such amount as may reasonably appear necessary to compensate the Village for any actual or prospective loss due to Work which is defective or does not conform to the Contract Documents; damage for which the Contractor is liable hereunder; liens or claims of liens; claims of third parties, subcontractors, or material men; or any failure of the Contractor to perform any of its obligations under this Contract. The Village may apply any money withheld or due Contractor hereunder to reimburse itself for any and all costs, expenses, losses, damages, liabilities, suits, judgments, awards, and attorney's fees incurred, suffered, or sustained by the Village and chargeable to the Contractor.

6. TERMINATION

The Village may terminate this Contract for cause, which includes but is not necessarily limited to, the Contractor's failure to perform the work pursuant to this Contract. The Village shall provide the Contractor with five (5) days' written notice of a termination for cause pursuant to the provisions of Section 12 below. The Village may also terminate this Contract when it determines the same to be in its best interests by giving fourteen (14) days' written notice to the Contractor pursuant to the provisions of Section 12 below. In such event, the Village shall pay to the Contractor all amounts due for the work performed up to the date of termination.

7. COMPLIANCE WITH APPLICABLE LAWS

The Contractor shall comply with all applicable laws, regulations, and rules promulgated by any federal, state, county, municipal and/or other governmental unit or regulatory body now in effect during the performance of the work. By way of example only and not as a limitation, the following are included within the scope of the laws, regulations and rules with which the Contractor must comply: all forms of Workers Compensation Laws, all terms of the equal employment opportunity rules and regulations of the Illinois Department of Human Rights, statutes relating to contracts let by units of government, and all applicable civil rights and anti-discrimination laws and regulations.

8. INDEMNIFICATION

To the fullest extent permitted by law, the Contractor shall waive any right of contribution against the Village and shall indemnify and hold harmless the Village and its officers, officials, employees, volunteers and agents from and against all claims, damages, losses and expenses, including, but not limited to, legal fees (attorney's and paralegal's fees, expert fees and court costs) arising out of or resulting from the performance of the Contractor's work, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or injury to or destruction of property, other than the work itself, including the loss of use resulting therefrom, or is attributable to misuse or improper use of trademark or copyright-protected material or otherwise protected intellectual property, to the extent it is caused in whole or in part by any wrongful or negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly

employed by any of them or anyone for whose acts any of them may be liable. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right to indemnity which the Village would otherwise have. The Contractor shall similarly protect, indemnify and hold and save harmless, the Village, its officers, officials, employees, volunteers and agents against and from any and all claims, costs, causes, actions and expenses, including, but not limited to, legal fees incurred by reason of the Contractor's breach of any of its obligations under, or the Contractor's default of, any provisions of this Contract. The indemnification obligations under this Section shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or any subcontractor under Workers' Compensation or Disability Benefit Acts or Employee Benefit Acts.

9. INSURANCE

The Contractor shall, at the Contractor's expense, secure and maintain in effect throughout the duration of this Contract, insurance of the following kinds and limits set forth in this Section. The Contractor shall furnish "Certificates of Insurance" to the Village before beginning Work on the Project pursuant to this Contract. All insurance policies shall be written with insurance companies licensed to do business in the State of Illinois and having a rating of at least A:VII according to the latest edition of the Best's Key Rating Guide; and shall include a provision preventing cancellation of the insurance policy unless thirty (30) days prior written notice is given to the Village. This provision shall also be stated on each Certificate of Insurance: "Should any of the above described policies be canceled before the expiration date, the issuing company shall mail fifteen thirty (30) days written notice to the certificate holder named to the left."

The limits of liability for the insurance required shall provide coverage for not less than the following amounts, or greater where required by law:

(A) Commercial General Liability:

- i. Coverage to include Broad Form Property Damage, Contractual and Personal Injury.
- ii. Limits:

General Aggregate	\$ 2,000,000.00
Each Occurrence	\$ 1,000,000.00
Personal Injury	\$ 1,000,000.00
- iii. Coverage for all claims arising out of the Contractor's operations or premises and anyone directly or indirectly employed by the Contractor.

(B) Workers' Compensation:

- i. Workers' Compensation insurance shall be provided in accordance with the provisions of the laws of the State of Illinois, including occupational disease provisions, for all employees who perform

the Work pursuant to this Contract, and if work is subcontracted pursuant to the provisions of this Contract, the Contractor shall require each subcontractor similarly to provide workers' compensation insurance. In case employees engaged in hazardous work under this Contract are not protected under the Workers' Compensation Act, the Contractor shall provide, and shall cause each subcontractor to provide, adequate and suitable insurance for the protection of employees not otherwise provided.

(C) Comprehensive Automobile Liability:

i. Comprehensive Automobile Liability coverage shall include all owned, hired, non-owned vehicles, and/or trailers and other equipment required to be licensed, covering personal injury, bodily injury and property damage.

ii. Limits:

Combined Single Limit \$1,000,000.00

(D) Umbrella:

i. Limits:

Each Occurrence/Aggregate \$ 5,000,000.00

(E) The Village, its officers, employees, agents and volunteers shall be named as additional insureds on all insurance policies set forth herein except Workers' Compensation. The Contractor shall be responsible for the payment of any deductibles for said insurance policies. The coverage shall contain no special limitations on the scope of protection afforded to the Village, its officers, employees, agents, and volunteers.

(F) The Contractor understands and agrees that any insurance protection required by this Contract or otherwise provided by the Contractor, shall in no way limit the responsibility to indemnify, keep and save harmless, and defend the Village, its officers, employees, agents and volunteers as herein provided.

10. GUARANTY

The Contractor warrants and guarantees that its Work provided for the Project to be performed under this Agreement, and all workmanship, materials, equipment, and supplies performed, furnished, used, or installed under this Contract, shall be free from defects and flaws in workmanship or design; shall strictly conform to the requirements of this Contract; and shall be fit and sufficient for the purposes expressed in, or reasonably inferred from, this Contract. The Contractor further warrants and guarantees that the strength of all parts of all manufactured materials, equipment, and supplies shall be adequate and as specified and that the performance requirements of this Contract shall be fulfilled.

The Contractor shall, at no expense to the Village, correct any failure to fulfill the above guaranty that may appear at any time. In any event, the guaranty herein expressed shall not be sole and exclusive, and is additional to any other guaranty or warranty expressed or implied.

11. AFFIDAVIT OR CERTIFICATE

The Contractor shall furnish any affidavit or certificate in connection with the work covered by this Contract as required by law.

12. NOTICES

Any notice required to be given by this Contract shall be deemed sufficient if made in writing and sent by certified mail, return receipt requested, or personal service, or by facsimile transmission to the persons and addresses indicated below or to such addresses and persons as either party hereto shall notify the other party of in writing pursuant to the provisions of this Section:

To the Village:

Village Manager
Village of Oak Park
123 Madison Street
Oak Park, Illinois 60302-4272
Email: villagemanager@oak-park.us
Facsimile: (708) 358-5101

To the Contractor:

Email: _____
Facsimile: _____

Mailing of such notice as and when above provided shall be equivalent to personal notice and shall be deemed to have been given at the time of mailing.

Notice of facsimile transmission shall be effective as of date and time of facsimile transmission, provided that the notice transmitted shall be sent on business days during business hours (9:00 a.m. to 5:00 p.m. Chicago time). In the event facsimile notice transmitted during non-business hours, the effective date and time of notice is the first hour of the first business day after transmission.

13. AUTHORITY TO EXECUTE

The individuals executing this Contract on behalf of the Contractor and the Village represent that they have the legal power, right, and actual authority to bind their respective parties to the terms and conditions of this Contract.

14. EFFECTIVE DATE

The effective date of this Contract reflected above and below shall be the date that the Village Manager executes this Contract behalf of the Village.

15. ENTIRE CONTRACT; APPROVAL OF SUBCONTRACTORS

This Contract, including the documents incorporated by reference herein, sets forth the entire Contract of the parties with respect to the accomplishment of the Work. No right or interest in this Contract shall be assigned, in whole or in part, by either party without the prior written consent of the other party. The Village reserves the right to approve the use of subcontractors to complete any portion of the Work and to approve any applicable contract between the Contractor and a proposed subcontractor to perform any of the Work. This Contract shall be binding upon the parties and upon their respective heirs, executors, administrators, personal representatives, successors, and assigns, except as herein provided.

16. INDEPENDENT CONTRACTOR

The Contractor shall have the full control of the ways and means of performing the work referred to above and that the Contractor and its employees, representatives or subcontractors are not employees of the Village, it being specifically agreed that the Contractor bears the relationship of an independent contractor to the Village. The Contractor shall solely be responsible for the payment of all salaries, benefits and costs of supplying personnel for the Work.

17. CONTRACT BOND

The Contractor, before commencing the work on the Project, shall furnish a Contract Bond. The Contract Bond shall be in an amount equal to 100% of the full amount of the Contract Sum as security for the faithful performance of its obligations pursuant to the Contract Documents and as security for the payment of all persons performing labor and furnishing materials in connection with the Contract Documents. Such bond shall be on standard AIA Documents, shall be issued by a surety satisfactory to the Village, and shall name the Village as a primary co-obligee. The Contract Bond shall become a part of the Contract Documents. The failure of Contractor to supply the required Contract Bond within ten (10) days after the Notice of Award or within such extended period as the Village may grant if the Contract Bond does not meet its approval shall constitute a default, and the Village may either award the Contract to the next lowest responsible proposer or re-advertise for proposals. A charge against the defaulting Contractor may be made for the difference between the amount of the Contractor's Proposal and the amount for which a contract for the work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the proposal guarantee.

18. GOVERNING LAW AND VENUE

This Contract shall be governed by the laws of the State of Illinois both as to interpretation and performance. Venue for any action pursuant to this Contract shall be in the Circuit Court of Cook County, Illinois.

19. AMENDMENTS AND MODIFICATIONS

This Contract may be modified or amended from time-to-time provided, however, that no such amendment or modification shall be effective unless reduced to writing and duly authorized and signed by the authorized representative of the Village and the authorized representative of the Contractor.

20. NON-WAIVER OF RIGHTS

No failure of either party to exercise any power given to it hereunder or to insist upon strict compliance by the other party with its obligations hereunder, and no custom or practice of the parties at variance with the terms hereof, nor any payment under this Contract shall constitute a waiver of either party's right to demand exact compliance with the terms hereof.

21. CONFLICT

In case of a conflict between any provision(s) of the Village's Request for Proposals or the Contractor's Proposal and this Contract, this Contract and the Village's Request for Proposals shall control to the extent of such conflict.

22. HEADINGS AND TITLES

The headings and titles provided in this Contract are for convenience only and shall not be deemed a part of this Contract.

23. COOPERATION OF THE PARTIES

The Village and the Contractor shall cooperate in the provision of the Work to be provided by Contractor pursuant to this Contract and in compliance with applicable laws, including, but not limited to, the Illinois Freedom of Information Act, 5 ILCS 140/1 *et seq.* ("FOIA"), and the provision of any documents and information pursuant to a FOIA request. The Contractor shall provide any and all documents to the Village pursuant to a FOIA request at no cost to the Village.

24. COUNTERPARTS; FACSIMILE OR PDF SIGNATURES

This Contract may be executed in counterparts, each of which shall be considered an original and together shall be one and the same Contract. A facsimile or pdf copy of this Agreement and any signature(s) thereon will be considered for all purposes as an original.

25. CERTIFIED PAYROLL

Contractor shall be solely responsible to maintain accurate records reflecting its payroll for its employees who perform any of the Work for the Village pursuant to this Contract and shall submit certified payroll records to the Village's Director of Public Works at any

time during the term of this Contract. Contractor shall provide said certified payroll records within seven (7) days upon the request of the Director of Public Works.

26. PREVAILING WAGE

Contractor and any applicable subcontractor shall pay prevailing wages as established by the Illinois Department of Labor and determined by the Village for each craft or type of work needed to execute the contract in accordance with the Illinois Prevailing Wage Act, 820 ILCS 130/0.01 *et seq.* ("Act"). Contractor shall prominently post the current schedule of prevailing wages at the Project site(s) and shall notify immediately in writing all of its subcontractors of all changes in the schedule of prevailing wages. Any increases in costs to Contractor due to changes in the prevailing rate of wage during the terms of any Contract shall be at the sole expense of Contractor and not at the expense of the Village, and shall not result in an increase to the Contract Price. Contractor shall be solely responsible to maintain accurate records as required by the Act and shall submit certified payroll records to the Village evidencing its compliance with the Act on no less than a monthly basis as required by the Act. Contractor shall be solely liable for paying the difference between prevailing wages and any wages actually received by laborers, workmen and/or mechanics engaged in the Work for the Project.

Contractor shall indemnify, hold harmless, and defend the Village, its officers, officials, employees, agents and volunteers ("Indemnified Parties") against all regulatory actions, complaints, damages, claims, suits, liabilities, liens, judgments, costs and expenses, including reasonable attorney's fees, which may in any way arise from or accrue against the Indemnified Parties as a consequence of noncompliance with the Act or which may in any way result therefrom, including a complaint by the Illinois Department of Labor under Section 4(a-3) of the Act, 820 ILCS 130/4(a-3) that any or all of the Indemnified Parties violated the Act by failing to give proper notice to the Grantee or any other party performing work on the Public Improvements that not less than the prevailing rate of wages shall be paid to all laborers, workers and mechanics performing Work on the Project, including interest, penalties or fines under Section 4(a-3). The indemnification obligations of this section on the part of Contractor shall survive the termination or expiration of this Agreement. In any such claim, complaint or action against the Indemnified Parties, Contractor shall, at its own expense, appear, defend and pay all charges of reasonable attorney's fees and all reasonable costs and other reasonable expenses arising therefrom or incurred in connection therewith, and, if any judgment or award shall be rendered against the Indemnified Parties in any such action, Contractor shall at its own expense, satisfy and discharge such judgment or award.

**[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK -
SIGNATURE PAGE FOLLOWS]**

IN WITNESS WHEREOF, the parties hereto have caused this Contract to be signed by their duly authorized representatives on the days and dates set forth below.

VILLAGE OF OAK PARK

CONTRACTOR

By: Cara Pavlicek
Its: Village Manager

By: _____
Its: _____

Date: _____, 2020

Date: _____, 2020

ATTEST

ATTEST

By: Vicki Scaman
Its: Village Clerk

By: _____
Its: _____

Date: _____, 2020

Date: _____, 2020

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Related Documents.
- B. Contract Description.
- C. Scheduling of Work.
- D. Construction Schedule.
- E. Construction Sequence.
- F. Contractor's Use of Site.
- G. Owner Occupancy.
- H. Specification Conventions.

1.2 RELATED DOCUMENTS

- A. Documents related to the Work include:
 - 1. Contract Drawings
 - 2. General Provisions of the Contract including General and Supplementary Conditions
 - 3. All other Sections included herein as part of the Project Manual
 - 4. Addendum to the Drawings and Project Manual issued during Bidding

1.3 CONTRACT DESCRIPTION

- A. Work of the Project includes the following:
 - 1. Selective demolition and disposal.
 - 2. Removal of existing firing range ventilation equipment including air handling unit, ductwork and accessories.
 - 3. Installation of new firing range ventilation equipment including air handling unit, ductwork and accessories.
 - 4. Removal of ceiling/lighting to install new ductwork and accessories.
 - 5. Installation of new ceiling tiles/lights in the areas demolition/replacement of ceiling.
- B. The Contract Documents indicate the Work of the contract and related requirements and conditions that have an impact on the Work. Related requirements and conditions that are indicated on the Contract Documents include, but are not necessarily limited to the following:
 - 1. Existing site conditions and restrictions on use of the Site.

1.4 SCHEDULING OF WORK

- A. Scheduling of Work
 - 1. With the exception of work listed in this Section, the Contractor may schedule his work in any manner he deems appropriate to complete the contract within the time allowed. The Contractor is cautioned that some of the work may have to be performed during other than normal working hours and that the Owner may revise the schedule whenever the Owner finds it necessary to

maintain work progression, or to protect the Owner's facility, or to maintain continuous, satisfactory operation of existing facilities.

2. The Contractor shall submit a Construction Progress Schedule as required in Section 01 32 16. The Contractor alternatives to the construction sequence described below. Alternatives that reduce the number and duration of shutdowns and coordination requirements or would reduce the risk of possible safety problems or plant operational problems which might occur will be considered for approval.
3. The date on which the contract time starts (date of the Notice to Proceed) is anticipated to be August 2020. The contract documents describe allowed contract time based on completion dates required. If the Contractor elects to submit a Construction Progress Schedule that shows an early completion for the project, it does so at its own risk and such a submission does not change the milestone completion dates contained in the contract documents. Moreover, the Owner will not accept any responsibility for nor be held liable for any damages allegedly caused by the Contractor's failure to complete the project within its proposed early completion schedule.
4. The construction sequence as defined by this Section has been developed in part to minimize the impacts of construction work on the continuous operation of the wastewater treatment plant. The construction sequence has also been developed in part to minimize the impacts of plant operations on the construction work. These concerns have resulted in a complex construction sequence to be accomplished in a relatively short period of time. Because of this, the Contractor is cautioned that completion of this project within the time frame allowed may require highly efficient construction management, extraordinary construction efforts, and/or innovative construction techniques.
5. The Contractor is responsible for the means and methods necessary to accomplish the work in compliance with the specified criteria. Access must be maintained for personnel and equipment to enter and maintain the facility at all times. All shut-downs must be coordinated with the Owner a minimum of 72 hours prior. All shut-downs must occur during low flow periods as defined by the Owner.

B. Coordination with Others

1. The Owner will attempt to keep the Contractor informed of changes to existing contracts and award of subsequent contracts that may affect the Contractor. Schedules of operations for other contractors working with the wastewater treatment plant will be made available to the Contractor upon request.

1.5 CONSTRUCTION SCHEDULE

- A. The work described in this Section shall be shown in the Construction Progress Schedule specified in Section 01 32 16. All construction steps, procedures and temporary facilities shall be approved by the Owner prior to implementation by the Contractor. The monthly updates of the Schedule of Construction shall show any changes in the proposed work, including proposed shutdown work.
- B. The completion schedule for this contract requires timely transmittal of contract submittals for review by the Engineer. The identification and transmittal of all submittals required for completion of the phase of work described above is the Contractor's responsibility.
- C. The Contractor shall be held responsible for all direct and indirect delays resulting from the Contractor's failure to identify and transmit the submittals required to successfully complete the contract work within the time specified.
- D. The following early submittals shall be submitted within ten days after Notice to Proceed:
 1. CPM Construction Schedule
 2. Health and Safety Plan

1.6 CONSTRUCTION SEQUENCE

- A. To be determined

1.7 CONTRACTOR'S USE OF SITE

- A. Limit use of site and premises to allow:
 - 1. Owner occupancy.
- B. Construction Operations: Construction operations to be coordinated with the Owner.
- C. Time Restrictions for Performing Work: Work hours are to be coordinated with the Owner.
- D. Utility Outages and Shutdown are to be coordinated with the Owner.

1.8 OWNER OCCUPANCY

- A. The Owner will occupy the premises during the entire period of construction for the conduct of normal operations.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.9 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 29 76

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Related documents
- B. Payment requests

1.2 PAYMENT REQUESTS

- A. General: Except as otherwise indicated, the progress payment cycle is to be regular. Each application must be consistent with previous applications and payments. Certain applications for payment, such as the initial application, the application at substantial completion, and the final payment application involve additional requirements.
 - 1. Waivers of Lien: For each payment application, submit waivers of lien from every entity (including Contractor) who could lawfully and possibly file a lien in excess of \$1,000 arising out of the Contract, and related to work covered by the payment. Submit partial waivers for the amount requested, prior to deduction or retainage, on each item. When the application shows completion of an item, submit final or full waivers. The Owner reserves the right to designate which entities involved in the work must submit waivers.
 - 2. Waiver Delays: Each progress payment must be submitted with Contractor's waiver for the period of construction covered by the application. At the Contractor's option, each progress payment may be submitted with waivers from the subcontractors or sub-subcontractors and suppliers for the previous period of construction covered by the previous application. The final payment application must be submitted together with or preceded by final or complete waivers from every entity involved with performance of the work covered by the payment request.
 - 3. Waiver Forms: Submit waivers on forms, and executed in a manner, acceptable to Owner.
 - 4. Sworn Statement: Each progress payment must be submitted with a sworn statement showing subcontractors and material suppliers and the payment status of each. Form of the sworn statement shall be subject to approval of the Owner.
- B. Payment Application Times: The "date" for each progress "payment" is as indicated in Owner-Contractor Agreement or, if none is indicated therein, it is the 15th day of each month. The period of construction work covered by each payment request is period indicated in Owner-Contractor Agreement or, if none is indicated therein, it is period ending 15 days prior to date for each progress payment, and starting day following end of preceding period. Dates shall be confirmed at the preconstruction meeting.
- C. Application Preparation: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Owner without action. Listing must include amounts of change orders issued prior to last day of the "period of construction" covered by application.
- D. Initial Payment Application: The principal administrative actions and submittals which must precede or coincide with submittal of contractor's first payment application can be summarized as follows, but not necessarily by way of limitation:
 - 1. Schedule of Values
 - 2. Schedule of Submittals (Section 01 33 00).

3. Listing of Contractor's staff assignments.
 4. Waiver of Lien and Sworn Statement.
- E. Monthly Payment Application: The principal administrative actions and submittals which must precede or coincide with submittal of contractor's first payment application can be summarized as follows, but not necessarily by way of limitation:
1. Updated Network Diagram Schedule (Section 01 32 16).
 2. Revised Schedule of Submittals (Section 01 33 00), if applicable.
 3. Updated listing of Contractor's staff assignments, if applicable.
 4. Waiver of Lien, Including Subcontractor Lien Waivers, and Sworn Statement.
 5. Demonstrated compliance with prevailing wage rates using certified payroll.
- F. Application at Time of Final Completion: Following issuance of Owner's final "certificate of substantial completion", and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application may be prepared and submitted by Contractor. The principal administrative actions and submittals which must proceed or coincide with such special applications can be summarized as follows, but not necessarily by way of limitation:
1. Warranties (guarantees), maintenance agreements and similar provisions of contract documents.
 2. Test records, maintenance instructions, start-up performance reports, and similar change-over information germane to Owner's occupancy, use, operation and maintenance of completed work.
 3. Final cleaning of the work.
 4. Application for reduction (if any) of retainage, and consent of surety.
 5. Advice to Owner on coordination of shifting insurance coverages, including proof of extended coverages as required.
 6. Listing of Contractor's incomplete work, recognized as exceptions to Engineer's certificate of substantial completion.
 7. Compact disc with project photos.
- G. Final Payment Application: The administrative actions and submittals which must precede or coincide with submittal of contractor's final payment application can be summarized as follows, but not necessarily by way of limitation:
1. Completion of project closeout requirements.
 2. Completion of items specified for completion beyond time of substantial completion (regardless of whether special payment application was previously made).
 3. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay.
 4. Transmittal of required project construction records to Owner.
 5. Proof, satisfactory to Owner, taxes, fees and similar obligations of Contractor have been paid.
 6. Removal of temporary facilities, services, surplus materials, rubbish and similar elements.
 7. Consent of surety for final payment.
- H. Application Transmittal: Submit 3 executed copies of each payment application, one copy of which is completed with waivers of lien, sworn statement and similar attachments. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Owner. Transmit to Owner by means ensuring receipt within 24 hours.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION – Not Used

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordinating interruptions in Owner's operations.
- B. Coordination and project conditions.
- C. Special reports.
- D. Field surveys.
- E. Preconstruction meeting.
- F. Progress meetings.
- G. Weekly report.
- H. Cutting and patching.
- I. Special procedures.
- J. Cleaning and protection.
- K. Conservation.

1.2 COORDINATING INTERRUPTIONS IN OWNER'S OPERATIONS

- A. Show all anticipated operational interruptions of the Owner's facilities on the progress schedule.
- B. Coordinate all operational interruptions with the Owner at least 48 hours prior to commencing with the work. The Owner may require that the Contractor reschedule work as required to maintain the operation of their facilities.
- C. Except as specified herein, all operations must be maintained during construction. The Contractor is responsible for all, temporary electrical, and temporary communications that are necessary to continue the Owner's operation of their facilities.

1.3 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify utility requirements and characteristics of operating equipment are compatible with utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.
- F. During Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.
- G. Limitations on construction area usage as well as specific requirements that impact utilization are indicated by Contract Documents. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on construction area.

1.4 SPECIAL REPORTS

- A. Existing Conditions: Submit photographs of all existing conditions prior to start of construction. Each photograph must include location and description including room number or reference point.
- B. Accident Reports: Prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

1.5 FIELD SURVEYS

- A. Before proceeding with the layout of actual work, verify the layout information shown on the drawings, in relation to the design survey, existing structures and features.
- B. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.6 PRECONSTRUCTION MEETING

- A. Engineer will schedule an initial progress meeting with the Contractor and Owner, recognized as the preconstruction meeting, after Notice of Award.
- B. The preconstruction meeting will be an organizational meeting. Agenda items may include:
 - 1. Execution of Owner-Contractor Agreement.
 - 2. Submission of executed bonds and insurance certificates.
 - 3. Distribution of Contract Documents.
 - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 - 5. Designation of personnel representing parties in Contract and Engineer.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling.
 - 8. Use of premises by Owner and Contractor.
 - 9. Owner's requirements.
 - 10. Survey and layout.
 - 11. Security and housekeeping procedures.
 - 12. Application for payment procedures.
 - 13. Procedures for testing.
 - 14. Procedures for maintaining record documents.
 - 15. Requirements for start-up of equipment.
 - 16. Inspection and acceptance of equipment put into service during construction period.

1.7 PROGRESS MEETINGS

- A. In addition to other project meetings held for other purposes, hold a general progress meeting with the Engineer and Owner throughout progress of the Work at monthly intervals.
- B. The schedule of the progress meetings will be determined during the preconstruction meeting. In general, progress meetings will be coordinated with preparation of the payment request.
- C. Review each entity's present and future needs including interface requirements, time, sequences, deliveries, access, site utilization, temporary facilities and services, hours of work, hazards and risks, housekeeping, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule, on time, or behind schedule in relation with updated progress schedule. Determine how behind-schedule work will be expedited, and secure commitments from entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within Contract Time. Review everything of significance which could affect progress of the work.
- D. Updating Schedules: Immediately following each progress meeting, where revisions to progress schedule have been made or recognized, revise and reissue progress schedule as described in Section 01 33 00.
- E. Attendance Required: Job superintendent, major subcontractors and suppliers, and others as appropriate to agenda topics for each meeting.
- F. Agenda:
 - 1. Review minutes of previous meetings, if applicable.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding planned progress.
 - 5. Review of submittals schedule and status of submittals.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Maintenance of progress schedule.
 - 8. Corrective measures to regain projected schedules.
 - 9. Planned progress during succeeding work period.
 - 10. Coordination of projected progress.
 - 11. Maintenance of quality and work standards.
 - 12. Effect of proposed changes on progress schedule and coordination.
 - 13. Other business relating to Work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate contractor.

- C. Execute cutting, fitting, and patching to complete Work, and to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and non-conforming Work.
 - 4. Remove samples of installed Work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- J. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections, match existing with new products for patching and extending work.
- B. Employ skilled and experienced installers to perform work.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
- I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.
- J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Engineer for review.

- L. Where change of plane of ¼ inch or more occurs, submit recommendation for providing smooth transition; to Engineer for review
- M. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- N. Finish surfaces as specified in individual product sections.

3.3 CLEANING AND PROTECTION

- A. General: During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance.
- B. Limiting Exposures of Work: To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation the following:
 - 1. Water or ice.
 - 2. Solvents.
 - 3. Chemicals.
 - 4. Light.
 - 5. Puncture.
 - 6. Abrasion.
 - 7. Heavy traffic.
 - 8. Misalignment.
 - 9. Excessive weathering.
 - 10. Unprotected storage.
 - 11. Improper shipping or handling.
 - 12. Theft.
 - 13. Vandalism.

3.4 CONSERVATION

- A. It is a requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to conservation of energy, water and materials.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Owner's/Engineer's Action.
- C. Proposed products list.
- D. Product data.
- E. Shop drawings.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Operation and Maintenance manuals.
- K. Manufacturer's field reports.
- L. Construction photographs.

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project and deliver to Engineer as directed below for electronic submittals. Coordinate submission of related items.
- F. For each submittal review, allow 15 days excluding delivery time to and from Contractor. Where the submittal must be held for coordination, the Engineer will so advise the Contractor.
- G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.

- H. Allow space on submittals for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.
- L. Except for samples, electronic submittals are required.
- M. Electronic submittals are required to conform to all of the submittal requirements listed above.
- N. Email electronic submittals to the Engineer.
- O. Submit electronic documents as a single portable electronic file (.pdf). Contractor should request an exception for documents that are not sent in pdf format or are sent as multiple files. Electronic files will be rejected if they are not clearly legible.
- P. Submittals delivered electronically will be returned to the Contractor as electronic files. Engineer will return:
 - 1. Engineer's review form and comments
 - 2. Contractor's transmittal form
 - 3. Submittal materials only if comments on the materials are required.

1.3 OWNER'S/ENGINEER'S ACTION

- A. Unless otherwise noted, the Owner/Engineer will review each submittal and mark with appropriate "Action".
- B. Action Stamp: The Owner/Engineer will stamp each submittal to be returned with a uniform, self-explanatory action stamp, appropriately marked and executed to indicate whether the submittal returned is for unrestricted use, final-but-restricted use (as marked), must be revised and resubmitted (use not permitted) or without action (as explained on the transmittal form).
- C. Final Unrestricted Release: Where the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.
 - 1. Marking: "No Exception Taken".
- D. Final-But-Restricted Release: When the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with the Owner/Engineer's notations, corrections marked on the submittal, and with the requirements of the contract documents; acceptance of the work will depend on that compliance.
 - 1. Marking: "Make Corrections Noted".
- E. Returned to Resubmittal: When the submittal is marked as follows, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in accordance with the Owner/Engineer's notations stating the reasons for returning the submittal. Repeat if necessary to obtain a different action marking. Do not permit submittals with the following marking to be used at the project site, or elsewhere where work is in progress.
 - 1. Marking:
 - a. "Rejected".
 - b. "Revise and Resubmit".
 - c. "Submit Specified Item."

1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.5 PRODUCT DATA

- A. Information required specifically as product data includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any), special notation of dimensions which have been verified by way of field measurement, and special coordination requirements for interfacing the material, product or system with other work.
- B. Collect required product data into a single submittal for each unit of work or system. Mark each copy to show which choices and options are applicable to the project. Where product data has been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark the copies to show clearly that such information is not applicable.
- C. Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Product data submittal is required for information and record and to determine that the products, materials and systems comply with the provisions of the contract documents. Therefore, the initial submittal is also the final submittal, except where the Engineer observes that there is non-compliance with the provisions of the contract documents and returns the submittal to the Contractor marked with the appropriate "Action".
- D. Unless submitted electronically, submit number of copies Contractor requires, plus three copies Engineer will retain.
- E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- F. Where product data must be specially prepared for required products, materials or systems, because standard printed data is not suitable for use, submit data as "shop drawings" and not as "product data".
- G. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- H. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 SHOP DRAWINGS

- A. Shop Drawings: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
 - 1. Include signed and sealed calculations to support design.

2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
- D. Make revisions and provide additional information when required by authorities having jurisdiction.
- E. Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work, compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the contract documents on the shop drawings.
- F. Do not permit shop drawing copies without an appropriate final "Action" marking by the Engineer to be used in connection with the work.
- G. Unless submitted electronically, submit number of opaque reproductions Contractor requires, plus three copies Engineer will retain.
- H. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 DESIGN DATA

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- C. Unless submitted electronically, submit number of opaque reproductions Contractor requires, plus three copies Engineer will retain.

1.8 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- C. Unless submitted electronically, submit number of opaque reproductions Contractor requires, plus three copies Engineer will retain.

1.9 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.
- D. Unless submitted electronically, submit number of opaque reproductions Contractor requires, plus three copies Engineer will retain.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.11 MANUFACTURER'S OPERATION AND MAINTENANCE MANUALS

- A. Obtain installation, operation, and maintenance manuals from manufacturers and suppliers for each item of equipment furnished under the Contract. Submit three copies of each complete manual to the Owner within 90 days after approval of shop drawings, product data, and samples and not later than the date of shipment of each item of equipment to the project site.
- B. Manuals shall be provided for each piece of equipment including individual components and subsystems of complete assemblies. The section of the manual on operation shall describe the function of each component and its relationship to the system of which it is a part. Where several models, options, or styles are described, the manual shall identify the items actually provided.
- C. The manual shall contain the following:
 - 1. An 8-1/2 x 11 inch typewritten sheet listing the manufacturer's identification, including order number, model, and serial number and location of parts and service centers.
 - 2. A separate 8-1/2 x 11 inch typewritten list of recommended stock of parts, including part number and quantity.
 - 3. Complete replacement parts list and drawings.
 - 4. Performance data and rating tables.
 - 5. Specific instructions for installation, operation, adjustment, and maintenance.
- D. Each manual shall be bound in a folder and labeled to identify the contents and project to which it applies.
- E. Operation and maintenance manuals specified herein are in addition to any operation, maintenance, or installation instructions required by the Contractor to install, test, and start up equipment.

1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Engineer's benefit as contract administrator or for Owner.
- B. Unless submitted electronically, submit two copies of the report within 5 days of observation to Engineer for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 CONSTRUCTION PHOTOGRAPHS

- A. Take pre-construction digital photos as evidence of existing project. The photos shall be submitted prior to working in each room.
- B. With the application at time of Final Completion: Deliver compact discs with .jpg files to Owner with project record documents. Catalog and index files by room number.

1.14 SUBMITTAL SCHEDULE

- A. A proposed preliminary submittal schedule is attached to this Section.
- B. Contractor shall submit his own Schedule of Submittals with the Initial Payment Application.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Source and quality of materials and equipment.
- F. Examination.
- G. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

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

1.3 TOLERANCES

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

1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, complies with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date for receiving bids, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, responsibilities of parties in Contract, nor those of Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.

1.6 SOURCE AND QUALITY OF MATERIALS AND EQUIPMENT

- A. The source of materials to be used shall be in accordance with the Contract Documents and as approved by the Engineer before delivery. The approval of the source of any material shall continue as long as the material conforms to the Specifications.
- B. All material not conforming to the requirements of the Specifications shall be considered as defective and shall be removed from the Work. If in place, faulty materials shall be removed by the Contractor at his expense and replaced with acceptable material unless permitted otherwise by the Owner. No defective materials which have been subsequently corrected shall be reused until approval has been given.
- C. Upon failure of the Contractor to comply immediately with any order of the Engineer to remove and replace defective material, the Owner shall have authority to remove and replace defective materials, and to deduct the cost of removal and replacement from any monies due or to become due to the Contractor. Failure to reject any defective materials or work at the time of installation shall in no way prevent later rejection when such defects are discovered, nor obligate the Owner to final acceptance.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

END OF SECTION

SECTION 01 42 16

DEFINITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of requirements.
- B. Definitions.

1.2 DESCRIPTION OF REQUIREMENTS

- A. This section specifies procedural and administrative requirements for compliance with governing regulations and codes and standards imposed upon the Work. These requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.
 - 1. The term "Regulations" is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the Work regardless of whether they are lawfully imposed by governing authority or not.
- B. Governing Regulations: Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations.

1.3 DEFINITIONS

- A. General Explanation: Certain terms used in contract documents are defined in this article. Definitions and explanations contained in this section are not necessarily complete but are general for the Work to the extent that they are not stated more explicitly in another element of the contract documents.
- B. General Requirements: Provisions and requirements of other Division 01 sections apply to the entire work of the Contract and, where so indicated, to other elements which are included in the project.
- C. Indicated: The term "indicated" is a cross-reference to graphic representations, notes or schedules on the drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for the purpose of helping the reader locate the cross-reference, and no limitation of location is intended except as specifically noted.
- D. Directed, Requested, etc.: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Owner", "requested by the Owner", and similar phrases. However, no such implied meaning will be interpreted to extend the Owner's responsibility into the Contractor's area of construction supervision.
- E. Approve: Where used in conjunction with the Engineer's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the term "approved" will be held to limitations of the Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will the Engineer's approval be interpreted as a release of the Contractor from responsibilities to fulfill requirements of contract documents or acceptance of the Work, unless otherwise provided by requirements of the contract documents.

- F. Project Site: The term "project site" means the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing other construction as part of the project or other projects. The extent of the project site is shown on the drawings and may or may not be identical with the description of the land upon which the project is to be built.
- G. Furnish: The term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations."
- H. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, applying, working to dimension, protecting, cleaning and similar operations."
- I. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
- J. Installer: The "installer" is "the entity" (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular element of construction at the project site, including installation, erection, application and similar required operations. It is a requirement that installers are experienced in the operations they are engaged to perform.
- K. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests of the Work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 42 19
REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of requirements.
- B. Specification format and content explanation.
- C. Drawing symbols.
- D. Industry standards.
- E. Governing regulations/authorities.

1.2 DESCRIPTION OF REQUIREMENTS

- A. This section specifies procedural and administrative requirements for compliance with governing regulations and codes and standards imposed upon the Work. These requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.
 - 1. The term "Regulations" is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the Work regardless of whether they are lawfully imposed by governing authority or not.
- B. Governing Regulations: Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. General: This article is provided to help the user of these specifications more readily understand the format, language, implied requirements and similar conventions of content. None of the following explanations shall be interpreted to modify the substance of contract requirements.
 - 1. Production Methods: Portions of these specifications have been produced by editing master specifications and the standard specifications covenants applicable to construction; they may contain minor deviations from traditional writing formats. Such deviations are a natural result of this production technique, and no other meaning shall be implied.
- B. Specification Format: These specifications are organized based upon the Construction Specifications Institute's 48-Division format. The organization of these specifications into Divisions, Sections or Trade Headings conforms generally to recognized industry practice.
- C. Specification Content: This project specification has been produced employing certain conventions in the use of language as well as conventions regarding the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 - 1. In certain circumstances, language used in specifications and other contract documents is of the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where the full context of the contract documents so indicates.

2. Imperative Language is used generally in the specifications. Requirements expressed imperatively are to be performed by the Contractor. At certain locations in the text, for clarity, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or by others when so noted.
- D. Methods of Specifying: Techniques or methods of specifying requirements vary throughout the text. The method used for specifying one element of the Work has no bearing on requirements for another element of the Work.
 - E. Assignment of Specialists: In certain circumstances, the specification requires or implies that specific elements of the Work are to be assigned to specialists who must be engaged to perform that element of the Work. Such assignments are special requirements over which the Contractor has no choice or option. They are intended to establish which party or entity involved in a specific element of the Work is considered as being sufficiently experienced in the indicated construction processes or operations to be recognized as "expert" in those processes or operations. Nevertheless, the ultimate responsibility for fulfilling all contract requirements remains with the Contractor.
 1. These requirements should not be interpreted to conflict with the enforcement of building codes and similar regulations governing the Work. They are also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
 - F. Trades: The use of certain titles such as "carpentry" in the specification, is not intended to imply that the Work must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also is not intended to imply that the requirements specified apply exclusively to tradespersons of that corresponding generic name.

1.4 DRAWING SYMBOLS

- A. General: Except as otherwise indicated, graphic symbols used on the drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., seventh edition.

1.5 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where more explicit or stringent requirements are written into the contract documents, applicable construction industry standards have the same force and effect as if bound into or copied directly into the contract documents. Such industry standards are made a part of the contract documents by reference. Individual specification sections indicate which codes and standards the Contractor must keep available at the project site for reference.
 1. Referenced standards (standards referenced directly in the contract documents) take precedence over standards that are not referenced but generally recognized in the industry for applicability to the Work.
 2. Unreferenced Standards: Except as otherwise limited by the contract documents, standards not referenced but recognized in the construction industry as having direct applicability will be enforced for performance of the Work. The decision as to whether an industry code or standard is applicable, or as to which of several standards are applicable, is the sole responsibility of the Engineer.
- B. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.
 1. Updated Standards: At the request of the Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of the contract documents and before the performance of the Work affected. The Engineer will decide whether to issue a change order to proceed with the updated standard.

- C. **Conflicting Requirements:** Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the contract documents specifically indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Engineer for a decision before proceeding.
1. **Minimum Quantities or Quality Levels:** In every instance the quantity or quality level shown or specified is intended to be the minimum to be provided or performed. Unless otherwise indicated, the actual Work may either comply exactly, within specified tolerances, with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits. In complying with these requirements, the indicated numeric values are minimum or maximum values, as noted, or as appropriate for the context of the requirements. Refer instances of uncertainty to the Engineer for decision before proceeding.
- D. **Copies of Standards:** The contract documents require that each entity performing work be experienced in that part of the Work being performed. Each entity is also required to be familiar with industry standards applicable to that part of the Work. Copies of applicable standards are not bound with the contract documents.
1. Where copies of standards are needed for proper performance of the Work, the Contractor is required to obtain such copies directly from the publication source.
 2. Although copies of standards needed for enforcement of requirements may be required submittals, the Engineer reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.
- E. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:
1. ANSI - American National Standards Institute, 1430 Broadway, New York, NY 10018, (212) 354-3300
 2. ASTM - ASTM, 655 Fifteenth Street NW, Washington, DC 20005, (202) 639-4025
 3. AWS - American Welding Society, P.O. Box 351040, 550 Le Jeune Road NW, Miami, FL 33135, (305) 443-9353
- F. **Federal Government Agencies:** Names and titles of federal government standard or specification producing agencies are frequently abbreviated. The following acronyms or abbreviations as referenced in the contract documents indicate names of standard or specification producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up-to-date as of the date of the contract documents.
1. EPA - Environmental Protection Agency, 401 M Street SW, Washington, DC 20460, (202) 829-3535
 2. OSHA - Occupational Safety and Health Administration (U.S. Department of Labor), Government Printing Office, Washington, DC 20402, (202) 783-3238

1.6 GOVERNING REGULATIONS/AUTHORITIES

- A. **General:** The procedure followed has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing contract documents; recognizing that such information may or may not be of significance in relation to the Contractor's responsibilities for performing the Work. Contact governing authorities directly for necessary information and decisions having a bearing on performance of the Work.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities:
 - 1. Temporary electricity.
 - 2. Telephone service.
 - 3. Temporary sanitary facilities.
- B. Construction Facilities:
 - 1. Field offices and sheds.
 - 2. Vehicular access, Parking, and Paved Area Use.
 - 3. Progress cleaning and waste removal.
- C. Temporary Controls:
 - 1. Barriers.
 - 2. Security.
- D. Construction Aids:
 - 1. Material hoists and cranes.
 - 2. Temporary runways, scaffolding, and ladders.
 - 3. Temporary chutes.
- E. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

- A. Owner will pay cost of energy used. Exercise measures to conserve energy. Utilize Owner's existing power service.
- B. Do not disrupt Owner's use of service.
- C. Complement existing power service capacity and characteristics as required for construction operations.
- D. If temporary wiring interferes with construction or the Owner's operation of the facility, it shall be relocated.
- E. Permanent convenience receptacles may be utilized during construction.
- F. When temporary service is no longer needed, remove all temporary electrical facilities from the site.

1.3 TELEPHONE SERVICE

- A. The Contractor's project manager and foreman shall be accessible by cellular phone to the Engineer and Owner during normal construction hours. Provide a 24-hour emergency contact number for the duration of the project.

1.4 TEMPORARY SANITARY FACILITIES

- A. Specific existing restroom facilities shall be designated for Contractor use. If the owner deems that this privilege has been abused, the Contractor shall provide enough chemical toilets to conveniently serve the needs of all Contractor personnel.
- B. Chemical toilets and their maintenance shall meet the requirements of State and local health regulations and ordinances. Any facilities or maintenance methods failing to meet these requirements shall be corrected immediately.
- C. At end of construction, return existing facilities used for construction operations to same or better condition as original condition.

1.5 FIELD OFFICES AND SHEDS

- A. Storage Areas: With permission from the City, the Contractor may utilize existing facility/areas for storage.
- B. Removal: At completion of Work remove all tools, accessories and debris. Restore areas.

1.6 VEHICULAR ACCESS, PARKING, AND PAVED AREA USE

- A. Use designated existing on-site roads for construction traffic.
- B. Use of designated existing on-site streets and driveways used for construction traffic and parking is permitted. Tracked vehicles not allowed on paved areas.
- C. Do not allow heavy vehicles or construction equipment in parking areas.
- D. Maintenance:
 - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

1.7 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.
- C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from site as needed and dispose off-site.

1.8 BARRIERS

- A. Replace damaged grass.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.9 SECURITY

- A. Security Program:

1. Protect Work from theft, vandalism, and unauthorized entry.
2. Initiate program in coordination with Owner's existing security system at project mobilization.
3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.

1.10 MATERIAL HOISTS AND CRANES

- A. Provide material hoists required for normal use by all trades and employ skilled hoist operators. Provide all necessary guards, signals, safety devices, etc., required for safe hoist operation. The construction and operation of material hoists shall be in accordance with the applicable ANSI Standards, the "Manual Code of Accident Prevention in Construction" of the Associated General Contractors of America, OSHA, and of other Federal, State, and municipal codes or ordinances. The Contractor shall prohibit the use of hoists for transporting personnel. Hoists shall be located to avoid risk of damage to completed work.
- B. Special rigging and hoisting facilities shall be provided by each trade requiring their use.

1.11 TEMPORARY RUNWAYS, SCAFFOLDING, AND LADDERS

- A. Provide temporary ladders, ramps, and runways as required for performance and inspection of the work. The above facilities shall be constructed and maintained in accordance with the applicable Federal, State, and Municipal regulations and codes.
- B. Furnish, erect, and maintain all scaffolding required for this work. Scaffolding shall be constructed and maintained in accordance with applicable State and Federal laws and local ordinances. Scaffolding shall be promptly removed after serving its purpose.
- C. The structural strength and safety of scaffolding, runways, covers, railings, ladders, stairs, etc., and compliance with law shall be the sole responsibility of the Contractor.

1.12 TEMPORARY CHUTES

- A. No materials shall be dropped from structures except through enclosed wooden or metal chutes which shall be provided and maintained as required for the performance of the work by the various trades.

1.13 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion or as soon as the Engineer deems permissible.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.
- D. Surfacing and sub-base material used for temporary road and parking areas shall be removed, unless otherwise directed by the Engineer.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Product substitution procedures.
- F. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- C. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Manufactured materials and products shall be delivered as needed for installation.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged, in original packages, containers, or bundles, as packaged by the manufacturer with manufacturer's name, brand, seals, and labels intact.
- D. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- E. Materials other than those designated within the Specifications or approved by the Owner shall not be delivered to the project site.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store, protect, and preserve products in accordance with manufacturers' instructions. Store all materials in a manner to facilitate inspection and to prevent damage, contamination, or intermixing.
- B. Repair any damage resulting from improper storage procedures, including damage caused by condensation or the elements. If products cannot be repaired to the specified condition as determined by the Engineer, Contractor shall replace them at no additional cost.

- C. Contractor shall properly coordinate delivery of equipment/materials to limit to the maximum extent possible storage time on site.
- D. Store with seals and labels intact and legible.
- E. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- F. For exterior storage of fabricated products, place on sloped supports above ground.
- G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- H. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description, subject to the review of product data and concurrence by the Owner as specified in Section 01 33 00.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article. Substitutions are subject to concurrence by the Owner as specified in Section 01 33 00.

1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for Substitutions only within 15 days after date of Owner-Contractor Agreement.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for Substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner for review or redesign services associated with re-approval by authorities having jurisdiction.

- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit request for Substitution for consideration in accordance with the requirements of Section 01 33 00. Limit each request to one proposed Substitution.
 - 2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 3. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of requirements.
- B. Prerequisites to substantial completion.
- C. Prerequisites to final completion.
- D. Final cleaning.
- E. Starting of systems.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for equipment and systems.
- J. Spare parts and maintenance products.

1.2 DESCRIPTION OF REQUIREMENTS

- A. Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that is to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.
- B. Specific requirements for individual units of work are included in the appropriate sections.
- C. Time of closeout is directly related to "Final Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

1.3 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. General: Complete the following before requesting the Engineer's inspection for certification of substantial completion, either for the entire Work or for portions of the Work. List known exceptions in the request.
 - 1. In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete. Include supporting documentation for completion as indicated in these contract documents.
 - 2. Submit a statement showing an accounting of changes to the Contract Sum.

3. Submit specific warranties, workmanship/maintenance bonds, final certifications and similar documents.
 4. Obtain and submit releases enabling the Owner's full, unrestricted use of the Work.
 5. Submit record drawings, maintenance manuals, damage or settlement survey, and similar final record information.
 6. Discontinue and remove temporary facilities and services from the project site, along with construction tools and facilities.
- B. Inspection Procedures: Upon receipt of the Contractor's Request for Substantial Completion, the Engineer will either proceed with inspection or advise the Contractor of unfilled prerequisites.
1. Following the initial inspection, the Engineer will either prepare the certificate of substantial completion or will advise the Contractor of work which must be performed before the certificate will be issued. The Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed.
 2. Results of the completed inspection will form the initial "punch-list" for final acceptance.

1.4 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: After the "punch-list" items have been completed the Contractor may request the Engineer's final inspection (Request for Final Completion) for certification of final completion, and final payment as required by the General Conditions. List known exceptions, if any, in the request.
1. Submit executed Request for Final Completion with executed "punch-list".
 2. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 3. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 4. Submit a certified copy of the Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Engineer.
 5. Submit consent of surety.
 6. Submit a final liquidated damages settlement statement, acceptable to the Owner.
- B. Re-inspection Procedure: The Engineer will re-inspect the Work upon receipt of the Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Engineer.
1. Upon completion of re-inspection, the Engineer will either prepare a certificate of final completion or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, the re-inspection procedure will be repeated.

1.5 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Except as otherwise indicated or requested by the Engineer, remove temporary protection devices and facilities which were installed during the course of the Work to protect previously completed Work during the remainder of the construction period.
- C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- D. Clean filters of operating equipment.
- E. Clean site; sweep paved areas, rake clean landscaped surfaces.

- F. Remove waste and surplus materials, rubbish, and construction facilities from site. Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Remove waste materials from the site and dispose of in a lawful manner.

1.6 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems with Manufacturer's Representative.
- B. Notify Engineer seven days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.7 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.8 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.

6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction. Protect from deterioration and loss in a secure, fire-resistive location.
- D. Provide access to record documents for Owner and Engineer reference during normal working hours.
- E. Record information concurrent with construction progress, not less than weekly. All record documents must be kept up to date on a continuous basis by all contractors and subcontractors. Failure to do so will result in withholding additional money from monthly payment requests.
- F. Record Specifications:
 1. Maintain one complete copy of the Project Manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction.
 2. Legibly mark and record at each product section description of actual products installed, including the following:
 - a. Manufacturer's name and product model and number.
 - b. Product substitutions or alternates utilized.
 - c. Changes made by Addenda and modifications.
- G. Record Drawings and Shop Drawings:
 1. Legibly mark each item to record actual construction including:
 - a. Measured depths of foundations in relation to finish [first] [main] floor datum.
 - b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - d. Field changes of dimension and detail.
 - e. Details not on original Contract drawings.
 2. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings.
 - a. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
 - b. Mark-up new information which is known to be important to the Owner and Engineer but was not shown on either contract drawings or shop drawings.
 - c. Note related change-order numbers where applicable.
 - d. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
 - e. For buried piping, electrical, conduits, etc. measure distance to permanent exposed improvements that will enable locations to be determined after backfilling. Provide two measurements for all bends, fittings, etc.
- H. Record Product Data: Maintain one copy of each product data submittal. Mark these documents to show significant variations in the actual Work performed in comparison with the submitted information. Include both variations in the products as delivered to the site, and variations from the manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up of record drawings and specifications.
 1. Upon Completion of mark-up, submit complete set of record product data to the Engineer for the Owner's records.

- I. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Engineer for the Owner's records.
- J. Submit documents to Engineer with claim for final Application for Payment.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable covers.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- E. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Certificates.
 - c. Originals of warranties and bonds.

1.10 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- B. Submit one copy of completed volume 15 days prior to final inspection. Draft copy be reviewed and returned, with Engineer comments. Revise content of document sets as required prior to final submission.
- C. Submit two sets of revised final volumes in final form within 10 days after final inspection.
- D. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

- E. Include manufacturer's printed operation and maintenance instructions.
- F. Additional Requirements: As specified in individual product specification sections.
- G. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.11 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 024119

SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation.
- B. Examination.
- C. Equipment Removal.
- D. Salvage Requirements.
- E. Demolition.

1.2 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

1.3 QUALITY ASSURANCE

- A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.

1.4 SCHEDULING

- A. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation and adjoining spaces.
- B. Coordinate with the Owner any building service interruptions.
 - 1. Do not disable or disrupt building fire or life safety systems without three calendar days prior written notice to Owner.
 - 2. Schedule tie-ins to existing systems to minimize disruption.
 - 3. Coordinate Work to ensure fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in full operation in occupied areas.

1.5 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent building areas.
- B. Cease operations immediately if structure appears to be in danger and notify Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Mark location and termination of utilities.
- B. Erect, and maintain temporary barriers and security devices at locations indicated, including warning signs and lights, and similar measures, for protection of the Owner and existing improvements indicated to remain.
- C. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy, where necessary.
- D. Prevent movement of structure; provide temporary bracing and shoring as required to ensure safety of existing structure.
- E. Provide appropriate temporary signage including signage for exit or building egress.
- F. Do not close or obstruct building egress path.

3.2 EXAMINATION

- A. Examine existing equipment and structures indicated to be demolished before demolition.
- B. Determine where removals may result in structural deficiency or unplanned building collapse during demolition. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
- C. Determine where demolition may affect structural integrity or weather resistance of adjacent buildings or structures indicated to remain.
 - 1. Identify measures required to protect adjacent buildings and structures from damage.
 - 2. Identify remedial work including patching, repairing, bracing, and other work required to leave buildings and structures indicated to remain in structurally sound and weathertight and watertight condition.

3.3 EQUIPMENT REMOVAL

- A. Piping, fittings, equipment, and accessories to be replaced as shown on the Contract Drawings shall be removed by the Contractor.
- B. The piping, fittings, equipment, and accessories shall be removed from the site by the Contractor at his own expense. The equipment shall be removed from the site within seven (7) days of removing it from the building.

3.4 SALVAGE REQUIREMENTS

- A. Coordinate with Owner/Engineer to identify equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage. Identification tags shall remain intact on all removed equipment and identify the date and location from which the salvaged item was removed.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with requirements of Section 01 60 00.

- E. Carefully remove building components and equipment indicated to be salvaged.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each salvaged item.

3.5 DEMOLITION

- A. Contractor must coordinate dumpster requirements with the owner. If dumpster is not allowed to the site, at the end of working day, all removed items shall be hauled away and disposed of at the contractor expense.
- B. Maintain protected egress from and access to adjacent existing buildings at all times.
- C. Do not close or obstruct roadways or sidewalks without Owner approval.
- D. Cease operations immediately if structure appears to be in danger and notify Engineer.
- E. Disconnect and remove designated utilities within demolition areas.
- F. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.
- G. Demolish in orderly and careful manner. Protect existing improvements and supporting structural members.
- H. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- I. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- J. The owner may choose to allow storage of removed materials in mechanical room if space is available.
- K. Conduct demolition to minimize interference with adjacent building areas.
- L. Project site does not allow contractor to bring a dumpster onsite.
- M. At the end of working day, contractor must haul away and dispose all removed materials at the contractor expense. The owner may choose to allow storage of removed materials in mechanical room if space is available.

END OF SECTION

SECTION 04 22 00
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 Summary:

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry-joint reinforcement.
 - 5. Miscellaneous masonry accessories.

- 1.2 The work includes partial removal of existing wall to create a larger opening to bring new air handling unit to the basement mechanical room. Once the equipment is set inside the room, wall must be restored.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 - 2. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
- C. Concrete Building Brick: ASTM C55.

2.3 MASONRY LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Aggregate for Mortar: ASTM C144.
- D. Aggregate for Grout: ASTM C404.
- E. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M, Grade 60.
- B. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Wire Size for Side Rods: 0.148-inch diameter.

3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Spacing of Cross Rods: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.6 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.

2.7 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 1. Do not use calcium chloride in mortar or grout.
 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 1. Use Type S.
- D. Grout for Unit Masonry: Comply with ASTM C476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations and substrates are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2-inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond pattern indicated on Drawings; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. At fire-rated partitions, treat joint between top of partition and underside of structure above with Firestopping.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 LINTELS

- A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.8 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.9 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

3.10 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess masonry and recycle or legally dispose of off Owner's property.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES PART

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Interior standard steel doors and frames.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.2 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames.
- B. Coordinate requirements for installation of door hardware.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
- C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.4 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3; SDI A250.4, Level A..
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches.
 - f. Core: 18-gauge vertical stiffeners, 8 inches on center, spot welded to face sheet every 6 inches.
 - 2. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Full profile welded.
 - c. Frame is to be prime painted on all surfaces.
 - 3. Exposed Finish: Prime.

2.3 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch-diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
 - 1. Fasteners: Masonry Screws.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.
 - 2. Gauge: Minimum 14 gauge (0.067 inch)

2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

2.5 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
 - 3. Reinforcement.
 - a. Hinge: 7 gauge (3/16 inch) thick by 1 1/2 inches wide by 6 inches long.
 - b. Lock hardware: 12 gauge.
 - c. Top and bottom channels: 14 gauge.

2.6 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
 - 2. Prime all surfaces.

PART 3 PRODUCTS

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive non templated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. General: Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with SDI A250.11 NAAMM-HMMA 840.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without

damage to completed Work.

2. Fire-Rated Openings: Install frames according to NFPA 80.
 3. Floor Anchors: Secure with masonry screws.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.3 CLEANING AND TOUCHUP

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

- A. Mechanical door hardware for the following.
 - 1. Swinging Doors.
- B. Related Requirements:
 - 1. Section 08 11 13 "Hollow Metal Doors and Frames" for astragals provided as part of labeled fire-rated assemblies and for door silencers provided as part of hollow-metal frames.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
 - 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Fastenings and other installation information.
 - e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - f. Mounting locations for door hardware.
 - g. List of related door devices specified in other Sections for each door and frame.
- C. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys to Owner by registered mail or overnight package service.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire- protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
 - 1. Door hardware is scheduled in Part 3.

2.4 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 - 1. Type: Stainless steel, concealed ball bearing hinges.
 - 2. Size: 4-1/2 inch x 4-1/2 inch.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.

- D. Lock Trim:
 - 1. Levers: Cast.
 - 2. Escutcheons (Roses): Cast.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.

2.6 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

2.7 LOCK CYLINDERS

- A. UIC Standard: Corbin-Russwin, D2 keyway

2.8 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock.
 - 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
- B. Keys: Nickel silver.

2.9 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.10 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.

2.11 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

2.12 FABRICATION

- A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not

permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Fire-Rated Applications:
 - a. Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.

2.13 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

- E. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- F. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE

- A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
 - 1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.
 - 3. Lockset Designs: Provide the lockset design designated below:
 - a. Mortise Lock: Best 1E74
- B. Hardware Set No. 1: (Mechanical Room Door)

1-1/2 pair Butts 1 Lockset 1 Wall Stop 1 Closer	Hager BB1279 612 Best 45H-7-D-3-M-612 (store room function) Rockwood 406 612 LCN 4040-DEL-H
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END OF SECTION

SECTION 09 05 11

ACOUSTICAL PANEL CEILING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes replacement of acoustical ceiling panels and exposed suspension system, as necessitated by removal of existing ceilings and installation of new HVAC and electrical.

1.02 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Product Test Reports: Indicate compliance of acoustical panel ceilings and components with requirements based on comprehensive testing of current products.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling panel from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
 - 2. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products," or from the listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.
 - 3. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.05 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.06 COORDINATION

- A. Coordinate installation of acoustical panels and any necessary suspension system with other construction that adjoins or penetrates ceiling.

1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. Acoustical Panel Colors and Patterns: Match existing acoustic panels (Contractor shall confirm).

2.02 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension system together with any edge suspension or support hardware and components to match existing suspension system.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
- E. Sheet-Metal Edge Moldings and Trim: Manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
 - 1. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's Retain one finish requirement above or below, or delete and insert others.
 - 2. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Comply with paint manufacturer's written instructions for applying and baking and for minimum dry film thickness.
 - a. Organic Coating: Manufacturer's standard thermosetting coating system with a minimum dry film thickness of 0.8 to 1.2 mils (0.02 to 0.03 mm).
 - b. Color: White.
 - 3. 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. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corporation.
 - c. USG Interiors, Inc.
- F. Hold-Down Clips for Non-Fire-Resistance-Rated Ceilings: For interior ceilings consisting of acoustical panels weighing less than 1 lb/sq. ft. (4.88 kg/sq. m), provide hold-down clips spaced 24 inches (610 mm) o.c. on all cross tees.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical panel ceilings.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Measure each ceiling area and establish sizes and layout of new or replacement acoustical panels. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 3. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 4. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings, hangers and trim at required electrical panel soffit at Gymnasium entry in coordination with surface mounted electrical junction box and access panel at ceiling. Set soffit below panel and provide minimum of 6 inches clear at sides of electrical box. Coordinate installation of soffit with new gypsum drywall installation over existing metal louvers above adjacent doorway and Coordinate height of bottom of soffit to provide sufficient clearance to permit removal of acoustic panel at bottom face of soffit without damage to panel. Butt trim at wall and new transom and provide moldings at all corners of soffit.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels in alternating pattern:
 - a. To match existing pattern.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.04 CLEANING

1. Clean exposed surfaces of acoustical panel ceilings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
2. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 09 12

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
- B. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
- D. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- E. Painting included in this Section includes the following:
 - a. New gypsum wallboard panels installed above selected doorways
 - b. Existing hollow-metal door frames in public corridors and interior rooms where designated
 - c. Exterior steel posts or trim for HVAC enclosure
 - d. New hollow metal doors and frames
 - e. New exposed HVAC ductwork and fittings
- F. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1.2 DEFINITIONS

- A. Standard terms used by the coatings industry are defined in ASTM D 16.
- B. General: Standard coating terms defined in ASTM D 16 apply to this Section.
- C. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
- D. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
- E. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
- F. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.3 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
- B. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
- C. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- D. Samples for Initial Selection: For each type of finish-coat material indicated.
- E. After color selection, Architect will furnish color chips for surfaces to be coated.
- F. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
- G. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
- H. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
- I. Division 1 Section "Submittal Procedures" specifies submission of three Samples as the default requirement. Insert number below only if it differs from the number retained or inserted in the Division 1 Section.
Submit Samples on the following substrates for Architect's review of color and texture only:
 - a. Ferrous Metal: 3-inch- square Samples of flat metal of solid metal for each color and finish.
- J. Coordinate below with qualification requirements retained in "Quality Assurance" Article.

1.4 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
- C. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.6 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- D. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.7 EXTRA MATERIALS

- A. Extra materials may not be allowed for publicly funded projects.
- B. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- C. Quantity: Furnish Owner with an additional 5 percent, but not less than 2 gallons, as appropriate, of each material and color applied.

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:
 - a. Benjamin Moore & Co. (Benjamin Moore).
 - b. PPG Industries, Inc. (Pittsburgh Paints).
 - c. Sherwin-Williams Co. (Sherwin-Williams).
 - d. Pratt & Lambert (P &L)

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: As selected by Architect from manufacturer's full range or as provided or necessary to match existing colors.

2.3 EXTERIOR PRIMERS

- A. Retain primer below over exterior concrete and masonry substrates, and mineral-fiber-reinforced cement panels.
- B. Retain primer below over exterior ferrous-metal substrates.
- C. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application on HVAC area enclosure.
 - a. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
 - b. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 - c. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
- D. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application, as required, for galvanized steel posts.
 - a. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 - b. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 - c. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2.4 INTERIOR PRIMERS

- A. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application on new gypsum door panels or other surfaces
 - a. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
 - b. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
 - c. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer for existing hollow-metal frames.
 - a. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
 - b. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils.
 - c. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.
- C Interior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application, as required, for galvanized steel posts.
 - a. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).
 - b. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils (0.076 mm).
 - c. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils (0.051 mm).

2.5 EXTERIOR FINISH COATS

- A. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application at HVAC area enclosure.
 - a. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel M28: Applied at a dry film thickness of not less than 2.0 mils.
 - b. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
 - c. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.

2.6 INTERIOR FINISH COATS

- A. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel for gypsum drywall panels in corridors and other public areas.
 - a. Benjamin Moore; Moorcraft Super Spec Latex Eggshell Enamel No. 274: Applied at a dry film thickness of not less than 1.3 mils.
 - b. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils.
 - c. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Full-Gloss Alkyd Enamel for Metal Surfaces: Factory-formulated full-gloss alkyd interior enamel for exposed hollow metal doors or frames and exposed HVAC ductwork.
 - a. Benjamin Moore; Moore's IMC Urethane Alkyd Enamel No. M22: Applied at a dry film thickness of not less than 2.0 mils.
 - b. Pittsburgh Paints; 7-814 Series Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils.
 - c. Sherwin-Williams; ProMar 200 Alkyd Gloss Enamel B35W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
- B. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
- C. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- D. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- E. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
- B. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- C. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
- D. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- E. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
- F. Provide barrier coats over incompatible primers or remove and reprime.
- G. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
- H. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- I. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
- J. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
- K. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
- L. Use only thinners approved by paint manufacturer and only within recommended limits.
- M. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Paint colors, surface treatments, and finishes are indicated in the paint schedules.

- C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- D. Provide finish coats that are compatible with primers used.
- E. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
- F. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
- G. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- H. Sand lightly between each succeeding enamel or varnish coat.
- I. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- J. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
- K. Omit primer over metal surfaces that have been shop primed and touchup painted.
- L. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- M. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- N. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- O. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
- P. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
- Q. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
- R. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- S. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others.

Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- T. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- U. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
- C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

- A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer for existing hollow metal doors and frames, railings and new trash area enclosure and all other painted metal surfaces.

- a. Primer: Exterior ferrous-metal primer.
- b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

Full-Gloss Alkyd-Enamel Finish: Two finish coats over a rust-inhibitive primer for existing hollow metal doors and frames, railings and new trash area enclosure and all other painted metal surfaces.

- c. Primer: Exterior ferrous-metal primer.
- d. Finish Coats: Exterior full-gloss alkyd enamel.

- B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:

Full-Gloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.

- a. Primer: Exterior galvanized metal primer.
- b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

Full-Gloss Alkyd-Enamel Finish: Two finish coats over a galvanized metal primer.

- c. Primer: Exterior galvanized metal primer.
- d. Finish Coats: Exterior full-gloss alkyd enamel.

3.7 INTERIOR PAINT SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

Low-Luster Acrylic-Enamel Finish Two finish coats over a primer for all new surfaces.

- a. Primer: Interior gypsum board primer.
- b. Finish Coats: Interior low-luster acrylic enamel.

- B. Ferrous Metal: Provide the following finish systems over ferrous metal:

Full-Gloss Alkyd-Enamel Finish: Two finish coats over a primer.

- a. Primer: Interior ferrous-metal primer.
- b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.

- C. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.

- a. Primer: Interior zinc-coated metal primer.
- b. Finish Coats: Interior full-gloss acrylic enamel.

END OF SECTION

SECTION 11 49 60
FIRING RANGE EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Range Mechanical.

1.02 SUBMITTALS

- A. Product Data: For each type of product specified.
- B. Submit shop drawings for the installation of this equipment. Provide plans, sections, and details, include all electrical data and connection details. Coordinate all details on drawings of the exact locations for mechanical work.

1.03 QUALITY ASSURANCE

- A. Range equipment manufacturers must meet the following qualifications: A firm having twenty 10 years experience in fabrication and installation of work of the quality and scope required on this project.
- B. Upon request provide a list of Ten (10) representative completed law enforcement type pistol range equipment installations in continuous use for five (5) years, with name, address and phone number of the Owner for each project.
- C. The range equipment supplier must have ISO 9001:2000 Quality Policy and an ISO 14001:2004 Environmental Policy Certifications. Information confirming such shall be provided upon request.
- D. Single Source Manufacturer - All equipment specified under this section shall be provided by (1) manufacturer to insure compatibility and product performance capability.
- E. The installation shall be under the direct supervision of the firing range equipment manufacturer.
- F. Any necessary part not specifically shown on the drawings or specified herein shall be furnished and installed if the omission is regularly and clearly a part of the equipment. (Unless work is designated "by others" in specifications herein).

1.04 SUBSTITUTIONS

- A. Minor variations in design to accommodate manufacturer's standard products are acceptable with architectural/client approval prior to bidding. No variations are permissible in quality or material specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all equipment cartoned or crated to provide protection during transit and job storage.
- B. Inspect equipment upon delivery for damage. Minor damages may be repaired, provided the finish items are equal in all respects to new work and acceptable to the owner/architect; otherwise, remove and replace damaged items immediately.
- C. Store equipment at the site under cover in a secured place. Store equipment off the floor and in a manner to promote air circulation. Avoid the use of non-vented plastic or canvas shelters that could create a humidity chamber.

1.06 WARRANTY

- A. Equipment shall be fully guaranteed against defects in workmanship and materials for a period of three (3) years from the date of substantial completion of this project.
- B. The manufacturer shall instruct Owner as to the proper operation and maintenance of the equipment at time of acceptance of the work.

1.07 COORDINATION

- A. Coordinate installation of equipment with other equipment being installed in the firing range including, acoustical panels, lighting and any necessary suspension system with other construction that adjoins or penetrates ceiling.
- B. Contractor shall also coordinate this project with another concurrent project with firing range back stop.

PART 2 - PRODUCTS

2.01 FIRING RANGE VENTILATION SYSTEM CRITERIA

- A. The Ventilation system shall be based on below performance criteria.
- B. Existing equipment serving this area meets the requirements of OSHA 29 CFR 1910.1025 and 29 CFR 1926.62. Contractor shall ensure these requirements are still met after the project has been completed.
- C. The firing range ventilation and environmental control system manufacturer/installing contractor must provide a written guarantee, prior to the bid date, that the completed installation will meet the requirements of OSHA 29 CFR 1910.1025 and 29 CFR 1926.62 when tested by an independent certified industrial hygienist under the following conditions:
 - 1. Only one shooter per booth.
 - 2. Air samples are taken at the firing line.
 - 3. There are no physical obstructions or non-shooting personal in the firing range during air testing between the back wall and the firing line.
 - 4. The firing rate will not exceed normal qualification shooting.
 - 5. The range has a negative pressure of 0.04 inches of water column minimum.
 - 6. The firing range ventilation and environmental control system is maintained, and operated in accordance with the manufacturer's instructions.
- D. Criteria / Quality Assurance:
 - 1. The system shall meet all the requirements of new publications no. (NIOSH) 76-130 dated December 1975 entitled "Lead Exposure Design Consideration For Indoor Firing Ranges," with the following exception:
 - a. The airborne inorganic lead concentration limits shall not exceed 50 $\mu\text{g}/\text{m}^3$ of air over a time weighted average (TWA) of eight hours as measured at the respiration zone of the shooters and the range officer when firing from the firing booths per OSHA 29 CFR 1910.1025 and 29 CFR 1926.62.
 - 2. Exhaust lead levels must meet EPA 40 CFR 50.12 (1.5 $\mu\text{g}/\text{m}^3$ quarterly) and carbon monoxide levels must not exceed 25 parts per million (PPM) when tested in the environment directly behind the firing positions.
 - 3. Testing for lead and CO concentrations shall be in strict conformance with the equipment procedures and format used by NIOSH, and to the following publications:
 - a. For lead: S341 lead and inorganic lead.
 - b. For CO: sampling data sheet 1.01, class D dated March 12, 1974, using sampling meter only.
 - 4. The firing range ventilation and environmental control system manufacturer/installing contractor must state in their written proposal that in the event the installed system does not

provide the minimum lead concentration levels required by this performance specification, as determined by a certified industrial hygienist's report, they shall at their own expense:

- a. Bring the firing range ventilation and environmental control system into compliance, or
 - b. Replace equipment with that which will meet the performance specification.
5. Components of the range ventilation and control system shall conform to the specific specification requirements hereinafter specified for each type of component.
 6. All items required by this specification are deemed necessary and must be completely furnished in order for the proposal to be considered responsive to this specification.
 7. Unless exceptions to this performance specification are specifically listed and submitted in writing by the prospective bidder, and received by the engineer not less than (10) ten days before the bid due date, it is understood that the bidder, if successful, will furnish equipment in strict accordance with this performance specification.

2.02 RANGE VENTILATION SYSTEM

- A. Supply Air System: S-5, 15,600 CFM at External Static of 2.0 in WC.
- B. Return Air System: 17,100 CFM at External Static of 1.5 in WC.
- C. Exhaust/Relief Air: 4,275 CFM
- D. Outdoor Air: 4,275 CFM
- E. Contractor shall verify performance of this equipment and make adjustments to belts, pulleys etc. to ensure this performance criteria is met.
- F. Provide new radial diffuser below ceiling. The basis of design for this product is Radial Diffuser manufactured by Carey's Small Arms Range, Tinley Park, IL or Patriot Range, Burr Ridge, IL.
- G. Provide new with 30% disposable pre-filters and 99.97% (HEPA) @ .03 micron New HEPA Filtration system behind openings.
- H. Filter Sizes: 24X24 (12 Each)

2.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. System shall meet the recommendations of National Institute for Occupational Safety.
- B. The ventilation system is a purge system. The completed system shall meet the recommendations of National Institute for Occupational Safety. Provide easy access to filter bank for filter removal and replacement. Provide high-efficiency particulate arrestor (HEPA) filter for final filter.
- C. Design for air-flow velocity at the firing lines to be an average 75 fpm +/- 10 % per stall averaging 75 fpm for the whole range, and not be less than 50 fpm at any reading point. Velocity is measured at three heights of 1 f), 3 ft, and 5 ft off the firing line floor at the center of each firing position at the farthest point.
- D. Maintain a negative inches of water pressure in the operating range area of 0.05 relative to the surrounding base building areas.
- E. Design for laminar (Even) airflow to go down range with a minimum of turbulence. Provide radial plenum diffusers for the supply air create new ductwork to capture the return air. Make all ductwork symmetrical.
- F. The contractor/supplier shall demonstrate to Owner that they have the expertise to design, build and complete the entire firing range. The contractor shall represent that they (contractor) have successfully designed and constructed other complete indoor firing range ventilation systems that adhere to the regulations listed below for lead exposure.
- G. The contractor is responsible for strict compliance under the firing range ventilation performance standards, as established by NIOSH.

- H. The performance intent for firing range ventilation systems shall meet all the requirements outlined as recommendations and design considerations in HEW publication no. (NIOSH) 76- 130 dated December 1975 entitled "Lead Exposure Design Considerations for Indoor Firing Ranges". Lead concentrations shall be maintained below the action level of 30 micrograms per cubic meter in an area where the limit shall not exceed 50 micrograms of lead per cubic meter of air over a time weighted average of eight hours as measured at the respiration zone of the shooters and the range officer when firing from the firing lines per OSHA 29 CFR. 1910.1025 And 1926.62.
- I. The air flow is designated to be as laminar or even flow. The air should be distributed through a continuous graduated plenum diffuser system provided by Carey's Small Arms Range, Tinley Park, IL or Patriot Range, Burr Ridge, IL. The configuration should provide for an even flow of air across the width and height of the range.
- J. The exhaust duct system shall evenly extracts the supply air from the range. The exhaust fan and filter system shall allow 350 to 500 fpm velocities across the filter media. The filter media should be that of at least 99.97% (HEPA) @ .03 micron. This will help achieve the federal exhaust emission levels established under EPA 40 CFR 50.12 (1.5 Micrograms of lead per cubic meter quarterly).

2.04 CONTRACTOR/SUPPLIER REQUIREMENTS

- A. All critical components of the system including the distribution diffusers and control systems and programming must be done by in house employees and not be subcontracted by the ventilation supplier.
- B. Contractor/Supplier will be qualified on the basis of responsibility of bid. Failure to demonstrate responsibility to Owner in proposal submittals shall result in disqualification of contractor.

PART 3 - EXECUTION

3.01 COORDINATION

- A. Coordinate locations of equipment and specific requirements with all other trades involved. Coordinate all mechanical and electrical requirements including all rough in location, junction boxes, etc. with appropriate trades.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Measure each ceiling area and establish sizes and layout of new or replacement acoustical panels. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.03 INSTALLATION

- A. Install in exact accordance with manufacturer's instructions and submittals.
- B. Install all components in a rigid secure manner.
- C. The ventilation equipment provider must have at least (2) locally residing (within 100 miles) factory trained & certified Service technician Representative. This Representative will be available to react to an emergency service need – and be on site within 48 hours of contact – during a normal Monday thru Friday work week.
- D. It shall be the owner's and/or their general contractor's responsibility to provide and install any/all conduits, junction boxes, lighting fixtures, and other requirements for electrical service and control wire needs.

3.04 VENTILATION SYSTEM COMMISSIONING PROCESS

- A. Scheduling Final Acceptance Test (Contractor and Owner): Coordinate mutually acceptable date well in advance.
- B. Preliminary Test (Contractor): At least 24 hrs prior to Final Acceptance Test Date
 - 1. Complete all scope items
 - 2. Perform test identical to those listed for Final Acceptance Test
 - 3. Balance, Adjust, retest as necessary until all tests successfully pass criteria
 - 4. Notify Owner that all items above have been successfully completed.
- C. Final Acceptance Test
 - 1. Airflow Test (Demonstrated to Owner Representative): Perform smoke tests and take preliminary readings to identify potential problem areas.
 - 2. Smoke Test (Contractor): Smoke bombs to be provided by contractor. A minimum of 10 smoke bombs will be available for testing. All smoke must move downrange. Smoke going backwards will constitute failure of acceptance.
- D. Air Flow Test (Contractor)
 - 1. Using store feature read the velocity with a Velgrid at three locations in the center of the lane, one foot up, down and center. Once acceptable readings are recorded, present to Owner. Acceptable average velocities are 71-79 (5%).
 - 2. Owner will witness one pass of readings, final readings to be documented from memory.
- E. General Inspection:
 - 1. Check of alarms/shut-offs in the control system.
 - 2. The start up and shut down sequence for ventilation system.

END OF SECTION

SECTION 230513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes single and three-phase motors for application on equipment provided under other sections.

1.2 REFERENCES

- A. American Bearing Manufacturers Association:
 - 1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
- C. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

- A. Product Data: Submit catalog data for each motor furnished loose. Indicate nameplate data, standard compliance, electrical ratings and characteristics, and physical dimensions, weights, mechanical performance data, and support points.
- B. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Testing Agency: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and protect products on site.
- B. Lift only with lugs provided. Handle carefully to avoid damage to components, enclosure, and finish.
- C. Protect products from weather and moisture by covering with plastic or canvas and by maintaining heating within enclosure.
- D. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.1 PRODUCT REQUIREMENTS FOR MOTORS FURNISHED WITH EQUIPMENT

- A. Motors 3/4 hp and Larger: Three-phase motor as specified below.
- B. Motors Smaller Than 3/4 hp: Single-phase motor as specified below, except motors less than 250 watts or 1/4 hp may be equipment manufacturer's standard.
- C. Three-Phase Motors: NEMA MG 1, Design B, energy-efficient squirrel-cage induction motor, with windings to accomplish starting methods and number of speeds as indicated on Drawings.
 - 1. Voltage: As indicated on Drawings.
 - 2. Service Factor: 1.15
 - 3. Enclosure: Meet conditions of installation unless specific enclosure is indicated on Drawings.
 - 4. Design for continuous operation in 40 degrees C environment, with temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 - 5. Insulation System: NEMA Class F
 - 6. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
 - 7. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay with wiring to terminal box.
 - 8. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for re-lubrication, rated for minimum ABMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
 - 9. Sound Power Levels: Conform to NEMA MG 1.
- D. Single Phase Motors:
 - 1. Permanent split-capacitor type where available, otherwise uses split-phase start/capacitor run or capacitor start/capacitor run motor.
 - 2. Voltage: As indicated on drawings, single phase, 60 Hz.
- E. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated.

2.2 SOURCE QUALITY CONTROL

- A. Test motors in accordance with NEMA MG 1, including winding resistance, no-load speed and current, locked rotor current, insulation high-potential test, and mechanical alignment tests.

PART 3 EXECUTION

3.1 EXISTING WORK

- A. Disconnect and remove abandoned motors
- B. Maintain access to existing motors and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

- A. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

- B. Install engraved plastic nameplates in accordance with Section 260553.
- C. Ground and bond motors in accordance with Section 260526.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.15.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports.
 - 2. Hanger rods.
 - 3. Inserts.
 - 4. Flashing.
 - 5. Sleeves.
 - 6. Mechanical sleeve seals.
 - 7. Formed steel channel.
 - 8. Firestopping relating to HVAC work.
 - 9. Firestopping accessories.
 - 10. Equipment bases and supports.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.1 - Power Piping.
 - 2. ASME B31.5 - Refrigeration Piping.
 - 3. ASME B31.9 - Building Services Piping.
- B. ASTM International:
 - 1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
 - 3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.
- D. FM Global:
 - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- E. Underwriters Laboratories Inc.:
 - 1. UL 263 - Fire Tests of Building Construction and Materials.
 - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 - 5. UL - Fire Resistance Directory.

1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke,

heat, and hot gases through fire rated construction. All existing corridor walls are treated as fire rated walls.

1.4 SYSTEM DESCRIPTION

- A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- B. B. Surface Burning: ASTM E84, UL 723 with maximum flame spread / smoke developed rating of 25/450.
- C. Firestop interruptions to fire rated assemblies, materials, and components. Fire rating of existing walls is shown on Drawing Sheet A-001.

1.5 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.6 SUBMITTALS

- A. Shop Drawings: Indicate system layout with location including critical dimensions, sizes, and pipe hanger and support locations and detail of trapeze hangers.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.
- C. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- D. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.
 - 2. Firestopping: Submit preparation and installation instructions.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.
 - 2. Floor [and Roof] Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
 - a. Floor Penetrations Within Wall Cavities: T-Rating is not required.
- B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
 - 1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.

- 2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.
- C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- D. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.
- E. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- F. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.
- C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Carpenter & Paterson Inc.
 - 2. Creative Systems Inc.
 - 3. Flex-Weld, Inc.
 - 4. Glope Pipe Hanger Products Inc.
 - 5. Michigan Hanger Co.
 - 6. Superior Valve Co.
- B. Hydronic Piping:
 - 1. Conform to ASME B31.9
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron or Carbon steel, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 inches and Larger: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 to 4 inches: Carbon steel, adjustable, clevis.
 - 5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

6. Wall Support for Pipe Sizes 3 inches and Smaller: Cast iron hooks.
7. Wall Support for Pipe Sizes 4 inches and Larger: Welded steel bracket and wrought steel clamp.
8. Vertical Support: Steel riser clamp.
9. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
10. Floor Support for Hot Pipe Sizes 4 Inches and Smaller: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Copper Pipe Support: Copper-plated, carbon steel ring.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

- A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

- A. Metal Flashing: 26 gage thick galvanized steel.
- B. Metal Counterflashing: 22 gage thick galvanized steel.
- C. Lead Flashing:
 1. Waterproofing: 5 lb./sq. ft sheet lead.
 2. Soundproofing: 1 lb./sq. ft sheet lead.
- D. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves for Round Ductwork: Galvanized steel.
- D. Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- E. Sealant: Acrylic.

2.6 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 1. Thunderline Link-Seal, Inc.
 2. NMP Corporation.

- B. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.7 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. B-Line Systems
 - 3. Midland Ross Corporation, Electrical Products Division
 - 4. Unistrut Corp.
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.8 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Fire Trak Corp.
 - 3. Hilti Corp.
 - 4. International Protective Coating Corp.
 - 5. 3M fire Protection Products
 - 6. Specified Technology, Inc.
- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Foam Firestopping Compounds: Multiple component foam compound.
 - 2. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
 - 3. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
- C. Color: To be selected by architect/engineer.

2.9 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Dam Material: Permanent:
 - 1. Sheet metal.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
 - 1. Furnish UL listed products [or products tested by independent testing laboratory.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:

1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify openings are ready to receive sleeves.
- B. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing or damming materials to arrest liquid material leakage.
- D. Obtain permission from Owner before using powder-actuated anchors.
- E. Obtain permission from Owner before drilling or cutting structural members.

3.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with ASME B31.1; ASME B31.5; ASME 31.9; ASTM F708.
- B. Support horizontal piping as scheduled.
- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.

- F. Support vertical piping at every other floor.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- L. Provide clearance in hangers and from structure and other equipment for installation of insulation.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members or formed steel channel or steel pipe and fittings. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.6 INSTALLATION - FLASHING

- A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- C. Provide curbs for roof installations 12 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.
- D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.7 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.
- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

- E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install chrome plated steel stainless steel escutcheons at finished surfaces.

3.8 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- F. Place intumescent coating in sufficient coats to achieve rating required.
- G. Remove dam material after firestopping material has cured.
- H. Fire Rated Surface:
 - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
 - 2. Where cable tray, bus, cable bus, conduit, wireway, trough, and penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- I. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated wall, partition floor, ceiling, and roof opening as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
 - 2. Install escutcheons, floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 - 3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.
 - 4. Interior partitions: Seal pipe penetrations at computer rooms, telecommunication rooms and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.9 FIELD QUALITY CONTROL

- A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.10 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.11 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

3.12 SCHEDULES

- A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 1)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8

- B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
PVC (All Sizes)	4	3/8

- C. Note 1: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Tags.
 - 3. Pipe markers.
 - 4. Duct markers.
 - 5. Labels.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturers catalog literature for each product required.
- B. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Samples: Submit two tags, labels, and pipe markers, size used on project.
- D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.4 QUALITY ASSURANCE

- A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Craftmark Identification Systems
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
- B. Product Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

- A. Manufacturers:
 - 1. Craftmark Identification Systems
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
- B. Plastic Tags
 - 1. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches diameter.
- C. Metal Tags:
 - 1. Aluminum with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

2.3 PIPE MARKERS

- A. Manufacturers:
 - 1. Craftmark Identification Systems
 - 2. Safety Sign Co.
 - 3. Seton Identification Products
- B. Color and Lettering: Conform to ASME A13.1.
- C. Plastic Pipe Markers:
 - 1. Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
 - 2. Bright colored continuously printed plastic sheet with separate direction allows. 1-1/4" size letters for pipe size 2" and smaller. 2-1/2" for pipe sizes 2-1/2" and larger.
 - 3. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.4 DUCT MARKERS

- A. Manufacturers:
 - 1. Brimar
 - 2. Craftmark Identification Systems
 - 3. Safety Sign Co.
 - 4. Seton Identification Products
- B. Color and Lettering: Conform to ASME A13.1.
- C. Vinyl Markers:
 - 1. Self-adhesive duct markers with directional arrow made with a minimum 3 mil thick high gloss vinyl film printed using UV and chemical resistant inks.
 - 2. For ducts 24" and smaller provide a minimum 14" x 2-1/4" marker with 1-1/2" characters.
 - 3. For ducts 26" and larger provide a minimum 24" x 4" marker with 2-1/2" characters.

2.5 LABELS

- A. Manufacturers:
 - 1. Craftmark Identification Systems
 - 2. Safety Sign Co.

3. Seton Identification Products

- B. Description: Laminated Mylar, size 1.9 x 0.75 inches, adhesive backed with printed identification.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.
- C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Identify heat pumps with plastic nameplates.
- F. Identify valves in main and branch piping with tags.
- G. Tag automatic controls, instruments, and relays. Key to control schematic.
- H. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 WORK INCLUDES

- A. Contractor provide:
 - 1. Testing adjusting and balancing of air moving equipment/systems.
 - 2. Testing adjusting and balancing of hydronic systems.
 - 3. Measurement of final operating condition of HVAC systems.
 - 4. Sound measurement of equipment operating conditions.
 - 5. Vibration measurement of equipment operating conditions.

1.2 REFERENCES

- A. Associated Air Balance Council:
 - 1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. Natural Environmental Balancing Bureau:
 - 1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

- A. Prior to commencing Work, submit proof of latest calibration date of each instrument.
- B. Test Reports: Indicate data on forms prepared following ASHRAE 111
- C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- D. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty or Copy of NEBB Certificate of Conformance Certification.
- E. Submit draft copies of report for review prior to final acceptance of Project.
- F. Furnish reports in soft cover, letter size, binder manuals, complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.
- B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ASHRAE 111.
- B. Prior to commencing Work, calibrate each instrument to be used. Upon completing Work, recalibrate each instrument to assure reliability.

1.6 QUALIFICATIONS

- A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC or Certified by NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer, NEBB Certified Testing, Balancing and Adjusting Supervisor, or registered professional engineer experienced in performance of this Work and licensed in State of Illinois.

1.7 SEQUENCING

- A. Sequence balancing between completion of systems tested and Date of Substantial Completion.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify systems are complete and operable before commencing work. Verify the following:
 - 1. Systems are started and operating in safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
 - 12. Hydronic systems are flushed, filled, and vented.
 - 13. Pumps are rotating correctly.

- 14. Proper strainer baskets are clean and in place or in normal position.
- 15. Service and balancing valves are open.

3.2 PREPARATION

- A. Furnish instruments required for testing, adjusting, and balancing operations.
- B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

- A. Verify recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.
- D. Report defects and deficiencies noted during performance of services, preventing system balance.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to obtain required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches positive static pressure near building entries.
- M. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable-air-volume temperature control.

3.6 WATER SYSTEM PROCEDURE

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

3.7 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
 - 1. HVAC Pumps.
 - 2. Air Coils.
 - 3. Air moving equipment.
 - 4. Fans.
 - 5. Air Filters.
 - 6. Air Inlets and Outlets.
 - 7. Boilers.

B. Report Forms

1. Title Page:

- a. Name of Testing, Adjusting, and Balancing Agency
- b. Address of Testing, Adjusting, and Balancing Agency
- c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
- d. Project name
- e. Project location
- f. Project Architect
- g. Project Engineer
- h. Project Contractor
- i. Project altitude
- j. Report date

2. Summary Comments:

- a. Design versus final performance
- b. Notable characteristics of system
- c. Description of systems operation sequence
- d. Summary of outdoor and exhaust flows to indicate building pressurization
- e. Nomenclature used throughout report
- f. Test conditions

3. Instrument List:

- a. Instrument
- b. Manufacturer
- c. Model number
- d. Serial number
- e. Range
- f. Calibration date

4. Electric Motors:

- a. Manufacturer
- b. Model/Frame
- c. HP/BHP and kW
- d. Phase, voltage, amperage; nameplate, actual, no load
- e. RPM
- f. Service factor
- g. Starter size, rating, heater elements
- h. Sheave Make/Size/Bore

5. V-Belt Drive:

- a. Identification/location
- b. Required driven RPM
- c. Driven sheave, diameter and RPM
- d. Belt, size and quantity
- e. Motor sheave diameter and RPM
- f. Center to center distance, maximum, minimum, and actual

6. Pump Data:

- a. Identification/number
- b. Manufacturer
- c. Size/model
- d. Impeller
- e. Service
- f. Design flow rate, pressure drop, BHP and kW
- g. Actual flow rate, pressure drop, BHP and kW
- h. Discharge pressure
- i. Suction pressure
- j. Total operating head pressure
- k. Shut off, discharge and suction pressures

- l. Shut off, total head pressure
- 7. Heating Coil Data:
 - a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Water flow, design and actual
 - g. Water pressure drop, design and actual
 - h. Entering water temperature, design and actual
 - i. Leaving water temperature, design and actual
 - j. Entering air temperature, design and actual
 - k. Leaving air temperature, design and actual
 - l. Air pressure drop, design and actual
- 8. Air Moving Equipment:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge
 - f. Air flow, specified and actual
 - g. Return air flow, specified and actual
 - h. Outside air flow, specified and actual
 - i. Total static pressure (total external), specified and actual
 - j. Inlet pressure
 - k. Discharge pressure
 - l. Sheave Make/Size/Bore
 - m. Number of Belts/Make/Size
 - n. Fan RPM
- 9. Return Air/Outside Air Data:
 - a. Identification/location
 - b. Design air flow
 - c. Actual air flow
 - d. Design return air flow
 - e. Actual return air flow
 - f. Design outside air flow
 - g. Actual outside air flow
 - h. Return air temperature
 - i. Outside air temperature
 - j. Required mixed air temperature
 - k. Actual mixed air temperature
 - l. Design outside/return air ratio
 - m. Actual outside/return air ratio
- 10. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual
 - f. Total static pressure (total external), specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size

- k. Fan RPM
- 11. Duct Traverse:
 - a. System zone/branch
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow
 - f. Test velocity
 - g. Test air flow
 - h. Duct static pressure
 - i. Air temperature
 - j. Air correction factor
- 12. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage
- 13. Air Monitoring Station Data:
 - a. Identification/location
 - b. System
 - c. Size
 - d. Area
 - e. Design velocity
 - f. Design air flow
 - g. Test velocity
 - h. Test air flow
- 14. Terminal Unit Data:
 - a. Manufacturer
 - b. Type, constant, variable, single, dual duct
 - c. Identification/number
 - d. Location
 - e. Model number
 - f. Size
 - g. Minimum static pressure
 - h. Minimum design air flow
 - i. Maximum design air flow
 - j. Maximum actual air flow
 - k. Inlet static pressure
- 15. Air Distribution Test Sheet:
 - a. Air terminal number
 - b. Room number/location
 - c. Terminal type
 - d. Terminal size
 - e. Area factor
 - f. Design velocity

- g. Design air flow
 - h. Test (final) velocity
 - i. Test (final) air flow
 - j. Percent of design air flow
16. Sound Level Report:
- a. Location
 - b. Octave bands - equipment off
 - c. Octave bands - equipment on
 - d. RC level - equipment on
17. Combustion Test:
- a. Manufacturer
 - b. Model number
 - c. Serial number
 - d. Firing rate
 - e. Overfire draft
 - f. Gas meter timing dial size
 - g. Gas meter time per revolution
 - h. Gas pressure at meter outlet
 - i. Gas flow rate
 - j. Heat input
 - k. Burner manifold gas pressure
 - l. Percent carbon monoxide (CO)
 - m. Percent carbon dioxide (CO₂)
 - n. Percent oxygen (O₂)
 - o. Percent excess air
 - p. Flue gas temperature at outlet
 - q. Ambient temperature
 - r. Net stack temperature
 - s. Percent stack loss
 - t. Percent combustion efficiency
 - u. Heat output
18. Vibration Test:
- a. Location of points:
 - 1) Fan bearing, drive end
 - 2) Fan bearing, opposite end
 - 3) Motor bearing, center (when applicable)
 - 4) Motor bearing, drive end
 - 5) Motor bearing, opposite end
 - 6) Casing (bottom or top)
 - 7) Casing (side)
 - 8) Duct after flexible connection (discharge)
 - 9) Duct after flexible connection (suction)
 - b. Test readings:
 - 1) Horizontal, velocity and displacement
 - 2) Vertical, velocity and displacement
 - 3) Axial, velocity and displacement
 - c. Normally acceptable readings, velocity and acceleration
 - d. Unusual conditions at time of test
 - e. Vibration source (when non-complying)

END OF SECTION

SECTION 230700

HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. HVAC piping insulation, jackets and accessories.
 - 2. HVAC equipment insulation, jackets and accessories.
 - 3. HVAC ductwork insulation, jackets, and accessories.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
 - 2. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 - 3. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
 - 4. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - 5. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - 6. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - 7. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
 - 8. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.
 - 9. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.
- B. Sheet Metal and Air Conditioning Contractors':
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- B. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

1.4 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Manufacturers for Glass Fiber and Mineral Fiber Insulation Products:
 - 1. CertainTeed.
 - 2. Knauf.
 - 3. Johns Manville.
 - 4. Owens-Corning.
- B. Manufacturers for Closed Cell Elastomeric Insulation Products:
 - 1. Aeroflex. Aerocell.
 - 2. Armacell, LLC. Armaflex.
 - 3. Nomaco. K-flex.

2.2 PIPE INSULATION

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 850 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-2: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket. Conform to ASTM C795 for application on Austenitic stainless steel.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 650 degrees F.
 - 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.

- C. TYPE P-5: ASTM C534; Type I, flexible, closed cell elastomeric insulation, tubular.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.

2.3 PIPE INSULATION JACKETS

- A. PVC Plastic Pipe Jacket:
 - 1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
 - 2. Thickness: 30 mil.
 - 3. Connections: Brush on welding adhesive.
- B. Aluminum Pipe Jacket:
 - 1. ASTM B209.
 - 2. Thickness: 0.016 inch thick sheet.
 - 3. Finish: Smooth.
 - 4. Joining: Longitudinal slip joints and 2 inch laps.
 - 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

2.4 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Adhesives: Compatible with insulation.

2.5 EQUIPMENT INSULATION

- A. TYPE E-1: ASTM C612; glass fiber, rigid board, noncombustible with factory applied reinforced aluminum foil jacket.
 - 1. Thermal Conductivity: 0.023 at 75 degrees F.
 - 2. Operating Temperature Range: 0 to 450 degrees F.
 - 3. Density: 3.0 pound per cubic foot.
 - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE E-3: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
 - 1. Thermal Conductivity: 0.27 at 75 degrees F.
 - 2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.

2.6 EQUIPMENT INSULATION JACKETS

- A. PVC Plastic Equipment Jacket:
 - 1. Product Description: ASTM D1785, sheet material, off-white color.
 - 2. Minimum Service Temperature: -40degrees F.
 - 3. Maximum Service Temperature: 150degrees F.

4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
5. Thickness: 30 mil.
6. Connections: Brush on welding adhesive.

2.7 EQUIPMENT INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Adhesives: Compatible with insulation.

2.8 DUCTWORK INSULATION

- A. TYPE D-1: ASTM C1290, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
 1. Thermal Conductivity: 0.27 at 75 degrees F.
 2. Maximum Operating Temperature: 250 degrees F.
 3. Density: 0.75 pound per cubic foot.
- B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied reinforced aluminum foil facing meeting ASTM C1136, Type II.
 1. Thermal Conductivity: 0.23 at 75 degrees F.
 2. Density: 3.0 pound per cubic foot.

2.9 DUCTWORK INSULATION JACKETS

- A. Aluminum Duct Jacket:
 1. ASTM B209.
 2. Thickness: 0.016 inch thick sheet.
 3. Finish: Smooth.
 4. Joining: Longitudinal slip joints and 2 inch laps.
 5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- B. Aluminum Duct Jacket Systems:
 1. Self-adhesive material with aluminum finish surface, color to be selected by owner.
 2. Tear strength of 8.5 lbs or greater meeting ASTM D624.
 3. Thickness: 6 mils sheet.
 4. Finish: Smooth.
 5. Non permeable with vapor barrier.
 6. Mold resistant.

2.10 DUCTWORK INSULATION ACCESSORIES

- A. Vapor Retarder Tape:
 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- B. Vapor Retarder Lap Adhesive: Compatible with insulation.
- C. Adhesive: Waterproof, ASTM E162 fire-retardant type.

- D. Liner Fasteners: Galvanized steel, self-adhesive pad head.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Lagging Adhesive: Fire retardant type with maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.
- H. Adhesives: Compatible with insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify piping, equipment and ductwork has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- C. Glass Fiber Board Insulation:
 - 1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 - 2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
 - 3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- D. Inserts and Shields:
 - 1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
 - 2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
 - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

- b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
- 3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- E. Insulation Terminating Points:
 - 1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
 - 2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
 - 3. Condensate Piping: Insulate entire piping system and components to prevent condensation.
- F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 8 feet above finished floor): Finish with PVC jacket and fitting covers.
- G. Prepare pipe insulation for finish painting.

3.3 INSTALLATION - EQUIPMENT

- A. Factory Insulated Equipment: Do not insulate.
- B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- D. Equipment Containing Fluids Below Ambient Temperature:
 - 1. Insulate entire equipment surfaces.
 - 2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 - 3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 4. Finish insulation at supports, protrusions, and interruptions.
- E. Equipment Containing Fluids 140 degrees F Or Less:
 - 1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
 - 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 - 3. Finish insulation at supports, protrusions, and interruptions.
- F. Equipment Containing Fluids Over 140 degrees F:
 - 1. Insulate flanges and unions with removable sections and jackets.
 - 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 - 3. Finish insulation at supports, protrusions, and interruptions.
- G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.
- H. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

- I. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.
- J. Prepare equipment insulation for finish painting.

3.4 INSTALLATION - DUCTWORK SYSTEMS

- A. Duct dimensions indicated on Drawings are finished inside dimensions.
- B. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor retarder jackets.
 - 2. Finish with tape and vapor retarder jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with or without standard vapor retarder jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Ductwork Exposed in Mechanical Equipment Rooms or Finished Spaces below 8 feet above finished floor: Finish with aluminum jacket.
- E. External Glass Fiber Duct Insulation:
 - 1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
 - 2. Secure insulation without vapor retarder with staples, tape, or wires.
 - 3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
 - 4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
 - 6. Insulate and seal exhaust and relief ductwork including the exterior building air outlet and all duct back to and including the damper.

3.5 SCHEDULES

- A. Heating Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Heating Water Supply and Return	P-1 or P-2	1-1/2 inches and smaller 2 inches and larger	1.5 2.0

- B. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches

Pump Bodies	E-3	1.5
Air Separators	E-3	1.5
Expansion Tanks	E-3	1.5

C. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Combustion Air	D-2	2.0
Outside Air Intake	D-2	2.0
Equipment Casings	D-2	2.0
Supply Ducts (externally insulated)	D-1	2.0
Supply Ducts (Mechanical Room and where noted)	D-2	2.0
Return Ducts (Mechanical Room and where noted)	D-2	2.0
Exhaust or Relief Ducts Within 10 feet of Exterior Openings and between exterior outlet and damper Thickness indicated is installed thickness.	D-2	2.0

END OF SECTION

SECTION 23 08 00
COMMISSIONING OF HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. HVAC commissioning description.
 - 2. HVAC commissioning responsibilities.

1.2 REFERENCES

- A. Associated Air Balance Council:
 - 1. AABC - AABC Commissioning Guideline.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE Guideline 1 - The HVAC Commissioning Process.
- C. National Environmental Balancing Bureau:
 - 1. NEBB - Procedural Standards for Building Systems Commissioning.

1.3 COMMISSIONING DESCRIPTION

- A. HVAC commissioning process includes the following tasks:
 - 1. Testing and startup of HVAC equipment and systems.
 - 2. Equipment and system verification checks.
 - 3. Assistance in functional performance testing to verify testing and balancing, and equipment and system performance.
 - 4. Provide qualified personnel to assist in commissioning tests, including seasonal testing.
 - 5. Complete and endorse functional performance test checklists provided by Commissioning Authority to assure equipment and systems are fully operational and ready for functional performance testing.
 - 6. Provide equipment, materials, and labor necessary to correct deficiencies found during commissioning process to fulfill contract and warranty requirements.
 - 7. Provide operation and maintenance information and record drawings to Commissioning Authority for review verification and organization, prior to distribution.
 - 8. Provide assistance to Commissioning Authority to develop, edit, and document system operation descriptions.
 - 9. Provide training for systems specified in this Section with coordination by Commissioning Authority.
- B. Equipment and Systems to Be Commissioned:
 - 1. Pumps.
 - 2. Boilers.
 - 3. Piping systems.
 - 4. Ductwork.
 - 5. Variable frequency drives.
 - 6. Air handling units.
 - 7. Air handling unit AHU duct system.
 - 8. Chemical treatment systems.

9. Fire dampers.
10. Indoor air quality.
11. Equipment sound control.
12. Equipment vibration control.
13. Automatic temperature control system.
14. Testing, Adjusting and Balancing work.

1.4 COMMISSIONING SUBMITTALS

- A. Draft Forms: Submit draft of system verification form and functional performance test checklist.
- B. Test Reports: Indicate data on system verification form for each piece of equipment and system as specified.
- C. Field Reports: Indicate deficiencies preventing completion of equipment or system verification checks equipment or system to achieve specified performance.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record revisions to equipment and system documentation necessitated by commissioning.
- B. Operation and Maintenance Data: Submit revisions to operation and maintenance manuals when necessary revisions are discovered during commissioning.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASHRAE Guideline 1.
- B. Perform Work in accordance with local standard.
- C. Maintain one copy of each document on site.

1.7 COMMISSIONING RESPONSIBILITIES

- A. Equipment or System Installer Commissioning Responsibilities:
 1. Attend commissioning meetings.
 2. Ensure temperature controls installer performs assigned commissioning responsibilities as specified below.
 3. Ensure testing, adjusting, and balancing agency performs assigned commissioning responsibilities as specified.
 4. Provide instructions and demonstrations for Owner's personnel.
 5. Ensure subcontractors perform assigned commissioning responsibilities.
 6. Ensure participation of equipment manufacturers in appropriate startup, testing, and training activities when required by individual equipment specifications.
 7. Develop startup and initial checkout plan using manufacturer's startup procedures and functional performance checklists for equipment and systems to be commissioned.
 8. During verification check and startup process, execute HVAC related portions of checklists for equipment and systems to be commissioned.
 9. Perform and document completed startup and system operational checkout procedures, providing copy to Commissioning Authority.

10. Provide manufacturer's representatives to execute starting of equipment. Ensure representatives are available and present during agreed upon schedules and are in attendance for duration to complete tests, adjustments and problem-solving.
11. Coordinate with equipment manufacturers to determine specific requirements to maintain validity of warranties.
12. Provide personnel to assist Commissioning Authority during equipment or system verification checks and functional performance tests.
13. Prior to functional performance tests, review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during tests.
14. Prior to startup, inspect, check, and verify correct and complete installation of equipment and system components for verification checks included in commissioning plan. When deficient or incomplete work is discovered, ensure corrective action is taken and re-check until equipment or system is ready for startup.
15. Provide factory supervised startup services for equipment and systems. Coordinate work with manufacturer and Commissioning Authority.
16. Perform verification checks and startup on equipment and systems as specified.
17. Assist Commissioning Authority in performing functional performance tests on equipment and systems as specified.
18. Perform operation and maintenance training sessions scheduled by Commissioning Authority.
19. Conduct HVAC system orientation and inspection.

B. Temperature Controls Installer Commissioning Responsibilities:

1. Attend commissioning meetings.
2. Review design for ability of systems to be controlled including the following:
 - a. Confirm proper hardware requirements exists to perform functional performance testing.
 - b. Confirm proper safeties and interlocks are included in design.
 - c. Confirm proper sizing of system control valves and actuators and control valve operation will result capacity control identified in Contract Documents.
 - d. Confirm proper sizing of system control dampers and actuators and damper operation will result in proper damper positioning.
 - e. Confirm sensors selected are within device ranges.
 - f. Review sequences of operation and obtain clarification from Architect/Engineer.
 - g. Indicate delineation of control between packaged controls and building automation system, listing BAS monitor points and BAS adjustable control points.
 - h. Provide written sequences of operation for packaged controlled equipment. Equipment manufacturers' stock sequences may be included, when accompanied by additional narrative to reflect Project conditions.
3. Inspect, check, and confirm proper operation and performance of control hardware and software provided in other HVAC sections.
4. Submit proposed procedures for performing automatic temperature control system point-to-point checks to Commissioning Authority and Architect/Engineer.
5. Inspect check and confirm correct installation and operation of automatic temperature control system input and output device operation through point-to-point checks.
6. Perform training sessions to instruct Owner's personnel in hardware operation, software operation, programming, and application in accordance with commissioning plan.
7. Demonstrate system performance and operation to Commissioning Authority during functional performance tests including each mode of operation.
8. Provide control system technician to assist during Commissioning Authority verification check and functional performance testing.
9. Provide control system technician to assist testing, adjusting, and balancing agency during performance of testing, adjusting, and balancing work.
10. Assist in performing operation and maintenance training sessions scheduled by Commissioning Authority.

- C. Testing, Adjusting, and Balancing Agency Commissioning Responsibilities:
 - 1. Attend commissioning meetings.
 - 2. Participate in verification of testing, adjusting, and balancing report for verification or diagnostic purposes. Repeat sample of 10 percent of measurements contained in testing, adjusting, and balancing report.
 - 3. Assist in performing operation and maintenance training sessions scheduled by Commissioning Authority.

1.8 COMMISSIONING MEETINGS

- A. Attend initial commissioning meeting and progress commissioning meetings as required by Commissioning Authority.

1.9 SCHEDULING

- A. Prepare schedule indicating anticipated start dates for the following:
 - 1. Piping system pressure testing.
 - 2. Piping system flushing and cleaning.
 - 3. Ductwork pressure testing.
 - 4. Equipment and system startups.
 - 5. Automatic temperature control system checkout.
 - 6. Testing, adjusting, and balancing.
 - 7. HVAC system orientation and inspections.
 - 8. Operation and maintenance manual submittals.
 - 9. Training sessions.
- B. Schedule seasonal tests of equipment and systems during peak weather conditions to observe full-load performance.
- C. Schedule occupancy sensitive tests of equipment and systems during conditions of both minimum and maximum occupancy or use.

1.10 COORDINATION

- A. Notify Commissioning Authority minimum of Two weeks in advance of the following:
 - 1. Scheduled equipment and system startups.
 - 2. Scheduled automatic temperature control system checkout.
 - 3. Scheduled start of testing, adjusting, and balancing work.
- B. Coordinate programming of automatic temperature control system with construction and commissioning schedules.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Place HVAC systems and equipment into full operation and continue operation during each working day of commissioning.
- B. Install replacement sheaves and belts to obtain system performance, as requested by Commissioning Authority.
- C. Install test holes in ductwork and plenums as requested by Commissioning Authority for taking air measurements.
- D. Prior to start of functional performance test, install replacement filters in equipment as specified in individual section.

3.2 COMMISSIONING

- A. Seasonal Sensitive Functional Performance Tests:
 - 1. Test heating equipment at winter design temperatures.
 - 2. Participate in testing delayed beyond Final Completion to test performance at peak seasonal conditions.
- B. Be responsible to participate in initial and alternate peak season test of systems required to demonstrate performance.
- C. Occupancy Sensitive Functional Performance Tests:
 - 1. Test equipment and systems affected by occupancy variations at minimum and peak loads to observe system performance.

END OF SECTION

SECTION 23 09 00

INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Control panel enclosures.
 - 2. Thermostats.
 - 3. Control air dampers.
 - 4. Electric damper actuators.
 - 5. Control valves.
 - 6. Electric valve actuators.
 - 7. Direct digital control system components.
 - 8. Differential pressure monitor.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
 - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 62 - Ventilation for Acceptable Indoor Air Quality.
- C. American Society of Mechanical Engineers:
 - 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. ASTM International:
 - 1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. ASTM A536 - Standard Specification for Ductile Iron Castings.
 - 3. ASTM B32 - Standard Specification for Solder Metal.
 - 4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 5. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 - 6. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.
- E. American Welding Society:
 - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
- F. National Electrical Manufacturers Association:
 - 1. NEMA DC 3 - Residential Controls - Electrical Wall Mounted Room Thermostats.
 - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- G. National Fire Protection Association:
 - 1. NFPA 72 - National Fire Alarm Code.
 - 2. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- H. Underwriters Laboratories, Inc.:

1. UL 1820 - Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate operating data, system drawings, wiring diagrams, and written detailed operational description of sequences.
- B. Product Data: Submit description and engineering data for each control system component. Include sizing as required.
- C. Manufacturer's Installation Instructions: Submit installation requirements for each control component.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors.
- B. Operation and Maintenance Data: Submit inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

1.5 QUALITY ASSURANCE

- A. Control Air Damper Performance: Test in accordance with AMCA 500.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept controls on site in original factory packaging Inspect for damage.

1.8 COORDINATION

- A. Coordinate installation of control components in piping systems with work of Section 23 21 16.
- B. Coordinate installation of control components in duct systems with work of Section 23 33 00.

PART 2 PRODUCTS

2.1 CONTROL COMPONENT MANUFACTURERS

- A. Installers:

1. Anchor Mechanical Inc.

2.2 CONTROL PANEL ENCLOSURES

- A. Furnish for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.
- B. Construction: NEMA 250, Type 1 steel enclosure.
- C. Covers: Continuous hinge, held closed by flush latch operable by key.
- D. Enclosure Finish: Manufacturer's standard enamel.

2.3 THERMOSTATS

- A. Electric Room Thermostats:
 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
 2. Service: cooling and heating.
 3. Covers: Locking with concealed setpoint, without thermometer.
- B. Room Thermostat Accessories:
 1. Thermostat Covers: Brushed aluminum.
 2. Insulating Bases: For thermostats located on exterior walls.
 3. Thermostat Guards: Metal mounted on separate base.
 4. Adjusting Key: Matching device.
 5. Aspirating Boxes: For thermostats requiring flush installation.
- C. Outdoor Reset Thermostat:
 1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
 2. Scale range: -10 to 70 degrees F.
- D. Air-stream Thermostats:
 1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
 2. Averaging service remote bulb element: 20 feet.
 3. Furnish with flange and shield.
- E. Electric Low Limit Duct Thermostat:
 1. Snap acting, single pole, single throw, manual reset switch tripping when temperature sensed across any 12 inches of bulb length is equal to or below set point.
 2. Bulb length: Minimum 20 feet.
 3. Furnish one thermostat for every 20 sq. ft of coil surface.

2.4 CONTROL AIR DAMPERS

- A. Performance: Test in accordance with AMCA 500.
- B. Frames: Extruded aluminum, welded or riveted with corner reinforcement, minimum 12 gage.

- C. Blades: Galvanized steel, maximum blade size 6 inches wide, 48 inches long, minimum 22 gage, attached to minimum 1/2 inch shafts with set screws.
- D. Blade Seals: Synthetic elastomeric mechanically attached, field replaceable.
- E. Jamb Seals: Stainless steel spring.
- F. Shaft Bearings: Graphite impregnated nylon sleeve, with thrust washers at bearings.
- G. Linkage Bearings: Graphite impregnated nylon.
- H. Outside Air Damper Leakage: Maximum leakage rate of 3.0 cfm per square foot at 1.0 inches wg pressure differential.
- I. Damper Leakage: Less than one percent based on approach velocity of 2000 fpm and 4 inches wg.
- J. Maximum Pressure Differential: 6 inches wg.
- K. Temperature Limits: - 40 to 200 degrees F.

2.5 ELECTRIC DAMPER ACTUATORS

- A. Operation: Reversing type proportional motor, spring-return.
- B. Enclosure Rating: NEMA 250 Type 1.
- C. Mounting: Direct mount.
- D. Stroke: 90 seconds end to end full stroke, 15 seconds return to normal for spring return.
- E. Protection: Electronic stall protection.
- F. Control Input: 0-10 VDC or 0-20 mA DC.
- G. Power: Nominal 24 volt AC.
- H. Torque: Size for minimum 150 percent of required duty.
- I. Duty cycle: rated for 65,000 cycles.
- J. Accessories:
 - 1. Cover mounted transformer.
 - 2. Auxiliary potentiometer.
 - 3. Damper linkage.
 - 4. Direct drive feedback potentiometer.
 - 5. Output position feedback.
 - 6. Field selectable rotational, spring return direction, field adjustable zero and span.
 - 7. End switch.

2.6 CONTROL VALVES

- A. Globe Pattern:

1. 2 inches and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with back seating capacity packable under pressure.
 2. 2-1/2 inches and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
 3. Hydronic Systems:
 - a. Rate for service pressure of 125 psig at 250 degrees F.
 - b. Replaceable plugs and seats of brass.
 - c. Sizing: Unless noted otherwise, size for 3 psig maximum pressure drop at design flow rate.
 - d. Furnish two-way valves with equal percentage characteristics. Furnish three way valves with linear characteristics. Size two way valve actuators to close valves against pump shut off head.
 4. Steam Systems:
 - a. Rate for service pressure of 125 psig at 250 degrees F.
 - b. Replaceable plugs and seats of stainless steel.
 - c. Sizing: Pressure drop across steam valve at maximum flow as indicated on Drawings.
 - d. Furnish valves with modified linear characteristics.
- B. Ball Valves:
1. Threaded ends for 2-way valves 2 inches and smaller. Threaded ends for 3-way valves 2 inches and smaller.
 2. Forged brass body, chrome plated brass ball and blowout proof stem and EPDM O-rings with minimum 600 psig rating.
 3. Fluid Temperature Range: minus 20 to 250 degrees F.
 4. Sizing: Unless noted otherwise, 3 psig maximum pressure drop at design flow rate.
 5. Flow Characteristics: Furnish 2-way valves with equal percentage characteristics. Furnish 3-way valves with equal percentage characteristic through control port and linear characteristic through bypass port.
 6. Size 2-way valve actuators to close valves against pump shut off head.
- C. Butterfly Valves:
1. Service Pressure Rating: 125 psig at 250 degrees F.
 2. Construction: ASTM A126 cast-iron or ASTM A536 ductile-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals.
 3. Body Style: Wafer, or Lug.
 4. Disc: Stainless steel.
 5. Resilient replaceable seat for service to 250 degrees F.
- D. Terminal Unit Control Valves:
1. Brass body, Class 250, nickel plated brass ball, with optimizer insert for modulating applications, blow out resistant stem, threaded ends.
 2. Two or three way as indicated in schedule or on Drawings.
 3. Integral actuator.
 4. Spring return required for unit ventilator heating valves and other terminal equipment with outside air.
 5. Furnish non-spring return valves with manual override capability built into actuator.
 6. Minimum Fluid Temperature: 20 degrees F.
 7. Maximum Operating Conditions: 250 degrees F.
 8. Sizing: Unless noted otherwise, 4 psig maximum pressure drop at design flow rate, to close against pump shutoff head.
 9. Flow Characteristics: Furnish two-way and three-way valves with equal percentage characteristics.

2.7 ELECTRIC VALVE ACTUATORS

- A. Fully factory assembled. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action under every condition.
- B. Motor: Permanent split-capacitor or shaded-pole type. Gear trains completely oil immersed and sealed. Furnish spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
- C. Actuator: Direct-coupled type non-hydraulic designed for minimum 100,000 full-stroke cycles at rated torque. Furnish actuator with rating of not less than twice thrust needed for actual operation of valve.
 - 1. Coupling: V-bolt and V-shaped, toothed cradle.
 - 2. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
 - 3. Fail-Safe Operation: Mechanical, spring-return mechanism. Furnish external, manual gear release on non-spring-return actuators.
 - 4. Furnish spring-return actuators with manual override. Complete manual override to take no more than 10 turns.
 - 5. Power Requirements:
 - a. Two-Position Spring Return: 24 volt AC or DC, maximum 10 vA.
 - b. Modulating: 24 volt AC, maximum 15 vA.
 - 6. Proportional Signal: 2 to 10 volt dc or 4 to 20 mA, and 2 to 10 volt dc position feedback signal.
 - 7. Temperature Rating: minus 22 to 140 degrees F.
 - 8. Run Time: 200 seconds open, 40 seconds closed.
- D. Size for torque required for valve close-off at maximum pump differential pressure, regardless of water loop system pressures.

2.8 DIRECT DIGITAL CONTROL SYSTEM COMPONENTS

- A. Temperature Sensors:
 - 1. Type: Resistance temperature detector (RTD) or thermistor.
 - 2. Accuracy:
 - a. Plus or minus 1 degree F for standard applications. Where high accuracy is required, furnish accuracy of plus or minus 0.2 degrees F.
 - b. Sensing Accuracy: Plus or minus 0.5 degree F.
 - c. Display Accuracy and Resolution: Minimum of plus or minus 1 degree F.
 - 3. Built-in communications port.
 - 4. Space Sensors: Digital with LCD display, day-night override button, and set point slide adjustment override options. Set point slide adjustment capable of being software limited by automation system to limit amount of room adjustment.
 - 5. Outside Air Sensors: Watertight inlet fitting, furnish with shield from direct sunlight.
 - 6. Duct Temperature Sensors:
 - a. Rigid or averaging type as indicated in sequence of operations. Averaging sensor minimum length: 5 feet in length.
 - b. Duct Cross Sections Greater Than 10 square feet: Furnish serpentine averaging element to sense stratified air temperatures.
 - 7. Piping Temperature Sensors: Furnish with separable brass well.
- B. Differential Pressure Switches:
 - 1. Furnish as specified in sequences of operation for status purposes in air and water applications.

2. Fully adjustable differential pressure settings.
 3. UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum).
 4. NEMA 250 Type 1 enclosure.
 5. Scale range and differential suitable for intended application.
- C. Static Pressure Sensors:
1. Differential pressure type.
 2. Sensor range closely matched to system static pressure, minus 0.5 to 0.5 inches water column, minus 1 to 1 inches water column or 0 to 2.5 inches water column.
 3. Accuracy: Plus or minus 5 percent of sensing range.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify air handling units and ductwork installation is complete and air filters are in place before installing sensors in air streams.
- B. Verify location of thermostats and humidistats and other exposed control sensors with Drawings before installation.
- C. Verify building systems to be controlled are ready to operate.

3.2 INSTALLATION

- A. Install thermostats and other exposed control sensors after locations are coordinated with other Work.
- B. Install thermostats, space temperature sensors and other exposed control sensors 54 inches above floor. Align with light switches.
- C. Install freeze protection thermostats using flanges and element holders.
- D. Install outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- E. Provide separable sockets for liquids and flanges for air bulb elements.
- F. Install guards on thermostats or other control components in racquetball courts and gymnasiums.
- G. Install control panels adjacent to associated equipment on vibration free walls or freestanding supports. Use one cabinet for more than one system in same equipment room. Install engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face. Label with appropriate equipment or system designation.
- H. Install conduit and electrical wiring in accordance with Division 26.

3.3 FIELD QUALITY CONTROL

- A. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

3.4 DEMONSTRATION AND TRAINING

- A. Demonstrate complete operation of systems, including sequence of operation prior to Date of Substantial Completion.
- B. Demonstrate complete and operating system to Owner.

END OF SECTION

SECTION 230923

DIRECT DIGITAL CONTROLS

PART 1 GENERAL

1.1 WORK INCLUDES

- A. Contractor shall provide control equipment and software as required for integration of new equipment into existing DDC controls system.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI MC85.1 - Terminology for Automatic Control.

1.3 SYSTEM DESCRIPTION

- A. The contractor shall provide a web based Building Automation Controls System compatible with existing Tridium Niagara system that will operate on Village of Oak Park intranet network.
- B. New controller(s) provided under this contract shall connect to field devices via BACnet/MSTP/IP field bus and provide all Building level integration/supervisory functionality. All control sequences shall therefore reside on building controller(s) in fully distributed control architecture.
- C. The Contractor shall surrender all programming files used in the project and shall guarantee that the products installed will be at current revisions, and provide updates for repairs made to software for 1 year.
- D. The sequence of operation for every system shall be included in the Building Automation System on the same screen showing that system graphic.
- E. Mechanical equipment controllers shall be connected to the system through the local network to the system backbone. The operator shall have direct access to all network devices at this point of entry.
- F. Provide computer software, hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- G. Provide controls for air-handling units, variable air volume terminals, pre-heat and reheat coils, pumps, boilers and air-cooled chillers, when directly connected to control units.
- H. Provide control systems consisting of thermostats, space temperature sensors, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories to operate mechanical systems, and to perform functions specified.
- I. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate the following:
 - 1. Trunk cable schematic showing programmable control-unit locations and trunk data conductors.
 - 2. Connected data points, including connected control unit and input device.
 - 3. System graphics showing monitored systems, data (connected and calculated) point addresses, and operator notations.
 - 4. System configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 - 5. Description and sequence of operation for operating, user, and application software.
 - 6. Use terminology in submittals conforming to ASME MC85.1.
- B. Product Data: Submit data for each system component and software module.
- C. Manufacturer's Installation Instructions: Submit installation instruction for each control system component.
- D. Qualifications: Submit proof of manufacturer, installer, and programmer qualifications.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
 - 2. Submit data specified in "Submittals" in final "Record Documents" form.
- B. Operation and Maintenance Data:
 - 1. Submit interconnection wiring diagrams complete field installed systems with identified and numbered system components and devices.
 - 2. Submit keyboard illustrations and step-by-step procedures indexed for each operator function.
 - 3. Submit inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience, and with service facilities within 100 miles of Project.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.
- C. Programmer: Individual(s) certified in Niagara AX product programming and must be a resident employee from an office within 100 miles of the jobsite. Temporarily importing employees from a further office just to do programming shall be unacceptable.

PART 2 PRODUCTS

2.1 DIRECT DIGITAL CONTROLS

- A. Manufacturers: Tridium Niagara
- B. Installer: Anchor Mechanical, Chicago, IL

2.2 CUSTOM APPLICATION CONTROL UNITS (CAC):

- A. Modular, comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control applications. CAC's shall be provided for Roof Top Units, Boiler Plant, Chiller Plant and other applications as shown on drawings and shall have device resource files and external interface definitions:
 - 1. Units monitor or control each input/output point; process information; and at least 50 expressions for customized HVAC control including mathematical equations, boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, enthalpy calculation, counters, interlocks, ramps, drivers, schedules, calendars, OSS, compare, limit, curve fit, and alarms.
 - 2. Stand alone mode control functions operate regardless of network status. Functions include the following:
 - a. Automatic communications loss detection to maintain normal control functionality regardless of available network communications.
 - b. Discrete/digital, analog, and pulse input/outputs.
 - c. Monitoring, controlling, or addressing data points.
 - d. Local energy management control strategies.
- B. Local operator interface port provides for download from and connection to portable workstation.
- C. Communication: The Custom Application Controller shall communicate via the Primary Controller Network between BMS Controllers. CAC's shall communicate with the UNC's and ASC's at a baud rate of not less than 78.8K baud using communications protocol (EIA 709.1).
- D. All CAC's shall support the portable workstation to provide uploading/downloading of Custom Application Controller databases, monitoring of all Standard Network Variables Types (SNVTs) including display of all bound SNVTs, monitoring and overrides of all controller physical input/output points, and editing of controller resident time schedules. POT connectivity shall be via digital wall sensor connected to controller.
- E. The Controls Contractor shall provide a Data Table showing all DDC points and information pertaining to all points. The tables shall reference points with respect to the names established on the project drawings and specifications.
- F. The Controls Contractor shall provide network cable to the Integrator's Universal Network Controller by leaving minimum of 10' of coiled cable at the NCU. Final connection to the NCU will be by the Integrator.

2.3 APPLICATION SPECIFIC CONTROL UNITS: (ASC)

- A. Single board construction comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control and unitary applications. ASCs shall be provided for

Unit Ventilators, Fan Coils, Heat Pumps, VAV Terminal Boxes, Rooftop Units and other applications as shown on the drawings. ASCs shall be based on the Echelon Neuron 3150 microprocessor working with the ASCs stand alone control program.

1. Units monitor or control each input/output point; process information; and download from the operator station.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
 - a. Peer to peer primary network level communications with automatic communications loss detection to maintain normal control functionality regardless of available network communications.
 - b. Discrete/digital, analog, and pulse input/output.
 - c. Monitoring, controlling, or addressing data points.
3. The local operator interface ports located on ASC and ASC sensors provide for download from, or upload to portable workstation.
4. Communication: ASC's shall communicate with the UNC's and CAC's at a baud rate of not less than 78.8K baud using communications protocol (EIA 709.1).
5. ASC units monitor or control each input/output point; process information; and at least 50 expressions for customized HVAC control including mathematical equations, boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, counters, interlocks, compare, limit, and alarms.
6. All ASC Controller setpoints shall be digital display setpoints with dual setpoint limits (integral hard limits which the user cannot exceed above and below and independent soft limits which are hidden from the user). All digital setpoints shall be network retentive after power outages and after replacement of sensor.
7. All ASC's shall support the portable workstation to provide uploading/downloading of Application Specific Controllers databases, Standard Network Variables Types (SNVTs) including display of all bound SNVTs, monitoring and overrides of all controller physical input/output points, and editing of controller resident time schedules. POT connectivity shall be via digital wall sensor connected to controller.

2.4 HVAC CONTROL PROGRAMS

- A. General:
 1. Use Inch-pound measurement and have S.I. (metric) units of measurement available.
 2. Identify each HVAC Control system.
- B. Optimal Run Time:
 1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
 2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
 3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
 4. Use outside air temperature to determine early shut down with ventilation override.
 5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
 6. Operator commands:
 - a. Define term schedule.
 - b. Add/delete fan status point.
 - c. Add/delete outside air temperature point.
 - d. Add/delete mass temperature point.
 - e. Define heating/cooling parameters.
 - f. Define mass sensor heating/cooling parameters.
 - g. Lock/unlock program.

- h. Request optimal run-time control summary.
- i. Request optimal run-time mass temperature summary.
- j. Request HVAC point summary.
- k. Request HVAC saving profile summary.
- 7. Control Summary:
 - a. HVAC Control system begin/end status.
 - b. Optimal run time lock/unlock control status.
 - c. Heating/cooling mode status.
 - d. Optimal run time schedule.
 - e. Start/Stop times.
 - f. Selected mass temperature point ID.
 - g. Optimal run-time system normal start-times.
 - h. Occupancy and vacancy times.
 - i. Optimal run time system heating/cooling mode parameters.
- 8. Mass temperature summary:
 - a. Mass temperature point type and ID.
 - b. Desired and current mass temperature values.
 - c. Calculated warm-up/cool-down time for each mass temperature.
 - d. Heating/cooling season limits.
 - e. Break point temperature for cooling mode analysis.
- 9. HVAC point summary:
 - a. Control system identifier and status.
 - b. Point ID and status.
 - c. Outside air temperature point ID and status.
 - d. Mass temperature point ID and status.
 - e. Calculated optimal start and stop times.
 - f. Period start.

2.5 PROGRAMMING APPLICATION FEATURES

- A. Trend Point:
 - 1. Output trend logs as line-graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique pattern and color, vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.
- B. Alarm Messages:
 - 1. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totaled point's warning limit, hardware elements advisories.
 - 2. Output assigned alarm with "message requiring acknowledgment".
 - 3. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.
- C. Weekly Scheduling:
 - 1. Automatically initiate equipment or system commands, based on selected time schedule for points specified.
 - 2. Program times for each day of week, for each point, with one minute resolution.
 - 3. Automatically generate alarm output for points not responding to command.
 - 4. Allow for holidays, minimum of 366 consecutive holidays.
 - 5. Operator commands:
 - a. System logs and summaries.
 - b. Start of stop point.
 - c. Lock or unlock control or alarm input.
 - d. Add, delete, or modify analog limits and differentials.

- e. Adjust point operation position.
 - f. Change point operational mode.
 - g. Open or close point.
 - h. Enable/disable, lock/unlock, or execute interlock sequence or computation profile.
 - i. Begin or end point totals.
 - j. Modify total values and limits.
 - k. Access or secure point.
 - l. Begin or end HVAC or load control system.
 - m. Modify load parameter.
 - n. Modify demand limiting and duty cycle targets.
6. Output summary: Listing of programmed function points, associated program times, and respective day of week programmed points by software groups or time of day.
- D. Interlocking:
- 1. Permit events to occur, based on changing condition of one or more associated master points.
 - 2. Binary contact, high/low limit of analog point or computed point capable of being used as master. Master capable of monitoring or commanding multiple slaves.
 - 3. Operator commands:
 - a. Define single master/multiple master interlock process.
 - b. Define logic interlock process.
 - c. Lock/unlock program.
 - d. Enable/disable interlock process.
 - e. Execute terminate interlock process.
 - f. Request interlock type summary.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify conditioned power supply is available to control units. Locate electrical power panels and add 15 amp single pole breakers as required to power new controls. Use lightly loaded circuits where space in panels is not available. Label all circuits that feed controls.
- B. Verify field end devices and wiring is installed prior to installation proceeding.

3.2 INSTALLATION

- A. Install control units and other hardware in position on permanent walls in existing control panels where not subject to excessive vibration.
- B. Install software in control units. Implement features of programs to specified requirements and appropriate to sequence of operation.
- C. Install with 120 volts alternating current, 15 amp dedicated power circuit to each programmable control unit.
- D. Install conduit and electrical wiring in accordance with Division 26.

END OF SECTION

SECTION 23 11 23

FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Natural gas piping above grade.
 - 2. Unions and flanges.
 - 3. Valves.
 - 4. Pipe hangers and supports.
 - 5. Strainers.
 - 6. Natural gas pressure regulators.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z21.15 - Manually Operated Gas Valves for Appliances, Appliance Connector Valves and Hose End Valves.
- B. American Society of Mechanical Engineers:
 - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
 - 2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 - 3. ASME B16.33 - Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 psig (sizes 1/2 - 2).
 - 4. ASME B31.9 - Building Services Piping.
 - 5. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- C. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - 3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 4. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 - 5. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.
 - 6. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- D. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.
- E. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.
- F. Underwriters Laboratories Inc.:
 - 1. UL 842 - Valves for Flammable Fluids.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections when joining dissimilar metals in systems.
- B. Provide flanges, unions, or couplings at locations requiring servicing. Use unions, flanges, or couplings downstream of valves and at equipment connections. Do not use direct welded or threaded connections to valves, equipment.
- C. Provide pipe hangers and supports in accordance with ASME B31.9.
- D. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.4 SUBMITTALS

- A. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
 - 3. Piping Specialties: Submit manufacturers catalog information including capacity, rough-in requirements, and service sizes for the following:
 - a. Strainers.
 - b. Natural gas pressure regulators.
 - c. Natural gas pressure relief valves.
- B. Design Data: Indicate pipe size. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves, piping system, and system components.
- B. Operation and Maintenance Data: Submit for valves and gas pressure regulators installation instructions, spare parts lists, and exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform natural gas Work in accordance with NFPA 54.
- B. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- C. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.
- D. Furnish shutoff valves complying with ASME B16.33 or ANSI Z21.15.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

- B. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation. Furnish temporary protective coating on cast iron and steel valves.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.
- B. Corrugated Stainless Steel Tubing: ANSI LC 1.

2.2 REGULATOR VENT PIPING, ABOVE GRADE

- A. Indoors: Same as natural gas piping, above grade.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.4 BALL VALVES

- A. Manufacturers:
 - 1. Crane Valve, North America
 - 2. Hammond Valve
 - 3. Milwaukee Valve Company
 - 4. NIBCO, Inc.
 - 5. Stockham Valves & Fittings
- B. 1/4 inch to 1 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.

2.5 STRAINERS

- A. Manufacturers:
 - 1. Mueller Steam Specialty
 - 2. O.C. Keckley Company
 - 3. Spirax Sarco, Inc.
- B. 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.6 NATURAL GAS PRESSURE REGULATORS

- A. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body.
 - 1. Comply with ANSI Z21.80.
 - 2. Temperatures: minus 20 degrees F to 150 degrees F.
 - 3. Body: Steel.
 - 4. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.
 - 5. Disk, diaphragm, and O-ring: Nitrile.
 - 6. Maximum inlet pressure: 150 psig.
 - 7. Furnish sizes 2 inches and smaller with threaded ends.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install natural gas piping in accordance with NFPA 54.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Where required, bend pipe with pipe bending tools in accordance with procedures intended for that purpose.
- E. Install piping to conserve building space and not interfere with use of space.
- F. Size and install gas piping to provide sufficient gas to supply maximum appliance demand at pressure higher than appliance minimum inlet pressure.
- G. Group piping whenever practical at common elevations.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Sleeve pipe passing through partitions, walls and floors.
- J. Provide clearance for installation of insulation and access to valves and fittings.

- K. Provide access where valves and fittings are not exposed.
- L. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.
- M. Provide support for utility meters in accordance with requirements of utility company.
- N. Install vent piping from gas pressure reducing valves to outdoors and terminate in weatherproof hood. Protect vent against entry of insects and foreign material.
 - 1. Minimum Vent Size: Connection size at regulator vent connection.
 - 2. Run individual vent line from each relief device, independent of breather vents.
- O. Breather vents may be manifolded together with piping sized for combined appliance vent requirements.
- P. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

3.4 FIELD QUALITY CONTROL

- A. Where gas appliance will be damaged by test pressure, disconnect appliance and cap piping during pressure test. Reconnect appliance after pressure test and leak test connection.
- B. Where gas appliance is designed for operating pressures equal to or greater than piping test pressure, provide gas valve to isolate appliance or equipment from gas test pressure.
- C. Pressure test natural gas piping in accordance with NFPA 54.
- D. Where new branch piping is extended from existing system, pressure test new branch piping only. Leak test joint between new and existing piping with noncorrosive leak detection fluid or other approved method.
- E. When pressure tests do not meet specified requirements, remove defective work, replace and retest.
- F. Immediately after gas is applied to a new system, or a system has been restored after gas service interruption, check pipe for leakage.
 - 1. Where leakage is detected, shut off gas supply until necessary repairs are complete.
- G. Do not place appliances in service until leak testing and repairs are complete.

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Heating water piping, above ground.
 - 2. Equipment drains and over flows.
 - 3. Unions and flanges.
 - 4. Pipe hangers and supports.
 - 5. Valves.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
 - 2. ASME B16.4 - Gray Iron Threaded Fittings.
 - 3. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 4. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - 5. ASME B31.1 - Power Piping.
 - 6. ASME B31.9 - Building Services Piping.
 - 7. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - 3. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
 - 4. ASTM A536 - Standard Specification for Ductile Iron Castings.
 - 5. ASTM B32 - Standard Specification for Solder Metal.
 - 6. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 7. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
 - 8. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - 9. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
 - 10. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- C. American Welding Society:
 - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
 - 2. AWS D1.1 - Structural Welding Code - Steel.

1.3 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

- B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Provide pipe hangers and supports in accordance with ASME B31.9.
- D. Use ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Use ball or butterfly valves for bypass, or manual flow control services.
- F. Use spring loaded check valves on discharge of boiler pumps.
- G. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.4 SUBMITTALS

- A. Shop Drawings: Indicate schematic layout of piping system, including equipment, critical dimensions, and sizes.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
 - 2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
- C. Test Reports: Indicate results of piping system pressure test.
- D. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures and isolation.
- E. Welders' Certificate: Include welders' certification of compliance with AWS D1.1.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves, equipment and accessories.
- B. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1 HEATING AND CHILLED WATER PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.
- B. Copper Tubing: ASTM B88, Type L, drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type DWV, L, drawn.
 - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
 - 2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150, malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with brazed joints.
 - 3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
 - 4. PVC Piping: PVC.
 - 5. CPVC Piping: CPVC.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
 - 2. Copper Piping: Class 150, slip-on bronze flanges.
 - 3. PVC Piping: PVC flanges.
 - 4. CPVC Piping: CPVC flanges.
 - 5. Gaskets: 1/16 inch thick preformed neoprene gaskets.
- C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

2.4 BALL VALVES

- A. Manufacturers:
 - 1. Crane Valve, North America
 - 2. Hammond Valve
 - 3. Milwaukee Valve Company
 - 4. NIBCO, Inc.
- B. 2 inches and Smaller: MSS SP 110, Class 150 bronze, two piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, solder or threaded ends with union, lever handle.

2.5 BALANCING VALVES

- A. Manufacturers:
 - 1. Tour and Anderson STAD

2. Wheatley GS Series
 3. Armstrong CBV Series
- B. 2 inches and Smaller: Class 150 brass construction, female thread, Y-pattern globe style, minimum 5 turn, concealed locking balance point, flow measurement ports.
 - C. 2-1/2 inches and Larger: Class 150 cast iron construction, flanged, Y-pattern globe style, minimum 5 turn, concealed locking balance point, flow measurement ports.

2.6 BUTTERFLY VALVES

- A. Manufacturers:
 1. Crane Valve, North America
 2. Hammond Valve
 3. Milwaukee Valve Company
 4. NIBCO, Inc.
 5. Stockham Valves & Fittings
- B. 2-1/2 inches and Larger: Class 150.
 1. Body: Cast or ductile iron, lug ends, stainless steel stem, extended neck.
 2. Disc: stainless steel.
 3. Seat: Resilient replaceable EPDM.
 4. Handle and Operator: 10 position lever handle.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems.

3.3 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install heating water piping in accordance with ASME B31.9.
- B. Route piping parallel to building structure and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

- F. Provide access where valves and fittings are not exposed.
- G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- H. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- I. Install valves with stems upright or horizontal, not inverted.

3.4 FIELD QUALITY CONTROL

- A. Test water piping system per ASME B31.9.

END OF SECTION

SECTION 23 21 16

HYDRONIC PIPING SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pressure gages.
 - 2. Pressure gage taps.
 - 3. Thermometers.
 - 4. Thermometer supports.
 - 5. Test plugs.
 - 6. Flexible connectors.
 - 7. Bladder-type expansion tanks.
 - 8. Air vents.
 - 9. Air separators.
 - 10. Strainers.
 - 11. Pump suction fittings.
 - 12. Combination Pump discharge valves.
 - 13. Balancing Valves.
 - 14. Relief valves.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
 - 2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- B. ASTM International:
 - 1. ASTM E1 - Standard Specification for ASTM Thermometers.
 - 2. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

1.3 SUBMITTALS

- A. Product Data: Submit for manufactured products and assemblies used in this Project.
 - 1. Manufacturer's data and list indicating use, operating range, total range, accuracy, and location for manufactured components.
 - 2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
 - 3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
 - 4. Submit electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures, application, selection, and hookup configuration. Include pipe and accessory elevations.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of actual locations of components and instrumentation, flow controls.

- B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instruments when areas are under construction, except rough in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

- A. Manufacturers:
 - 1. Terice.
 - 2. Weiss.
 - 3. Taylor.
 - 4. Ametek.
- B. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
 - 1. Case: Cast aluminum.
 - 2. Bourdon Tube: Phosphor bronze.
 - 3. Dial Size: 4-1/2 inch diameter.
 - 4. Mid-Scale Accuracy: One percent.
 - 5. Scale: Psi.

2.2 PRESSURE GAGE TAPS

- A. Ball Valve: Brass 1/4 inch NPT for 250 psi.
- B. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.
- C. Siphon: Brass, 1/4 inch NPT angle or straight pattern.

2.3 STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Terice.
 - 2. Weiss.
 - 3. Taylor.
 - 4. Ametek.

- B. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear Lexan.
 - 3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
 - 4. Accuracy: ASTM E77 2 percent.
 - 5. Calibration: Degrees F.

2.4 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.5 TEST PLUGS

- A. 1/4 inch NPT or 1/2 inch NPT brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with:
 - 1. Neoprene core for temperatures up to 200 degrees F.
 - 2. Nordel core for temperatures up to 350 degrees F.
 - 3. Viton core for temperatures up to 400 degrees F.
- B. Test Kit:
 - 1. Carrying case, internally padded and fitted containing:
 - a. Two 2-1/2 inch diameter pressure gages.
 - 1) Scale range: 0 to 100 psi
 - b. Two gage adapters with 1/8 inch probes.
 - c. Two 1-1/2 inch dial thermometers.
 - 1) Scale range: 30 to 100 degrees F.
 - 2) Scale range: 100 to 200 degrees F.

2.6 FLEXIBLE CONNECTORS

- A. Manufacturers:
 - 1. Flexonics.
 - 2. Vibration Isolator.
 - 3. Mason.
- B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

2.7 BLADDER-TYPE EXPANSION TANKS

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Taco.
 - 3. Amtrol.
 - 4. Armstrong.
- B. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible butyl bladder sealed into tank, and steel support stand.

- C. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to pressure listed on drawings.
- D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure back flow prevention device, test cocks, strainer, vacuum breaker, and by-pass valves.
- E. Size: As scheduled on the drawings.

2.8 AIR VENTS

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Taco.
 - 3. Amtrol.
 - 4. Armstrong.
- B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Float Type: Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
- D. Washer Type: Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.9 AIR SEPARATORS

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Taco.
 - 3. Amtrol.
 - 4. Armstrong.
- B. Dip Tube Fitting: For 125 psig operating pressure; to prevent free air collected in boiler from rising into system.
- C. In-line Air Separators: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME Section VIII; for 125 psig operating pressure.
- D. Combination Air Separators/Strainers: Steel, tested and stamped in accordance with ASME Section VIII; for 125 psig operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.10 STRAINERS

- A. Manufacturers:
 - 1. Amtrol.
 - 2. Watts.
 - 3. Armstrong.
- B. Size 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

- C. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

2.11 PUMP SUCTION FITTINGS

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Armstrong.
 - 3. Aurora.
- B. Fitting: Angle pattern, cast-iron body. Threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger. Rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.
- C. Accessories: Adjustable foot support, blow-down tapping in bottom, gage tapping in side.

2.12 COMBINATION PUMP DISCHARGE VALVES

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Wheatley.
 - 3. Taco.
- B. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psig operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.
- C. Manufacturer shall provide Cv rating for every 10% increment of valve opening. Brass readout valves shall be provided for differential pressure measurement.

2.13 BALANCING VALVES

- A. Manufacturers:
 - 1. Bell & Gossett.
 - 2. Tour Anderson.
 - 3. Aurora.
 - 4. Nexus.
- B. Construction: Brass or bronze body with union on inlet, and outlet, temperature and pressure test plug on inlet and outlet.
- C. Calibration: Control within 5 percent of design flow over entire operating pressure.
- D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.
- E. Accessories: In-line strainer on inlet and ball valve on outlet.

2.14 RELIEF VALVES

- A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.

PART 3 EXECUTION

3.1 INSTALLATION - THERMOMETERS AND GAGES

- A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.
- B. Install gage taps in piping
- C. Install pressure gages with pulsation dampers. Provide ball valve to isolate each gage. Extend nipples to allow clearance from insulation.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.
- E. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets.
- F. Coil and conceal excess capillary on remote element instruments.
- G. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- H. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- I. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.2 INSTALLATION - HYDRONIC PIPING SPECIALTIES

- A. Locate test plugs adjacent to thermometers and thermometer sockets.
- B. Where large air quantities accumulate, provide enlarged air collection standpipes.
- C. Install manual air vents at system high points.
- D. For automatic air vents in ceiling spaces or other concealed locations, provide 3/4" threaded end with hose connection.
- E. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- F. Provide drain and hose connection with valve on strainer blow down connection.
- G. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.
- H. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.
- I. Support pump fittings with floor mounted pipe and flange supports.
- J. Provide relief valves on pressure tanks, low-pressure side of reducing valves and expansion tanks.
- K. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
- L. Pipe relief valve outlet to nearest floor drain.

- M. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. Do not install hydronic pressure gauges until after systems are pressure tested.

END OF SECTION

SECTION 23 21 23

HYDRONIC PUMPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Vertical In-line pumps.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. Underwriters Laboratories Inc.:
 - 1. UL 778 - Motor Operated Water Pumps.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide pumps to operate at system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.4 SUBMITTALS

- A. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.
- B. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 VERTICAL IN-LINE PUMPS

- A. Type: Vertical, single stage, close coupled, radial or horizontally split casing, for in-line mounting, for 175 psig working pressure.

- B. Casing: Cast iron with suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Stainless steel, fully enclosed, keyed directly to motor shaft or extension.
- D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.
- E. Shaft Sleeve: Aluminum bronze.
- F. Seal: Carbon rotating against stationary ceramic seat, 212

PART 3 EXECUTION

3.1 INSTALLATION

- A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings. For close coupled or base mounted pumps, install supports under elbows on pump suction and discharge line sizes 4 inches and over.
- C. Install pumps on vibration isolators.
- D. Install flexible connectors at or near pumps where piping configuration does not absorb vibration.
- E. Provide line sized shut-off valve and strainer on pump suction, and line sized combination pump discharge valve on pump discharge.
- F. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings.
- G. Provide air cock and drain connection on horizontal pump casings.
- H. Lubricate pumps before start-up.

END OF SECTION

SECTION 23 25 00
HVAC WATER TREATMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. System cleaner.
 - 2. Closed system treatment (water).
 - 3. Glycol/Water Make-up Packages.
 - 4. Glycol
 - 5. Pot Feeders.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 SUBMITTALS

- A. Product Data: Submit chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
- B. Manufacturer's Installation Instructions: Submit placement of equipment in systems, piping configuration, and connection requirements.
- C. Manufacturers Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

PART 2 PRODUCTS

2.1 SYSTEM CLEANER

- A. Product Description: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodium tri-Poly phosphate and sodium molybdate.
- B. Biocide; chlorine release agents including sodium hypochlorite or calcium hypochlorite, or microbiocides including quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

2.2 CLOSED SYSTEM TREATMENT (WATER)

- A. Sequestering agent to reduce deposits and adjust pH; polyphosphate.

- B. Corrosion inhibitors; liquid boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulfites.
- C. Conductivity enhancers; phosphates or phosphonates.

2.3 BY-PASS (POT) FEEDER

- A. 1.8-gal quick opening cap for working pressure of 175 psig.
- B. One pot feeder shall be provided for each of the four hot water systems

2.4 GLYCOL/WATER MAKE-UP PACKAGE

- A. Glycol/water make-up package shall be Axiom Industries Ltd. Model MF300.
- B. One Glycol/water package shall be provided for each of the four hot water systems.
- C. System shall include 17 U.S. gallon storage/mixing tank with molded-in level gauge, 5" fill/access opening and cover; pump suction hose with inlet strainer and check valve; pressure pump with fuse protection; low fluid level pump cut-out float switch; manual diverter valve for purging air and agitating contents of storage tank; pressure switch with snubber, each individually adjustable from 10 psig to 25 psig cut-out pressure; factory cut-out pressure set to 15psig; and liquid filled pressure gauge. Unit to be c/w UL listed and fused power supply adapter with LED power indicator light, 115/60/1 to 24 VDC 50 watts AC, supplied loose for field installation.
- D. Feeder shall be compatible with glycol solutions of up to 50% concentration. Pump shall be capable of running dry without damage. Unit shall be completely assembled.
- E. Include optional Low-Level Alarm Panel with Remote Monitoring Dry Contacts and Selectable Audible Alarm

2.5 GLYCOL SOLUTION

- A. Manufacturers:
 - 1. Dowtherm HT
 - 2. Interstate Chemical
- B. Inhibited propylene glycol suitable for operating temperatures from -50 degrees F to 325 degrees F.
- C. Purchase the glycol per-mixed with deionized water. Mix 30 percent glycol / 70 percent water.
- D. Provide solution in quantity sufficient to completely fill all four systems, with 100% of the air vented, fill the 17-gallon capacity of the glycol make-up package, and one 5-gallon tote for future use.

PART 3 EXECUTION

3.1 PREPARATION

- A. Operate, fill, start and vent systems prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.

3.2 CLEANING

- A. Concentration:
 - 1. As recommended by manufacturer.
 - 2. One pound per 100 gallons of water contained in the system.
 - 3. One pound per 100 gallons of water for hot systems and one pound per 50 gallons of water for cold systems.
 - 4. Fill steam boilers only with cleaner and water.
- B. Hot Water Heating Systems:
 - 1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
 - 2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
 - 3. Circulate for 6 hours at design temperatures, then drain.
 - 4. Refill with clean water and repeat until system cleaner is removed.
- C. Use neutralizer agents on recommendation of system cleaner supplier and acceptance of Architect/Engineer.
- D. Flush open systems and glycol filled closed systems with clean water for one hour minimum. Drain completely and refill.
- E. Remove, clean, and replace strainer screens.
- F. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 CLOSED SYSTEM TREATMENT

- A. Provide one bypass feeder on the system. Install isolating and drain valves and interconnecting piping. Install around balancing valve downstream of circulating pumps as indicated on Drawings.
- B. Introduce closed system treatment through bypass feeder when required or indicated by test.

3.4 DEMONSTRATION

- A. Furnish two-hour training course for operating personnel, instruction to include installation, care, maintenance, testing, and operation of water treatment systems. Arrange course at start-up of systems.

END OF SECTION

SECTION 233100

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Duct Materials.
 - 2. Casings.
 - 3. Ductwork fabrication.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 3. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 4. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 - 5. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 6. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 7. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - 8. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 9. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Air Duct Leakage Test Manual.
 - 2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- D. Underwriters Laboratories Inc.:
 - 1. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.4 SUBMITTALS

- A. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/4 inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
 - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.

2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
3. Fittings.
4. Reinforcing details and spacing.
5. Seam and joint construction details.
6. Penetrations through fire rated and other walls.
7. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

B. Product Data: Submit data for duct materials and duct connectors.

C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

D. Manufacturer's Installation Instructions: Submit special procedures for glass fiber ducts.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

B. Construct ductwork to NFPA 90A standards.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealant.

PART 2 PRODUCTS

2.1 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G60 (zinc coating of in conformance with ASTM A90/A90M).

B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Hanger Rod: ASTM A36/A36M; galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

A. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards). Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.
 - 1. Sealants, Mastics and Tapes: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
 - 2. Do not provide sealing products not bearing UL approval markings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inches and smaller.
- D. Use double nuts and lock washers on threaded rod supports.
- E. For outdoor ductwork, protect ductwork, ductwork supports, linings and coverings from weather.
- F. Exhaust Outlet Locations:
 - 1. Minimum Distance from Property Lines: 3 feet.
 - 2. Minimum Distance from Building Openings: 5 feet.
 - 3. Minimum Distance from Outside Air Intakes: 10 feet.
 - 4. Maximum Allowable Leakage: In accordance with ICC IECC.

3.3 SCHEDULES

- A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
Combustion Air Intake	Galvanized Steel
Supply	Galvanized Steel
Return and Relief	Galvanized Steel

- A. END OF SECTION Ductwork Pressure Class Schedule:

AIR SYSTEM	PRESSURE CLASS
Constant Volume Supply	3 inch wg regardless of velocity.
Supply (Heating Systems)	3 inch wg
Return and Relief	3 inch wg regardless of velocity.
General Exhaust	3 inch wg regardless of velocity.

END OF SECTION

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Volume control dampers.
 - 2. Flexible duct connections.
 - 3. Dynamic Fire Dampers.
 - 4. Duct test holes.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
 - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- B. ASTM International:
 - 1. ASTM E1 - Standard Specification for ASTM Thermometers.
- C. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 2. NFPA 92A - Recommended Practice for Smoke-Control Systems.
- D. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- E. Underwriters Laboratories Inc.:
 - 1. UL 555 - Standard for Safety for Fire Dampers.
 - 2. UL 555S - Standard for Safety for Smoke Dampers.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors and duct test holes.
- B. Product Data: Submit data for shop fabricated assemblies and hardware used.
- C. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
 - 1. Flexible duct connections.
 - 2. Dynamic Fire Dampers.
 - 3. Volume control dampers.
 - 4. Duct access doors.
 - 5. Duct test holes.
- D. Product Data: For fire dampers, smoke dampers and combination fire and smoke dampers submit the following:
 - 1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.
 - 2. Indicate materials, construction, dimensions, and installation details.
 - 3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

- E. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke and Fire Dampers.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of access doors.
- B. Operation and Maintenance Data: Submit for Combination Smoke and Fire Dampers.

1.5 QUALITY ASSURANCE

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.
- B. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- C. Storage: Store materials in a dry area indoor, protected from damage.
- D. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Ruskin.
 - 2. Vent Products.
 - 3. Cesco Products.
 - 4. Greenheck.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- C. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.
 - 1. Less than 12 inches square, secure with sash locks.
 - 2. Up to 18 inches Square: Furnish two hinges and two sash locks.
 - 3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Furnish additional hinge.
 - 5. Sash Lock.
 - 6. Compression Latch.
 - 7. Hinge.
 - 8. Access panels with sheet metal screw fasteners are not acceptable.

2.2 DYNAMIC FIRE DAMPERS

- A. Manufacturers:

1. Ruskin.
 2. Vent Products.
 3. Cesco Products.
 4. Greenheck.
- B. Fabricate in accordance with NFPA 90A and UL 555.
- C. Fire Resistance: Match fire rating of adjacent walls.
- D. Dynamic Closure Rating: Dampers classified for dynamic closure to 2000 fpm and 4 inches wg static pressure.
- E. Construction:
1. Integral Sleeve Frame: Minimum 20 gage roll formed galvanized steel. Length: 12 inches.
 2. Blades:
 - a. Style: Curtain type.
 - b. Action: Spring or gravity closure upon fusible link release.
 - c. Material: Minimum 24 gage roll formed, galvanized steel.
 3. Closure Springs: Type 301 stainless steel, constant force type, if required.
- F. Fusible Link Release Temperature: 165 degrees F.
- G. Mounting: Vertical or horizontal.
- H. Duct Transition Connection, Damper Style:
1. A style - rectangular connection, frame and blades in air stream.
 2. G style - A style connection, grille mounting tabs at end of sleeve for grille.
 3. CR style - round connection, sealed.
 4. R style - round connection, blades in air stream, non-sealed.
 5. LR style - round connection, blades out of air stream, non-sealed.
 6. LO style - oval connection, non-sealed.
- I. Finish: Mill galvanized.

2.3 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Splitter Dampers:
1. Material: Same gage as duct to 24 inches size in both dimensions, and two gages heavier for sizes over 24 inches.
 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw;
 4. Single Blade Dampers: Fabricate for duct sizes up to 48 x 48 inch.
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware;
- D. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg;

- E. Quadrants:
 - 1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches furnish regulator at both ends.

2.4 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Connector: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
 - 2. Net Fabric Width: Approximately 6 inches wide.
 - 3. Metal: 3 inch wide, 24 gage galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs. per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.5 DUCT TEST HOLES

- A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify rated walls are ready for fire damper installation.
- B. Verify ducts and equipment installations are ready for accessories.
- C. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.2 INSTALLATION.

- A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside.
- C. Access Doors: Install access doors at the following locations:
 - 1. Spaced every 50 feet of straight duct.
 - 2. Upstream of each elbow.
 - 3. Before and after each duct mounted filter.
 - 4. Before and after each duct mounted coil.
 - 5. Before and after each duct mounted fan.
 - 6. Before and after each automatic control damper.
 - 7. Before and after each fire damper, smoke damper and combination fire and smoke damper.
- D. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, Review locations prior to fabrication.

1. Mark access doors for fire and smoke dampers on outside surface, with minimum 1/2 inch high letters reading: FIRE/SMOKE DAMPER, SMOKE DAMPER, OR FIRE DAMPER.
- E. Install temporary duct test holes and required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- F. Install permanent duct test holes required for testing and balancing purposes.
- G. Install fire dampers, combination fire and smoke dampers and smoke dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
 1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
 2. Install dampers square and free from racking with blades running horizontally.
 3. Do not compress or stretch damper frame into duct or opening.
 4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
 5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.3 INSTALLATION - THERMOMETERS

- A. Install thermometers in air duct systems on flanges.
- B. Where thermometers are provided on local panels, duct mounted thermometers are not required.
- C. Locate duct-mounted thermometers minimum 10 feet downstream of mixing-dampers, coils, or other devices causing air turbulence.
- D. Install static pressure gages to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gage.
- E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- F. Install thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- G. Adjust thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.4 DEMONSTRATION

- A. Demonstrate re-setting of fire dampers to Owner's representative.

END OF SECTION

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Grilles.

1.2 REFERENCES

- A. Air Movement and Control Association International, Inc.:
 - 1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 SUBMITTALS

- A. Product Data: Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B. Test Reports: Rating of air outlet and inlet performance.

1.4 QUALITY ASSURANCE

- A. Test and rate louver performance in accordance with AMCA 500.

PART 2 PRODUCTS

2.1 WALL/DUCT EXHAUST AND RETURN GRILLES

- 1. Anemostat Air Products
 - 2. E. H Price Company
 - 3. Krueger
 - 4. Nailor Industries, Inc.
 - 5. Titus
 - 6. Tuttle and Bailey
- B. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, horizontal face.
- C. Frame: 1-1/4 inch margin with countersunk screw mounting.
- D. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, Smooth finish, color to be selected.

- E. Damper: Integral, gang-operated, opposed-blade type with removable key operator, operable from face.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify inlet and outlet locations.
- B. Verify wall systems are ready for installation.

3.2 INSTALLATION

- A. Install diffusers to ductwork with airtight connection.
- B. Install balancing dampers on duct take-off to diffusers, grilles, and registers, whether or not dampers are furnished as part of diffuser, grille, and register assembly.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

SECTION 23 52 34

HIGH EFFICIENCY CONDENSING BOILERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. High efficiency condensing.
 - 2. Boiler controls.
 - 3. Boiler trim.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI Z21.13 - Gas-fired Low Pressure Steam and Hot Water Boilers.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
 - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. American Society of Mechanical Engineers:
 - 1. ASME Section IV - Boiler and Pressure Vessel Code - Heating Boilers.
 - 2. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- D. Hydronics Institute:
 - 1. H.I. Heating Boiler Standard - Testing and Rating Standard for Heating Boilers.
- E. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. National Fire Protection Association:
 - 1. NFPA 54 - National Fuel Gas Code.

1.3 SUBMITTALS

- A. Product Data: Submit capacities and accessories included with boiler. Include general layout, dimensions, size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.
- B. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.
- C. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.5 QUALITY ASSURANCE

- A. Conform to ASME Section IV for construction of boilers. Provide boilers registered with National Board of Boiler and Pressure Vessel Inspectors.
- B. Boiler Performance Requirements: Conform to minimum efficiency prescribed by ASHRAE 90.1 when tested in accordance with H.I. Heating Boiler Standard.
- C. Unit Certification: AGA certified.
- D. Conform to applicable code for internal wiring of factory wired equipment.
- E. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.
- B. Protect boilers from damage by leaving packing in place until installation.

PART 2 PRODUCTS

2.1 HIGH EFFICIENCY CONDENSING BOILERS

- A. Manufacturers:
 - 1. Lochinvar Corp.
 - 2. Cleaver Brooks.
 - 3. Superior Boilers.
 - 4. Aerco.
- B. Product Description: natural gas packaged, modulating, sealed combustion, power-vented, high efficiency gas-fired boiler(s) with cast aluminum sectional heat exchangers.
- C. Boiler(s) shall be 93% minimum I=B=R thermal efficient as required by BTS 2000.
- D. Boiler shall be capable of full modulation firing with a turn down of up to 5 to 1.
- E. Boiler(s) shall be manufactured by ISO 9001 registered company to conform to Section IV of the ASME Boiler and Pressure Vessel Code:
 - 1. Stainless Steel heat exchanger fire tested and hydrostatically pressure tested at factory in accordance with ASME requirements.
 - 2. Maximum allowable working pressure 80 PSIG water as listed on the rating label.
 - 3. Factory Assembled and Tested.
- F. Boiler(s) main components:
 - 1. Sealed combustion chamber with separation from sediment and lime.
 - 2. Gas valve designed with negative pressure regulation.
 - 3. The burner shall be premix combustion type, made with stainless steel providing a wide range of modulating firing rates.
 - 4. Variable speed blower system, capable of modulating the boiler firing rate from 100% to 10%.
 - 5. Control feature to allow the air/fuel ratio through a minimum 5 to 1 turndown ratio.

6. Electronic display for boiler set-up, boiler status, and boiler diagnostics.
- G. Venting and Combustion Air:
1. Capable of using outside air piped directly to boiler for combustion.
 2. The boiler shall be direct vent or direct exhaust using stainless steel, double wall venting. PVC or CPVC.
 3. Integral condensate collector in the vent adapter to capture condensate from the vent system.
- H. Boiler Trim
1. All electrical components to be high quality manufacture and bear UL label.
 2. Boiler must be CSD-1 compliant with factory report for ASME CDS-1.
 3. Water boiler(s) controls furnished:
 - a. High limit temperature control with manual reset 190 degrees F maximum allowable boiler water temperature.
 - b. Combination pressure-temperature gauge. Gauge dial clearly marked and easy to read.
 - c. ASME certified pressure relief valve, set to relieve at 30 PSIG.
 - d. Flue gas, outlet water temperature, and return water temperature sensors.
 - e. Low water protection with manual reset.
 - f. High and Low gas pressure switches with manual reset and indicator lights.
 - g. Built-in freeze protection.
 4. Boiler Control to be UL 353 Listed with:
 - a. Furnish interface to Direct Digital Control System. The unit shall be complete with BACnet communication interface that allows direct connection to the BAS network specified in 23 09 23. The controls interface shall allow access by the Direct Digital Controls system specified in 23 09 23 to all internal points available within the unit that can be accessed by the unit manufacturer.
 - b. 4 pump contacts.
 - c. Indoor outdoor reset.
 - d. Interface for all control and sensor points.
 - e. Variable temperature zone that requires NO MIXING valves.
 - f. Multiple LCD digital temperature access points including supply, return, system temps, flue gas temp.
 - g. LCD display and keypad access.
 - h. Alarm contact includes flame failure, high temperature and low water cut off.
 - i. Remote modulation capable for Multiple Boiler Systems and Building Automation Systems.
 - j. Capable of controlling addition multiple boilers by either sending 0-10 volt DC signal or contact closure.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install boilers plumb and level, to plus or minus 1/16 inch over boiler base.
- B. Maintain manufacturer's recommended clearances around and over boilers.
- C. Install boiler on concrete housekeeping pad, minimum 3-1/2 inches high and 6 inches larger than boiler base on each side.
- D. Connect natural gas piping in accordance with NFPA 54.
- E. Connect natural gas piping to boiler, full size of boiler gas train inlet. Arrange piping with clearances for burner removal and service.

- F. Connect hot water piping to supply and return boiler connections.
- G. Install discharge piping from relief valves and drain valves to nearest floor drain.
- H. Install boiler trim and accessories furnished loose for field mounting.
- I. Install electrical devices furnished loose for field mounting.
- J. Install control wiring between boiler control panel and field mounted control devices.
- K. Connect flue to boiler outlet, full size of outlet.

3.2 FIELD QUALITY CONTROL

- A. Perform combustion test.
- B. Arrange with local authorities having jurisdiction for inspection of boiler, piping, and for certificate of operation.

3.3 CLEANING

- A. Flush and clean boilers upon completion of installation, in accordance with manufacturer's start-up instructions.

3.4 MANUFACTURER'S FIELD SERVICES

- A. Start-up boilers according to manufacturer's start-up instructions and in presence of boiler manufacturer's representative, general contractor, sub-contractor, engineer and owner. Test controls and demonstrate compliance with requirements. Adjust burners for maximum efficiency. Replace damaged or malfunctioning controls and equipment.

3.5 DEMONSTRATION AND TRAINING

- A. Demonstrate operation and maintenance procedures.
- B. Furnish services for manufacturer's technical representative for one 8 hours day to instruct Owner's personnel in operation and maintenance of boilers. Schedule training with Owner/Engineer. Provide at least 7 days notice to Engineer of training date.

END OF SECTION

SECTION 237300

INDOOR CENTRAL STATION AIR HANDLING UNITS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Modular factory fabricated air-handling units and accessories.

1.2 REFERENCES

- A. American Bearing Manufacturers Association:
 - 1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - 2. ABMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- B. Air Movement and Control Association International, Inc.:
 - 1. AMCA 99 - Standards Handbook.
 - 2. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - 3. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
 - 4. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
 - 5. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- C. Air-Conditioning and Refrigeration Institute:
 - 1. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
 - 2. ARI 430 - Central-Station Air-Handling Units.
 - 3. ARI 610 - Central System Humidifiers for Residential Applications.
 - 4. ARI Guideline D - Application and Installation of Central Station Air-Handling Units.
- D. National Electrical Manufacturers Association:
 - 1. NEMA MG 1 - Motors and Generators.
- E. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- F. Underwriters Laboratories Inc.:
 - 1. UL 900 - Air Filter Units.
 - 2. UL - Fire Resistance Directory.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.
- B. Product Data, Submit the following:
 - 1. Published Literature: Indicate capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
 - 2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.

3. Fans: Performance and fan curves with specified operating point plotted, power, RPM.
4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring. Indicate factory installed and field installed wiring.

C. Manufacturer's Installation Instructions: Submit.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.5 QUALITY ASSURANCE

- A. Outside Air Damper Leakage: Test in accordance with AMCA 500.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage.
- B. Protect units from weather and construction traffic by storing in dry, roofed location.

1.8 EXTRA MATERIALS

- A. Furnish one set of fan belts for each unit.
- B. Furnish one set of filters for each unit.

PART 2 PRODUCTS

2.1 AIR HANDLING UNITS

- A. Manufacturers:
 1. Trane
 2. Daikin.
 3. Carrier
 4. Dunham Bush
- B. Configuration: Fan and coil section plus accessories, including:
 1. Return Fan Section.

2. Filter section.
3. Heating coil section.
4. Supply Fan Section
5. See Drawings for actual configuration.

C. Fabrication: Conform to AMCA 99 and ARI 430.

2.2 CASING

- A. Channel base of welded steel. Assemble sections and panels with ¼" thick, ½" wide gaskets, and bolts. Provide unit with full length, with split base rail, minimum 5 inches high.
- B. Outside Casing: Galvanized Steel: 0.0516 inch.
- C. Inside Casing: Galvanized Steel: Solid, 0.0276 inch thick.
- D. Floor Plate: Galvanized Steel: 0.1382 inch thick or 10 guage.
- E. Removable Panels: Frame shall be constructed to permit complete removal of wall and/or roof panels without affecting structural integrity of equipment. Panels shall be removable without the use of electricity or compressed air and shall not require the removal of sheet metal screws.
- F. Insulation: Neoprene coated, glass fiber, applied to internal surfaces with adhesive and weld pins with exposed edges of insulation coated with adhesive. Panel insulation must be non-compressed throughout the entire unit.
 1. 'K' factor at 75 degrees F: Maximum 0.26 Btuh inch/ sq ft/ degrees F.
 2. Density: 2 inch thick, 1-1/2 lbs/cu ft.
 Insulation: Injected foam throughout the unit, with filled panels. Thermal Resistance value of R-13 ft2-h-F/Btu injected foam or higher.
- G. Finish: Finish: Manufacturers standard paint on exterior.
- H. Access Doors: Insulated sandwich type construction and thickness to match wall panels for flush mounting, with hinges, gasket, latch, and handle assemblies. Hinges shall allow for 180 degree door swing.
 1. Door seal: 3/8" bulb-type gasket provided around entire door perimeter.
 2. Inspection window: 12 x 12 inch inspection window of 1/4 inch thick Plexiglas.
 3. Required Sections:
 - a. Fan (motor side).
 - b. Filter (both sides).
- I. Drain Pans: Double thickness galvanized steel, minimum 4 inches deep, with 2 inch insulation between layers with welded corners. Cross break and pitch to drain connection. Furnish drain pans under fan section, heating coil section, and cooling coil section. Drains pans located in cooling coil section shall be provided with stainless steel liner.
- J. Strength: Furnish structure to brace casings for suction pressure of [2.5][4] inch wg, with maximum deflection of 1 in 200.

2.3 FANS

- A. Type: single-width, single-inlet, multiblade-type direct-drive plenum fan.

- B. Performance Ratings: Conform to AMCA 210 and label with AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.
- D. Bearings: Self-aligning, grease lubricated, ball or roller bearings with lubrication fittings extended to exterior of casing with copper tube and grease fitting rigidly attached to casing.
- E. Mounting: Locate fan and motor internally on welded steel base coated with corrosion resistant paint. Factory mount motor on slide rails. Furnish access to motor, drive, and bearings through removable casing panels or hinged access doors. Mount base on 2 inch vibration isolators.
- F. Fan Modulation: Variable Frequency Drive.
- G. Flexible Connection: Separate unit from connecting ductwork.

2.4 BEARINGS AND DRIVES

- A. Bearings: Pillow block type, self-aligning, grease-lubricated ball bearings, with ABMA 9 L-10 life at 250,000 hrs.
- B. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
- C. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of motor.
- D. Belt Guard: Fabricate to SMACNA Standard; 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.5 COILS

- A. General Requirements:
 - 1. All coils furnished shall meet or exceed the scheduled performance requirements.
 - 2. Unless noted or shown otherwise on the Drawings, coils shall have the same end connections regardless of the number of rows deep.
- B. Casing with access on right side of coil. Enclose coil with headers and return bends fully contained within casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.
- C. Eliminators: Three break of galvanized steel, mounted over drain pan.
- D. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.

- E. Unless noted or shown otherwise on the Drawings, coils shall have the same end connections regardless of the number of rows deep.
- F. Fabrication:
 - 1. Up to a four row drainable water coil.
 - 2. Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
 - 3. Fins: 0.010" thick Aluminum.
 - 4. Casing: Die formed channel frame of galvanized steel.
- 5. Constructed of seamless copper tubes mechanically expanded into aluminum fins. Factory leak tested under water.
- 6. Stainless Steel drain pan and piping connection.
- 7. Furnish for multiple circuited units intertwined row circuiting.

2.6 FILTERS

- A. Filter Box: Section with filter guides, access doors from both sides, for side loading with gaskets and blank-off plates.
- B. Filter Media: UL 900 listed, Class II.
- C. Flat or Angle: 2 inches deep disposable panel filters.
- D. Filter Gauges: 3-1/2 inch diameter diaphragm actuated dial in metal case, with static pressure tips.

2.7 DAMPERS

- A. Mixing Boxes: Section with factory mounted outside and return air dampers of galvanized steel with vinyl bulb edging and edge seals in galvanized frame, with galvanized steel axles in self-lubricating nylon bearings, in opposed blade arrangement with damper blades positioned across short air opening dimension.
- B. Outside Air Damper Leakage: Maximum 3.0 cfm per square foot at 1.0 inches wg pressure differential.
- C. Damper Leakage: Maximum 5 cfm per square foot at 4.0 inches wg pressure differential.
- D. Damper Actuators: By the Temperature Controls Contractor.

2.8 CONTROLS

- A. Controls: Refer to Section 23 09 23. Refer to Section 23 09 93 for sequence of operation.

2.9 CAPACITY

- A. As scheduled on the Drawings.

2.10 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. As scheduled on the Drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with ARI 430.
- B. Install flexible connections between unit and inlet and discharge ductwork. Install metal bands of connectors parallel with minimum 1 inch flex between ductwork and fan while running.
- C. Install assembled units with vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads. Install restraining snubbers as required. Adjust snubbers to prevent tension in flexible connectors when fan is operating.
- D. Install floor mounted units on concrete housekeeping pads at least 4 inches high and 6 inches wider than unit.
- E. Provide sheaves required for final air balance.
- F. Insulate coil headers located outside airflow as specified for piping.
- G. Install condensate piping with trap and route from drain pan to nearest floor drain.

3.2 INSTALLATION HEATING COIL

- A. Make connections to coils with unions or flanges.
- B. Connect HWS and HWR piping per details.
- C. Provide accessories per manufacturer's installation instructions.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Furnish services of factory trained representative for minimum of one day to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, calibrate controls, and instruct Owner on operation and maintenance.

3.4 CLEANING

- A. Vacuum clean coils and inside of unit cabinet.
- B. Install temporary filters during construction period. Replace with permanent filters at Substantial Completion.

3.5 DEMONSTRATION

- A. Demonstrate unit operation and maintenance.

3.6 PROTECTION OF FINISHED WORK

- A. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

END OF SECTION

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 SUMMARY

- A. The electrical work included in all other divisions is the responsibility of the contractor performing the Division 26 work unless noted otherwise.
- B. Scope
 - 1. The work under this section includes basic electrical requirements, which are applicable to all Division 26 sections. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections. Included are the following topics:
 - a. PART 1 - GENERAL
 - 1) Project Overview
 - 2) Scope
 - 3) Related Work
 - 4) Reference Standards
 - 5) Regulatory Requirements
 - 6) Quality Assurance
 - 7) Continuity of Existing Services and Systems
 - 8) Approved Electrical Testing Laboratories
 - 9) Sealing and Fire Stopping
 - 10) Intent
 - 11) Omissions
 - 12) Work Sequence and Scheduling
 - 13) Salvage Materials
 - 14) Certificates and Inspections
 - b. PART 2 - PRODUCTS
 - 1) Access Panels and Doors
 - c. PART 3 - EXECUTION
 - 1) Excavation and Backfill
 - 2) Concrete Work
 - 3) Equipment Access
 - 4) Coordination
 - 5) Housekeeping and Clean Up

1.2 REFERENCES

- A. Abbreviations of standards organizations referenced in this and other sections are as follows:
 - 1. ANSI American National Standards Institute
 - 2. ASTM American Society for Testing and Materials
 - 3. EPA Environmental Protection Agency
 - 4. ETL Electrical Testing Laboratories, Inc.
 - 5. IEEE Institute of Electrical and Electronics Engineers
 - 6. IES Illuminating Engineering Society
 - 7. ISA Instrument Society of America
 - 8. NBS National Bureau of Standards
 - 9. NEC National Electric Code
 - 10. NEMA National Electrical Manufacturers Association

- 11. NESC National Electrical Safety Code
- 12. NFPA National Fire Protection Association
- 13. UL Underwriters Laboratories Inc.

1.3 REGULATORY REQUIREMENTS

- A. All work and materials are to conform in every detail to applicable rules and requirements of the National Electrical Code (NFPA 70), other applicable National Fire Protection Association codes, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

1.4 QUALITY ASSURANCE

- A. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space, and for obtaining the performance from the system into which these items are placed.
- B. Manufacturer references used herein are intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply.
- C. All materials, except medium voltage equipment and components, shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards, if available, applicable, shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system, except for medium voltage equipment and components, shall be so labeled.
- D. Provide individual motor test for all motors 15HP and larger. Test shall be standard NEMA production test consisting of the following:
 - 1. Locked Rotor Current
 - 2. High Potential Test

1.5 CONTINUITY OF EXISTING SERVICE AND SYSTEMS

- A. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner. Any outage must be scheduled when the interruption causes the least interference with normal institutional schedules and business routines. No extra costs will be paid to the Contractor for such outages which must occur outside of regular weekly working hours.
- B. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible. Note that operations are on a seven-day week schedule.

1.6 APPROVED ELECTRICAL TESTING LABORATORIES

- A. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
 - 1. Underwriters Laboratories Inc.
 - 2. Electrical Testing Laboratories, Inc.

1.7 SEALING AND FIRESTOPPING

- A. Sealing and fire stopping of sleeves/openings between conduits, cable trays, wireways, troughs, cablebus, busduct, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. Provide all fire stopping of fire rated penetrations and sealing of smoke rated penetrations in compliance with section 07 84 13 Penetration Firestopping.

1.8 INTENT

- A. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.
- B. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or exists within the Drawings, the Contractor shall furnish the item, system, or workmanship, which is the highest quality, largest, or most closely fits the intent (as determined by the Engineer). Refer to the General Conditions of the Contract for further clarification.
- C. It must be understood that the details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
- D. All sizes as given are minimum except as noted.
- E. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to the A/E's inspections, tests and approval from the commencement until the acceptance of the completed work.
- F. Whenever a particular manufacturer's product is named, it is intended to establish a level of quality and performance requirements unless more explicit restrictions are stated to apply

1.9 OMISIONS

- A. No later than ten (10) days before bid opening, the Contractor shall call the attention of the Engineer to any materials or apparatus the Contractor believes to be inadequate and to any necessary items of work omitted

1.10 WORK SEQUENCE AND SCHEDULING

- A. Install work in phases to accommodate Owner's requirements. During the construction period coordinate electrical schedule and operations with General Contractor.

1.11 SALVAGED MATERIALS

- A. No materials removed from this project shall be reused except as noted on the Drawings. All materials removed shall become the property of and shall be disposed of by the Contractor.

1.12 CERTIFICATES AND INSPECTIONS

- A. Obtain and pay for all required installation inspections. Deliver originals of these certificates to the Owner.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

- A. Lay-in Ceilings:
 - 1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration provided under other divisions are sufficient; no additional access provisions are required unless specifically indicated.
- B. Plaster Walls and Ceilings:
 - 1. 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers and similar wet areas, concealed hinges, screwdriver operated cam latch for general application, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

PART 3 EXECUTION

3.1 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with Division 01.

3.2 EQUIPMENT ACCESS

- A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish the access doors to the General Contractor and reimburse the General Contractor for installation of those access door.

3.3 COORDINATION

- A. The Contractor shall cooperate with other trades and the Owner in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the electrical work to better fit the general installation, such work shall be done at no extra cost to the Owner, provided such decision is reached prior to actual installation. The Contractor shall check location of electrical outlets with respect to other installations before installing.
- B. The Contractor shall verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to light fixtures, panelboards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
- C. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- D. Verify the integrity of any fire or smoke rating on these surfaces.

3.4 HOUSEKEEPING AND CLEAN UP

- A. The Contractor shall clean up and remove from the premises, on a daily basis, all debris and rubbish resulting from its work and shall repair all damage to new and existing equipment resulting from its work. When job is complete, this Contractor shall remove all tools, excess material and equipment, etc., from the site.

3.5 MOTOR TESTING

- A. Provide meggar test for all motors 15 HP and larger at startup or within 2 weeks prior to startup or 2 weeks after startup.

END OF SECTION

SECTION 26 05 02

ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Disconnection of existing electrical services to existing plant for total demolition.

1.2 RELATED WORK

- A. Applicable provisions of Division 01 govern work under this section.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work as specified in the individual Sections.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Verify whether or not PCB ballasts exist in light fixtures which will be disposed of. If PCB light fixture ballasts exist, then follow requirements in PCB BALLAST HANDLING and LAMP AND PCB BALLAST DISPOSAL below.
- C. Demolition Drawings are based on casual field observation and/or existing record documents. Report discrepancies to the Architect/Engineer before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- B. Coordinate utility service outages with the Owner, General Contractor, and Architect/Engineer. Also, coordinate utility service outages with the local Utility Company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations and follow the safe working practice requirements of NFPA 70E.

3.3 PCB BALLAST HANDLING

- A. Generally, all high-power factor fluorescent light ballasts manufactured before 1978 and some HID ballasts contain polychlorinated biphenyl (PCB) compounds in their capacitors. The Contractor shall inspect all ballasts in all light fixtures and take the actions described below.
- B. The disposal of all ballasts labeled as "NON-PCBs" or "NO PCBs" shall become the responsibility of the Contractor. If the PCB content is not stated on the ballast label, the ballast shall be handled as a PCB ballast.
- C. All PCB ballasts shall be removed from the light fixtures and shall have the wires clipped off. However, before removal, all PCB ballasts shall be carefully inspected for leaks. If a ballast appears to be leaking (evidenced by potting compound leaking out or by an oily film on the ballast surface) the ballast must be handled per EPA and DNR PCB regulations. Basically, this means the ballast is to be carefully removed from the fixture and placed in an approved drum. See paragraph below for the drum specifications. The person removing the ballast from the fixture shall wear protective gloves, eye protection, and protective clothing as necessary.
- D. If the fixture has also been contaminated, it must be cleaned to less than 10 micrograms/100 square centimeters contamination before disposal. This cleaning must be done by an approved PCB contractor and is not considered a part of this contract.
- E. The PCB ballasts shall then be placed in US DOT approved drums (barrels). The contractor may furnish their own drums or obtain them from Lamp Recyclers Incorporated (800-558-1166). The quantity and size of the drums will be determined by the contractor at the time of construction, 30 and 55 gallon drums are typically available.
- F. These PCB drums shall be placed in storage with the cover that came with the barrels, in a location within a building, as designated by the Engineer. The drums are not to be placed outside where they are exposed to weather.
- G. THESE PCB BALLASTS ARE NOT TO BE REMOVED FROM THE WORK SITE BY THE CONTRACTOR. To do so would be a violation of DNR and DOT hazardous waste regulations and may result in a fine to the Contractor.
- H. The Contractor shall label and mark the PCB storage drums with EPA approved PCB labels and the storage area with signs, marks and lines to meet the State of Illinois regulations regarding Management of PCBs and Products Containing PCBs.
- I. The Contractor shall also provide approved PCB absorbent materials to be stored immediately adjacent to the drum storage area. Do not place loose absorbent material in the drums.
- J. The Contractor shall provide to the Engineer, in written form, a total count of these ballasts (or their total weight by drum) and where they are stored.
- K. See Lamp and PCB Ballast Disposal instructions below.

3.4 LAMP AND PCB BALLAST DISPOSAL

- A. All lamps (fluorescent, incandescent, and HID) contain mercury and/or lead (in the base) as well as other heavy metals and compounds which are regulated by the EPA and DNR during the disposal process. As a result, regulations have been issued covering the handling and

disposal of all lamps. Lamps which have been removed from service for disposal shall be handled as follows by the Contractor.

- B. The Contractor shall very carefully remove all lamps (fluorescent, incandescent, and HID) from light fixtures before removal of the fixture from its mounted position. This is to reduce the likelihood that the lamp(s) will be broken. The Contractor will be charged the cost difference between disposal of broken and unbroken lamps, for all lamps broken in excess of 1% of the total lamps removed in the project.
- C. The contractor shall contact Lamp Recyclers Incorporated (800-558-1166) to coordinate the storage and pickup of disposed lamps and PCB ballasts. The contractor may furnish their own containers or obtain them from Lamp Recyclers Incorporated. Removed lamps and PCB ballasts shall be placed in containers by the contractor, marked with the number and type of lamp and PCB ballast, and placed in storage at a location on the user agency's property. The contractor shall label the area as "Hazardous Material Storage". The contractor shall make arrangements for pickup of the lamps and PCB ballasts with Lamp Recyclers Incorporated, shall provide a count of all stored lamps and PCB ballasts, and shall fill out any required forms.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes building wire and cable, and wiring connectors and connections.
- B. Related Sections:
 - 1. Section 26 05 53 - Identification for Electrical Systems: Product requirements for wire identification.

1.2 REFERENCES

- A. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
 - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Underwriters Laboratories, Inc.:
 - 1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
 - 1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
 - 2. Stranded conductors for control circuits.
 - 3. Conductor not smaller than 12 AWG for power and lighting circuits.
 - 4. Conductor not smaller than 14 AWG for control circuits.
 - 5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.
- B. Wiring Methods: Provide the following wiring methods:
 - 1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHW insulation in raceway.
 - 2. Exposed Dry Interior Locations: Use only Type THHN/THWN or XHHW insulation in raceway.
 - 3. Above Accessible Ceilings: Use only Type THHN/THWN or XHHW insulation in raceway.
 - 4. Wet or Damp Interior Locations: Use only Type XHHW insulation in raceway.
 - 5. Exterior Locations: Use only XHHW insulation in raceway.
 - 6. Underground Locations: Use only Type XHHW insulation in raceway.

1.4 DESIGN REQUIREMENTS

- A. Conductor sizes are based on copper.

1.5 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.

1.7 FIELD MEASUREMENTS

- A. Verify field measurements are as indicated on Drawings.

1.8 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned

PART 2 PRODUCTS

2.1 BUILDING WIRE

- A. Product Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Temperature Rating: 90 degrees C.

2.2 WIRING CONNECTORS

- A. Split Bolt Connectors: Not acceptable.
- B. Solderless Pressure Connectors: High copper alloy terminals may be used only for cable termination to equipment pads or terminal. Not approved for splicing.
- C. Spring Wire Connectors: Solderless spring type pressure connectors with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
- D. Compression Connectors: Long barrel; seamless, tin-plated electrolytic copper tubing; internally beveled barrel ends. Conductor shall be clearly marked with the wire size and type and proper number and location of crimps.
- E. Mechanical Connectors: Bolted type; tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.

2.3 TERMINATIONS

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.
- B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify interior of building has been protected from weather.
- B. Verify mechanical work likely to damage wire and cable has been completed.
- C. Verify raceway installation is complete and supported.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

- A. Remove exposed abandoned wire and cable , including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations or as specified.
- E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

- A. Route wire and cable to meet Project conditions.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Identify and color code wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.
- D. Special Techniques--Building Wire in Raceway:
 - 1. Pull conductors into raceway at same time.
 - 2. Install building wire 4 AWG and larger with pulling equipment and suitable wire pulling lubricant.
- E. Special Techniques - Wiring Connections:
 - 1. Clean conductor surfaces before installing lugs and connectors.

2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
 3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
 4. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
 5. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- F. Install terminal lugs on ends of 600-volt wires unless lugs are furnished on connected device, such as circuit breakers.
- G. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.
- H. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.5 WIRE COLOR

- A. General:
1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
 - a. Orange, brown, and yellow for circuits at 120/208 volts or 277/480 volts single or three phase.
 2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
 - a. Orange, brown, and yellow for circuits at 120/208 volts or 277/480 volts single or three phase.
- B. Neutral Conductors: White. When two or more neutrals are located in one conduit, individually identify each with proper circuit number.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.
- E. Ground Conductors:
1. For 6 AWG and smaller: Green.
 2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wire.
 - 2. Mechanical connectors.
 - 3. Exothermic connections.

1.2 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
 - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
 - 2. NFPA 99 - Standard for Health Care Facilities.

1.3 SYSTEM DESCRIPTION

- A. Grounding systems use the following elements as grounding electrodes:
 - 1. Existing Metal underground water pipe.
 - 2. Metal building frame.
 - 3. Concrete-encased electrode.
 - 4. Ground ring.
 - 5. Rod electrode.
 - 6. Plate electrode.

1.4 QUALITY ASSURANCE

- A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years' experience.

PART 2 PRODUCTS

2.1 WIRE

- A. Material: Stranded copper.

B. Grounding Electrode Conductor: Bare copper conductor.

C. Bonding Conductor: Bare copper conductor.

2.2 MECHANICAL CONNECTORS

A. Description: Bronze connectors, compression type applied with compression tool, suitable for grounding and bonding applications, in configurations required for installation.

2.3 EXOTHERMIC CONNECTIONS

A. Manufacturers:

1. Bundy
2. Erico
3. Harger

B. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove paint, rust, mill oils, and any other surface contaminants as needed at connection points.

3.2 EXISTING WORK

A. Modify existing grounding system to maintain continuity to accommodate renovations and new equipment.

B. Extend existing grounding system using materials and methods compatible with existing electrical installations or as specified.

3.3 INSTALLATION

A. Install rod electrodes at location near new service equipment. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

B. Connect to site grounding system.

C. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

D. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

E. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.4 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors for tightness and proper installation.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Formed steel channel.
 - 3. Spring steel clips.
 - 4. Sleeves.
 - 5. Mechanical sleeve seals.
 - 6. Firestopping relating to electrical work.
 - 7. Firestopping accessories.
 - 8. Equipment bases and supports.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
 - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
- C. Underwriters Laboratories Inc.:
 - 1. UL 263 - Fire Tests of Building Construction and Materials.
 - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
 - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
 - 5. UL - Fire Resistance Directory.
- D. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years of documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 3 years of experience.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Materials and Finishes: Corrosion resistant.
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free-running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.
- F. Cable Ties: High-strength nylon temperature rated to 185 degrees F. Self locking.

2.2 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Unistrut
 - 2. Substitutions: B-Line
- B. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

- A. Manufacturers:
 - 1. Caddy
 - 2. Substitutions: B-Line
- B. Product Description: Mounting hole and screw closure.

2.4 SLEEVES

- A. Sleeves through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.5 MECHANICAL SLEEVE SEALS

- A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
 - 2. Foam Firestopping Compounds: Single component foam compound.
 - 3. Firestop Pillows: Formed mineral fiber pillows.
- B. Color: Dark gray.

2.7 FIRESTOPPING ACCESSORIES

- A. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- B. General:
 - 1. Furnish UL listed products.
 - 2. Select products with rating not less than rating of wall or floor being penetrated.
- C. Non-Rated Surfaces:
 - 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
 - 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Obtain permission from Architect/Engineer before drilling or cutting structural members.

3.2 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Provide precast inserts, expansion anchors and preset inserts.
 - 2. Steel Structural Elements: Provide beam clamps and spring steel clips.
 - 3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.

5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
4. Support vertical conduit at every floor.

3.3 INSTALLATION - FIRESTOPPING

A. Use firestop pillows when possible. Use other products only if pillows will not work for the application.

B. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

C. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

D. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating to uniform density and texture.

E. Fire-Rated Surface:

1. Seal opening at floor, wall, ceiling, and roof as follows:
 - a. Install sleeve with bushings through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
2. Where cable tray and conduit penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.

F. Non-Rated Surfaces:

1. Seal opening through non-fire rated wall, floor, ceiling, and roof opening as follows:

- a. Install sleeve with bushings through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.

3.4 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

3.5 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with stuffing insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install chrome plated steel escutcheons at finished surfaces.

3.6 PROTECTION OF FINISHED WORK

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
 - 1. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 2. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 3. Section 26 05 53 - Identification for Electrical Systems.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
 - 7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Wet and Damp Locations: Provide thin-wall nonmetallic conduit. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas. (Unless directed otherwise on project drawings.)
- C. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes. (Unless directed otherwise on project drawings.)
- D. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes. (Unless directed otherwise on project drawings.)

1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: 3/4 inch (19 mm) unless otherwise specified.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

1.6 COORDINATION

- A. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.1 METAL CONDUIT

- A. Rigid Galvanized Steel (RGS) Conduit:
- B. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction.
- B. Fittings: NEMA FB 1.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked steel construction with PVC jacket.
- B. Fittings: NEMA FB 1.
- C. Provide outdoor- and UV-rated materials as required for installation location.

2.4 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; steel set screw type.

2.5 NONMETALLIC CONDUIT

- A. Product Description: NEMA TC 2; Schedule 40 and Schedule 80 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

2.6 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
- C. Wall Plates for Finished Areas: As specified in Section 26 07 26.
- D. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.7 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 07 16.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron.
 2. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Remove concealed abandoned raceway to its source.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations or as specified.
- F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes in accordance with Section 26 05 53.

- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Maintain clearance between raceway and piping for maintenance purposes.
- K. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- L. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- M. Bring conduit to shoulder of fittings; fasten securely.
- N. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
- O. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- P. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 2 inch size.
- Q. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- R. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.
- S. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- T. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

- U. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

3.5 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.
- B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- C. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- D. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- E. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- F. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- G. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- H. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- I. Install adjustable steel channel fasteners for hung ceiling outlet box.
- J. Do not fasten boxes to ceiling support wires or other piping systems.
- K. Support boxes independently of conduit.
- L. Install gang box where more than one device is mounted together. Do not use sectional box.
- M. Install gang box with plaster ring for single device outlets.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using approved materials.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.
- D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

3.8 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Nameplates.
 - 2. Labels.
 - 3. Wire markers.

1.2 ENVIRONMENTAL REQUIREMENTS

- A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved black letters on white background.
- B. Letter Size:
 - 1. 1/8 inch (3 mm) high letters for identifying individual equipment and loads.
 - 2. 1/4 inch (6mm) high letters for identifying grouped equipment and loads.

2.2 LABELS

- A. Labels: Adhesive tape, with 3/16 inch black letters on white background.

2.3 WIRE MARKERS

- A. Description: Cloth tape, split sleeve, or tubing type wire markers.
- B. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.

2.4 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady
 - 2. Kolbi
 - 3. Seton
 - 4. Substitutions: Must be approved by Engineer.
- B. Description: 4inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 EXISTING WORK

- A. Install identification on existing switchboard 'MDP' to remain in accordance with this section. Re-apply proper labels to remaining breaker sections, including main and feeders.

3.3 INSTALLATION

- A. Install identifying devices after completion of painting.
- B. Nameplate Installation:
 - 1. Install nameplate parallel to equipment lines.
 - 2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
 - 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
 - 4. Secure nameplate to equipment front using screws, rivets, or adhesive.
 - 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
 - 6. Install nameplates for the following:
 - a. Panelboards – label any modified branch circuits at the panelboard. Also label equipment with appropriate panel branch circuit designation.
 - b. Switchboards – label each switchboard section with designator shown on project drawings. Label each breaker in switchboard, including main and branch breakers, with the appropriate destination equipment.
- C. Label Installation:
 - 1. Install label parallel to equipment lines.
 - 2. Install label for identification of individual branch circuit serving device on all receptacles and junction boxes. Label shall be affixed outside receptacle cover plate. Also handwrite circuit with black permanent marker inside cover plate.
- D. Wire Marker Installation:
 - 1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
 - 2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
 - 3. Install labels at data outlets identifying patch panel and port designation as indicated on Drawings.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fuses.

1.2 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 SUBMITTALS

- A. Product Data: Submit data sheets showing electrical characteristics, including time-current curves. Highlight exact fuses to be used.

1.4 MAINTENANCE MATERIALS

- A. Extra Materials:
 - 1. Furnish three spare fuses of each Class, size, and rating installed.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of three years of experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers:
 - 1. Bussman.
 - 2. Gould Shawmut, Ferraz Shawmut.

2.2 DESIGN REQUIREMENTS

- A. Select fuses to provide appropriate levels of short circuit and overcurrent protection for the following components: wire, cable, bus structures, and other equipment. Design system to maintain component damage within acceptable levels during faults.
- B. Select fuses to coordinate with time current characteristics of other overcurrent protective elements, including other fuses, circuit breakers, and protective relays. Design system to maintain operation of device closest to fault operates.

2.3 FUSE PERFORMANCE REQUIREMENTS

- A. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).

B. Power Load Feeder Switches: Class RK1 (time delay).

C. Motor Load Feeder Switches: Class RK1 (time delay).

2.4 FUSES

A. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

2.5 CLASS RK1 (TIME DELAY) FUSES

A. Dimensions and Performance: NEMA FU 1.

B. Voltage: Rating suitable for circuit phase-to-phase voltage.

PART 3 EXECUTION

3.1 DEMOLITION

A. Remove fuses from abandoned circuits.

B. Maintain access to existing fuses and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

A. Install fuse with label oriented so manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 28 19

ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
- B. Related Requirements:
 - 1. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 2. Section 26 05 53 - Identification for Electrical Systems.
 - 3. Section 26 28 13 - Fuses.

1.2 REFERENCE STANDARDS

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

- A. Product Data: Submit switch datasheet that includes ratings and enclosure dimensions. Highlight exact products to be installed.

PART 2 PRODUCTS

2.1 FUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Square D
 - 2. Eaton
 - 3. General Electric
- B. Description: NEMA KS 1, Type HD, enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Materials:
 - 1. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.
 - 2. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - a. Interior Dry Locations: Type 1.
 - b. Exterior Locations: Type 3R.
 - 3. Furnish switches with entirely copper current-carrying parts.

2.2 NONFUSIBLE SWITCH ASSEMBLIES

- A. Manufacturers:
 - 1. Eaton.
 - 2. General Electric.
 - 3. Square D Co.
- B. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.
- C. Enclosure: NEMA KS 1, type as indicated on Drawings. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
- D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

2.3 SWITCH RATINGS

- A. Switch Rating: Horsepower rated sized as indicated on Drawings.
- B. Short Circuit Current Rating: UL listed for 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere), 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes), 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

PART 3 EXECUTION

3.1 DEMOLITION

- A. Disconnect and remove abandoned enclosed switches.
- B. Maintain access to existing enclosed switches and other installations remaining active and requiring access.

3.2 INSTALLATION

- A. Install enclosed switches where indicated.
- B. Install enclosed switches plumb. Provide supports in accordance with Section 26 05 29.
- C. Height: 5 feet to operating handle.
- D. Install fuses for fusible disconnect switches. Refer to Section 26 28 13 for product requirements.
- E. Install engraved plastic nameplates in accordance with Section 26 05 53. Engrave nameplates with the equipment served and the panel and circuit number supplying the switch.
- F. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.

3.4 CLEANING

- A. Clean existing enclosed switches to be reinstalled.

END OF SECTION

SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes manual and magnetic motor controllers in individual enclosures.
- B. Related Sections:
 - 1. Section 26 28 13 - Fuses.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
 - 2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
 - 3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
 - 4. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
 - 5. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
 - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. Underwriters Laboratories Inc.:
 - 1. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.

1.3 SUBMITTALS

- A. Product Data: Submit catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
- B. Test Reports: Indicate field test and inspection procedures and test results.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' experience.

PART 2 PRODUCTS

2.1 MANUAL MOTOR CONTROLLER

- A. Product Description: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, red pilot light, NO, NC, auxiliary contact, and toggle operator.
- B. Enclosure: NEMA ICS 6, Type to meet conditions of installation.

2.2 MOTOR STARTING SWITCH

- A. Product Description: NEMA ICS 2, AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, with red pilot light and toggle operator.
- B. Enclosure: NEMA ICS 6, Type to meet conditions of installation.

2.3 FULL-VOLTAGE NON-REVERSING CONTROLLERS

- A. Product Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- B. Control Voltage: 120 volts, 60 Hertz.
- C. Overload Protection: Electronic.
- D. Product Features:
 - 1. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.
 - 2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty type.
 - 3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
 - 4. Pushbuttons: Shrouded type.
 - 5. Indicating Lights: LED type.
 - 6. Selector Switches: Rotary type.
 - 7. Relays: NEMA ICS 2.
 - 8. Control Power Transformers: 120 volt secondary, 50 VA minimum, in each motor starter. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.
- E. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using thermal magnetic circuit breaker conforming to UL 489, with integral thermal and instantaneous magnetic trip in each pole.
- F. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
 - 1. Interior Dry Locations: Type 1.
 - 2. Exterior Locations: Type 3R.

PART 3 EXECUTION

3.1 EXISTING WORK

- A. Disconnect and remove abandoned enclosed motor controllers.
- B. Maintain access to existing enclosed motor controllers and other installations to remain active and to require access. Modify installation or provide access panel.
- C. Clean and repair existing enclosed motor controllers to be reinstalled.

3.2 INSTALLATION

- A. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29.

- B. Height: 5 feet to operating handle.
- C. Install fuses for fusible switches. Refer to Section 26 28 13 for product requirements.
- D. Select and install overload heater elements in motor controllers to match installed motor characteristics.
- E. Install engraved plastic nameplates. Refer to Section 26 05 53 for product requirements and location.
- F. Neatly type label and place inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place label in clear plastic holder.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS, except Section 4.

END OF SECTION

SECTION 26 51 00

INTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior luminaires.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
 - 2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).

1.3 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.
- B. Product Data: Submit dimensions, ratings, and performance data.

1.4 SUBSTITUTIONS

- A. No substitutions will be accepted after bids are received. The lighting equipment specified herein has been carefully chosen for its ability to meet the luminous performance requirements of this project. Substitutions in all likelihood will be unable to meet all of the same criteria as specified equipment. No exceptions.
- B. Any luminaire offered that is not specified by manufacturer and model number shall be accompanied by a full description that includes drawings, product data, photometrics and independent test lab performance data. The per-unit add or deduct cost for use of the submitted luminaire along with the above information shall be submitted to Engineer for approval 14 days prior to the bid. No substitutions will be accepted after this time.
- C. The Engineer and Architect shall be able to reject any and all substitutions if they determine the fixture is not comparable to the specified luminaires.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 LED LUMINAIRES

- A. Provide LED Light Fixtures: Metalux #24GR-LD5-64-F1-UNV-L835-CD1-U or equal.
- B. LED Luminaires shall meet all DesignLights Consortium® (DesignLights.org) Product Qualification Criteria. This does not require that the luminaire be listed on the DesignLights Consortium's® Qualified Products List, but they must meet the Product Qualification Criteria. The technical requirements that the luminaire shall meet for each Application Category are:
 - 1. Minimum Light Output.
 - 2. Zonal Lumen Requirements.
 - 3. Minimum Luminaire Efficacy.
 - 4. Minimum CRI.
 - 5. L70 Lumen Maintenance.
 - 6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED components.
- C. Color Temperature of 3000K-4100K for interior luminaires.
- D. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- E. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- F. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
- G. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
- H. Driver shall have a rated life of 50,000 hours, minimum.
- I. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
- J. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior luminaires, and a minimum of 70 for exterior luminaires.
- K. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation. Exterior luminaires to operate in ambient temperatures of -20°F to 122°F (-29°C to 50°C).
- L. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.
- M. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10 percent.
- N. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20% at full input power and across specified voltage range.
- O. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.

- P. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- Q. All luminaires shall be provided with knockouts for conduit connections.
- R. The LED luminaire shall carry a limited 5-year warranty minimum for LED light engine(s)/board array, and driver(s).
- S. Provide all of the following data on submittals:
 - 1. Delivered lumens
 - 2. Input watts
 - 3. Efficacy
 - 4. Color rendering index.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.
- B. Locate recessed ceiling luminaires as indicated on Drawings.
- C. Install recessed luminaires to permit removal from below.
- D. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- E. Install clips to secure recessed grid-supported luminaires in place.
- F. Install accessories furnished with each luminaire.
- G. Connect luminaires to branch circuit outlets.
- H. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- I. Install specified lamps in each luminaire.
- J. Ground and bond interior luminaires.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.3 CLEANING

- A. Remove dirt and debris from enclosures.
- B. Clean photometric control surfaces as recommended by manufacturer.

- C. Clean finishes and touch up damage.

END OF SECTION

Clark Dietz, Inc.
1815 S. Meyers Rd., Suite 470
Oakbrook Terrace, IL 60181

p 630.413.4130
clarkdietz.com

Clark>Dietz

Engineering Quality of Life™

VILLAGE OF OAK PARK

BID NO. 20-135

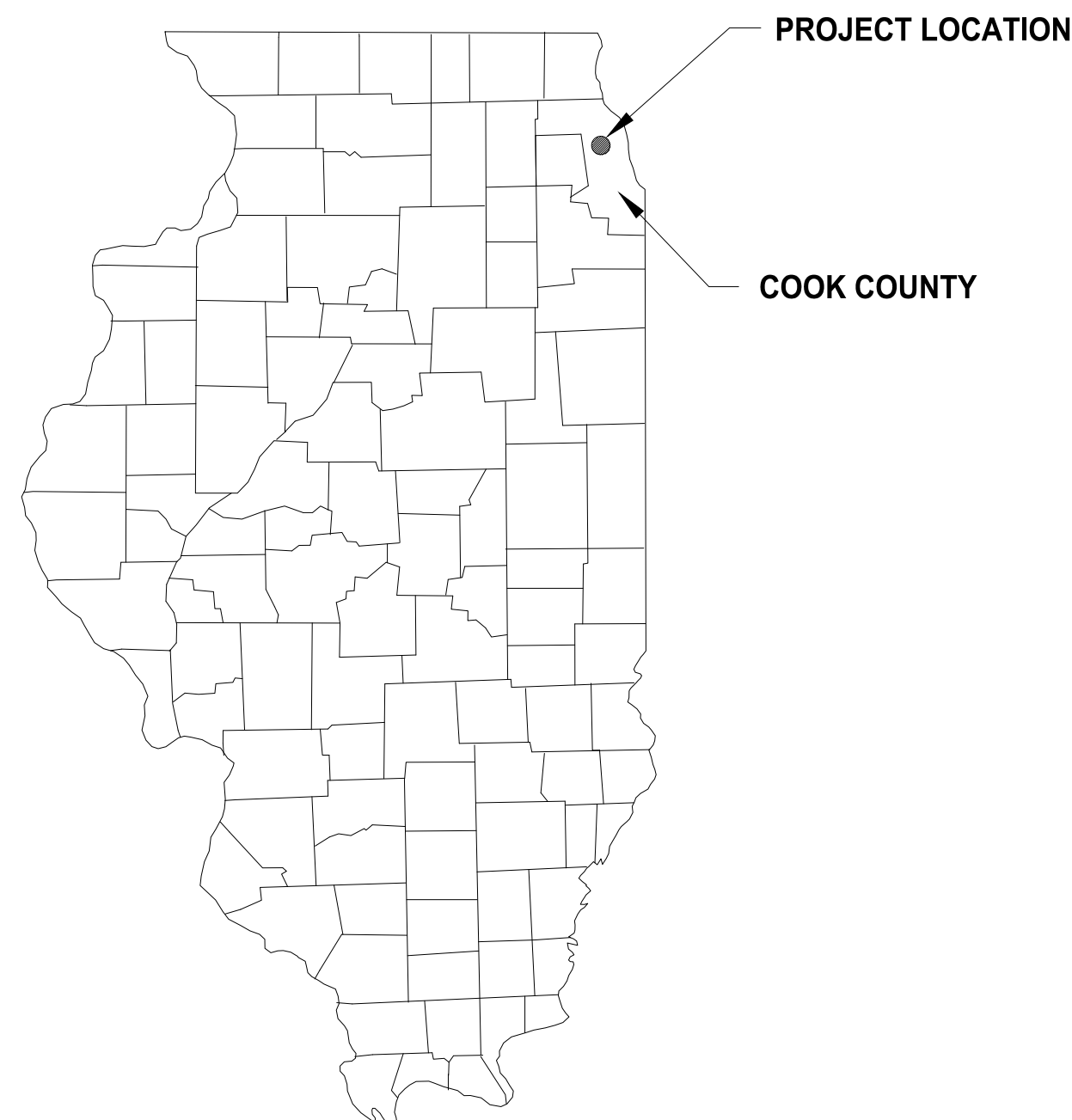
POLICE DEPARTMENT FIRING RANGE

VENTILATION IMPROVEMENTS

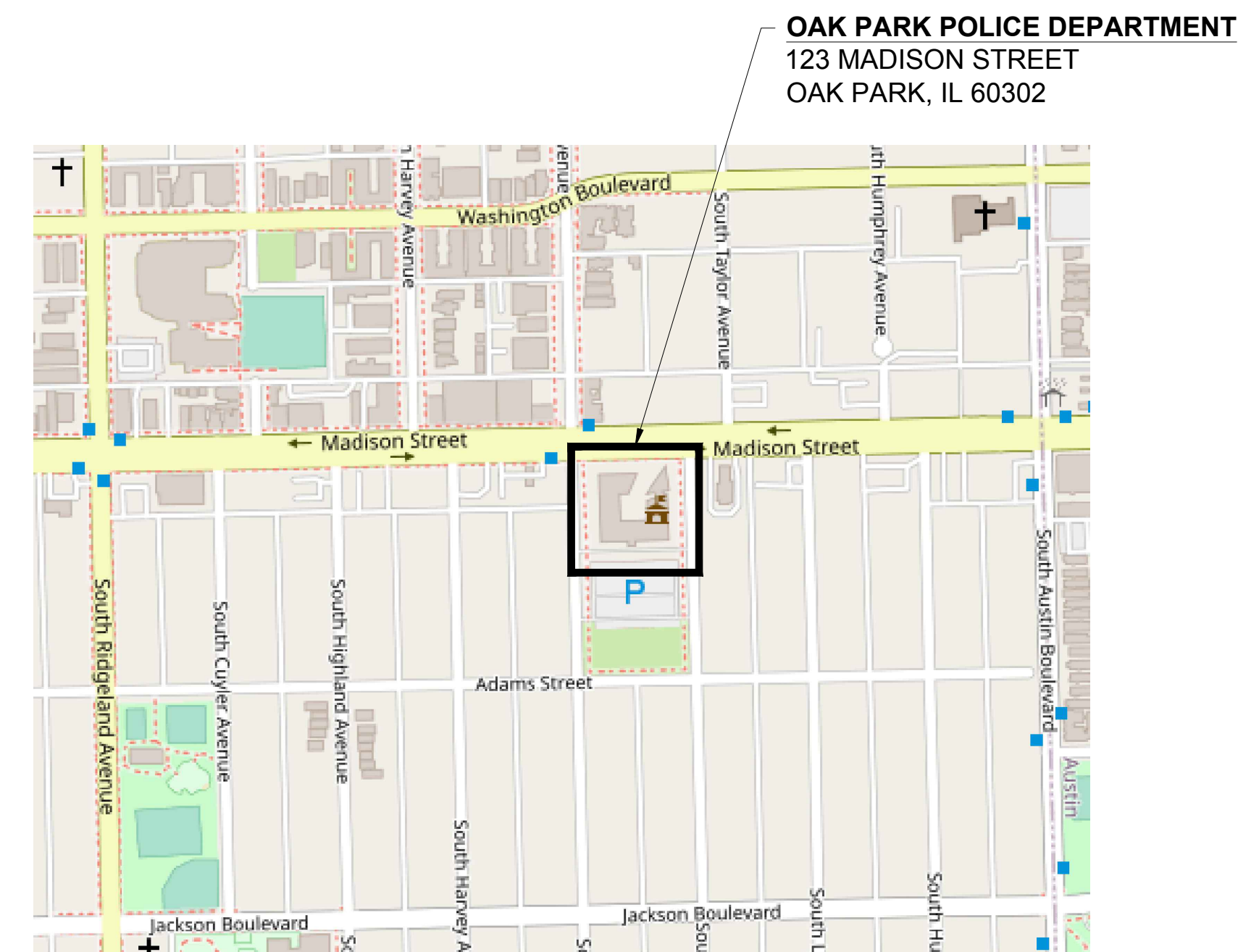
ISSUED FOR BID

JULY 22, 2020

SHEET LIST	
NUMBER	TITLE
G0.01	COVER
M0.01	HVAC GENERAL NOTES AND LEGEND
M1.01	BASEMENT MECHANICAL DEMOLITION PLAN
M2.01	BASEMENT MECHANICAL NEW WORK PLAN
M4.01	MECHANICAL SCHEDULES
M5.01	TC SCHEMATIC
M5.02	TC SCHEMATIC
M5.03	MECHANICAL SECTIONS
M6.01	MECHANICAL DETAILS
M6.02	MECHANICAL DETAILS
E0.01	ELECTRICAL GENERAL NOTES, LEGEND, ABBREVIATIONS AND SCHEDULE
E1.01	BASEMENT ELECTRICAL DEMOLITION PLAN
E2.01	BASEMENT ELECTRICAL NEW WORK PLAN



GENERAL LOCATION MAP



PROJECT LOCATION MAP

ClarkDietz

DESIGN FIRM REG. 184-000450
CLARK DIETZ, INC.
OAKBROOK TERRACE, IL 60181
PHONE : 630.415.4130
WWW.CLARKDIETZ.COM



VILLAGE OF OAK PARK
123 MADISON STREET
OAK PARK, IL 60302

PROJECT TITLE
POLICE DEPARTMENT
FIRING RANGE
VENTILATION IMPROVEMENTS
BID NO. 20-135

DESIGNED BY: TAS, AJM
DRAWN BY: TAS, AJM
CHECKED BY: NTP
DATE CHECKED: 07.20.2020

07.22.20 ISSUED FOR BID
DATE REVISION

DRAWING TITLE
COVER

PROJECT No.
00400020

DRAWING No.
G0.01

VENTILATION LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	SUPPLY DUCT UP OR TOWARD		RECTANGULAR DUCT (FIRST FIGURE IS SIDE SHOWN) ALL DUCT DIMENSIONS ARE INSIDE CLEAR DIMENSIONS
	SUPPLY DUCT DOWN OR AWAY		ROUND DUCTWORK
	RETURN DUCT UP OR TOWARD		FLAT OVAL DUCTWORK
	RETURN DUCT DOWN OR AWAY		FLEXIBLE DUCTWORK
	EXHAUST DUCT UP OR TOWARD		90° ELBOW WITH TURNING VANES
	EXHAUST DUCT DOWN OR AWAY		BRANCH DUCT TAP
	SUPPLY DIFFUSER (WITH HARD DUCT)		ACCESS DOOR (HORIZONTAL/VERTICAL)
	SUPPLY DIFFUSER (WITH FLEXDUCT)		MOTORIZED DAMPER
	RETURN GRILLE OR REGISTER (WITH HARD DUCT)		FLEXIBLE DUCT CONNECTION
	RETURN GRILLE OR REGISTER (WITH FLEXDUCT)		TRANSITION FROM RECTANGULAR TO ROUND DUCT
	EXHAUST GRILLE OR REGISTER (WITH HARD DUCT)		THERMOSTAT W/EQUIPMENT NUMBER
	EXHAUST GRILLE OR REGISTER (WITH FLEXDUCT)		DIRECTION OF AIRFLOW
			CONTROL WIRING

HEATING LEGEND

SYMBOL	DESCRIPTION
	HOT WATER HEATING SUPPLY
	HOT WATER HEATING RETURN
	ELBOW DOWN OR AWAY
	ELBOW UP OR TOWARD
	TEE DOWN OR AWAY
	TEE UP OR TOWARD
	RISE OR DROP
	90° ELBOW
	PIPE TEE
	PIPE TAKEOFF (FROM BOTTOM OF MAIN)
	PIPE TAKEOFF (FROM TOP OF MAIN)
	45° ELBOW
	45° BRANCH
	PITCH PIPING IN DIRECTION OF ARROW
	BALANCING VALVE
	BALL VALVE
	TO BE REMOVED
	NEW CONNECTION TO EXISTING
	EXISTING EQUIPMENT
	NEW EQUIPMENT

GENERAL DEMOLITION HEATING NOTES

1. VERIFY EXACT SIZE AND LOCATION OF EXISTING UTILITIES PRIOR TO START OF DEMOLITION.
2. DISCONNECT ALL HEATING PIPING CONNECTIONS TO EQUIPMENT BEING REMOVED.
3. UNLESS OTHERWISE NOTED, REMOVAL OF PIPING AND/OR EQUIPMENT SHALL INCLUDE ALL INSULATION, VALVES, HANGERS, SUPPORTS, EQUIPMENT PADS, FLASHING, CONTROLS, AND ASSOCIATED ACCESSORIES.
4. UNLESS OTHERWISE NOTED, REMOVAL OF PIPING SHALL BE BACK TO THE MAIN OR LAST ACTIVE SERVICE.
5. ALL OPENINGS OR HOLES LEFT IN EXISTING WALLS, FLOORS, AND CEILINGS TO REMAIN, INCLUDING CHASES, SHALL BE PATCHED TO MATCH EXISTING CONDITIONS.

GENERAL HEATING NOTES

1. THE LOCATIONS AND SIZES OF EXISTING PIPING AND EQUIPMENT HAS BEEN TAKEN FROM "AS-BUILT" DRAWINGS AND INFORMATION PROVIDED BY THE OWNER. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO START OF WORK.
2. PIPING IS SHOWN IN SCHEMATIC FORM ONLY, CHANGES IN ELEVATION ARE NOT NECESSARILY SHOWN. ROUTE PIPING IN AN ORDERLY MANNER AS REQUIRED FOR CLEARANCE WITH STRUCTURAL CONDITIONS. COORDINATE LOCATION OF PIPING WITH OTHER TRADES PRIOR TO INSTALLATION. WHERE POSSIBLE, RACK PIPING HORIZONTALLY OR VERTICALLY.
3. COORDINATE LOCATIONS AND SIZES OF PIPING CONNECTIONS WITH ALL TRADES.
4. ALL CONNECTIONS TO, OR SHUTDOWNS OF, EXISTING SYSTEMS SHALL BE COORDINATED WITH THE OWNER TO PROVIDE MINIMUM INTERFERENCE WITH THEIR OPERATION AND DOWNTIME OF THE SYSTEM. PROVIDE PROPOSED PHASING PLAN FOR CONNECTIONS TO EXISTING SERVICES TO OWNER FOR APPROVAL PRIOR TO STARTING OF WORK.
5. PROVIDE AND INSTALL ISOLATION VALVES IN ALL BRANCH PIPING.
6. CONNECTIONS TO EQUIPMENT SHALL BE PROVIDED WITH ISOLATION VALVES AND UNIONS TO FACILITATE EQUIPMENT REMOVAL.
7. LOCATE ALL ISOLATION VALVES IN AN ACCESSIBLE LOCATION. WHERE VALVES ARE NOT ACCESSIBLE PROVIDE 12X12 ACCESS DOOR.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SUPPORTING SYSTEMS AND DEVICES FOR ALL HEATING PIPING, EQUIPMENT, AND ACCESSORIES.
9. SEE HEATING DETAILS FOR EXACT PIPING CONNECTIONS TO EQUIPMENT, INCLUDING VALVES, TRAPS, AND SYSTEM ACCESSORIES.
10. BALANCING VALVES SHALL BE, AT A MINIMUM, ONE PIPE SIZE SMALLER THAN THE PIPING IN WHICH THEY ARE INSTALLED. CONTRACTOR SHALL VERIFY THAT VALVE CAN BE ADJUSTED TO MEET FLOW REQUIREMENTS WITHOUT THE PRODUCTION OF UNACCEPTABLE NOISE.
11. LOCATE AND INSTALL ALL HEATING EQUIPMENT TO PROVIDE MANUFACTURER'S MINIMUM SERVICE CLEARANCES.

SITE/PROJECT SPECIFIC REQUIREMENTS

1. EXISTING FINISHES - CONTRACTOR SHALL PROTECT ALL EXISTING FINISHED SURFACES (FLOORS, WALLS, CEILINGS, STEPS, RAILINGS, FURNISHINGS, ETC.) FROM DAMAGE DURING THE PROJECT. CONTRACTOR SHALL PAY ALL COSTS INCURRED TO REPAIR OR REPLACE COMPONENTS DAMAGED AS A RESULT OF WORK DONE FOR THE PROJECT.
2. EQUIPMENT LOADING - CONTRACTOR MAY USE BOILER ROOM DOOR AND EXTERIOR STAIRWELL TO LOAD EQUIPMENT INTO BUILDING. CONTRACTOR SHALL VERIFY EXISTING DIMENSIONS AND CLEARANCES OF OPENINGS BEFORE ORDERING EQUIPMENT.
3. TEMPORARY REMOVAL OF COMPONENTS - CONTRACTOR MAY TEMPORARILY REMOVE EXISTING DOORS, RAILINGS, FURNISHINGS, ETC. WHILE LOADING AND UNLOADING EQUIPMENT. CONTRACTOR SHALL STORE AND PROTECT ANY ITEMS FROM DAMAGE. CONTRACTOR SHALL PROMPTLY REINSTALL OR REPLACE ANY REMOVED COMPONENTS ONCE ADDITIONAL CLEARANCE IS NOT NEEDED.

GENERAL DEMOLITION VENTILATION NOTES

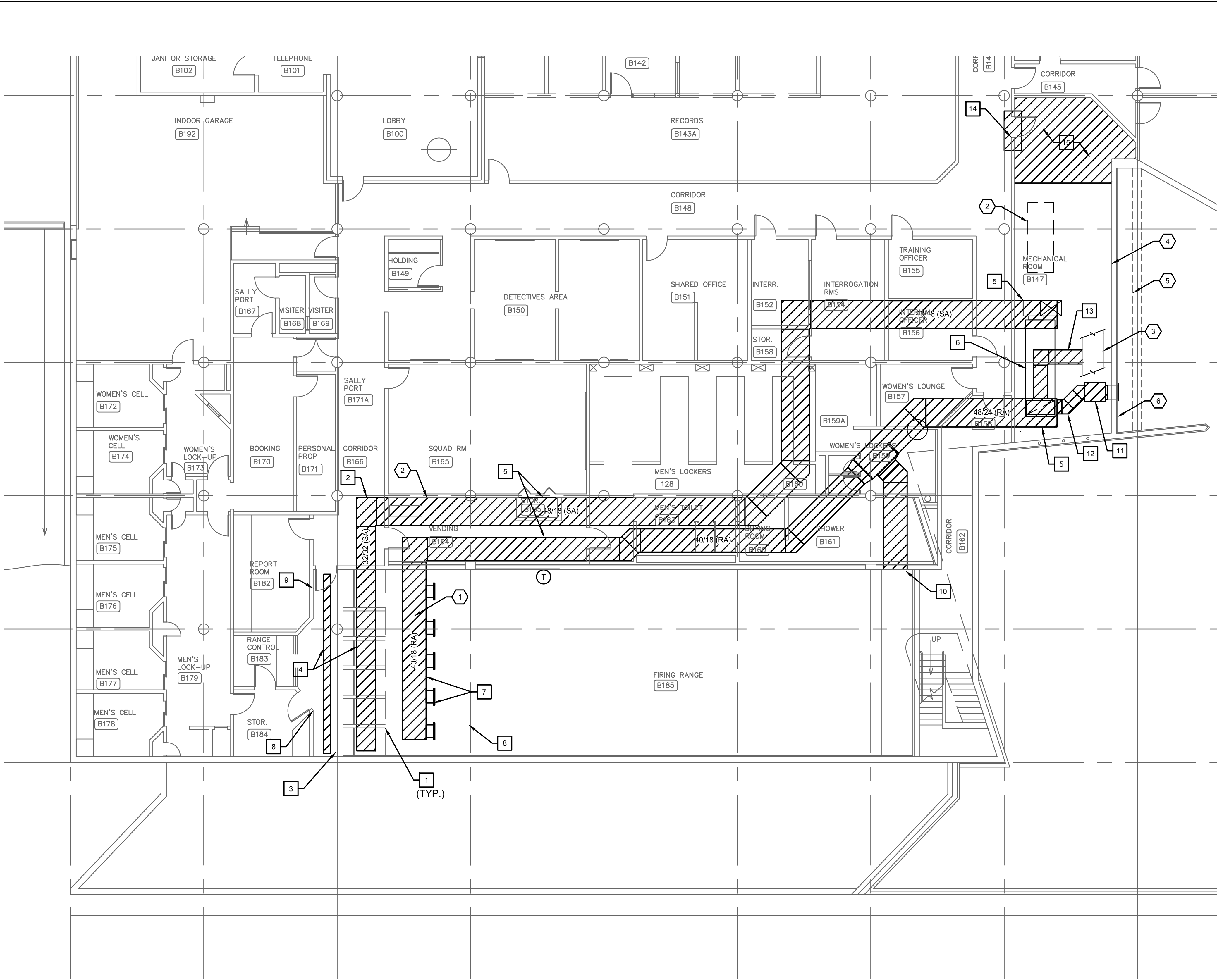
1. VERIFY EXACT SIZE AND LOCATION OF EXISTING UTILITIES PRIOR TO START OF DEMOLITION.
2. DISCONNECT ALL DUCTWORK CONNECTIONS TO EQUIPMENT BEING REMOVED.
3. ALL OPENINGS OR HOLES LEFT IN EXISTING WALLS, FLOORS, AND CEILINGS TO REMAIN, INCLUDING CHASES, SHALL BE PATCHED TO MATCH EXISTING CONDITIONS.

GENERAL VENTILATION NOTES

1. THE LOCATIONS AND SIZES OF EXISTING DUCTWORK AND EQUIPMENT HAS BEEN TAKEN FROM "AS-BUILT" DRAWINGS AND INFORMATION PROVIDED BY THE OWNER. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO START OF WORK.
2. DUCTWORK IS SHOWN IN SCHEMATIC FORM ONLY, OFFSETS AND CHANGES IN ELEVATIONS ARE NOT NECESSARILY SHOWN. ROUTE DUCTWORK IN AN ORDERLY MANNER AS REQUIRED FOR CLEARANCE WITH STRUCTURAL CONDITIONS. COORDINATE LOCATION OF DUCTWORK PRIOR TO INSTALLATION.
3. COORDINATE LOCATIONS AND SIZES OF CONNECTIONS WITH ALL TRADES.
4. ALL CONNECTIONS TO, OR SHUTDOWNS OF, EXISTING SYSTEMS SHALL BE COORDINATED WITH THE OWNER TO PROVIDE MINIMUM INTERFERENCE WITH THEIR OPERATION AND DOWNTIME OF THE SYSTEM. PROVIDE PROPOSED PHASING PLAN FOR CONNECTIONS TO EXISTING SERVICES TO OWNER FOR APPROVAL PRIOR TO STARTING WORK.
5. PROVIDE AND INSTALL MANUAL BALANCING DAMPERS IN ALL BRANCH DUCTWORK AND AT EACH AIR INLET AND OUTLET.
6. LOCATE ALL MANUAL BALANCING DAMPERS IN AN ACCESSIBLE LOCATION. WHERE DAMPERS ARE NOT ACCESSIBLE PROVIDE MINIMUM 18x18 ACCESS DOOR.
7. UNLESS OTHERWISE NOTED, CONCEAL ALL DUCTWORK ABOVE CEILINGS, IN WALLS, OR INSIDE CHASES.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SUPPORTING SYSTEMS AND DEVICES FOR ALL DUCTWORK, VENTILATION EQUIPMENT, AND ACCESSORIES.
9. PROVIDE AND INSTALL SLEEVES FOR ALL DUCTWORK PASSING THROUGH WALLS AND FLOORS.
10. PROVIDE FIRE AND/OR SMOKE DAMPERS AT ALL PENETRATIONS OF FIRE AND/OR SMOKE RATED WALLS, CEILINGS, AND FLOORS. SEE ARCHITECTURAL PLANS FOR LOCATIONS OF FIRE AND/OR SMOKE RATED WALLS, CEILINGS, AND FLOORS. PROVIDE ACCESS DOOR(S) TO FACILITATE RESETTING OF DAMPERS.
11. PROVIDE RIGID METAL DUCT, WITH NO EXCEPTION, WHERE FIRE AND/OR SMOKE RATED WALLS, CEILINGS, AND FLOORS ARE PENETRATED.
12. FOR DUCT CONNECTIONS TO TERMINAL DEVICES, FANS, AND OTHER EQUIPMENT SEE VENTILATION DETAILS.
13. COORDINATE LOCATIONS OF ALL DIFFUSERS, GRILLES, AND REGISTERS WITH ARCHITECTURAL REFLECTED CEILING PLANS.
14. LOCATE AND INSTALL ALL VENTILATION EQUIPMENT TO PROVIDE MANUFACTURER'S MINIMUM SERVICE CLEARANCES.

TEMPERATURE CONTROLS GENERAL NOTES

1. COORDINATE EXACT LOCATIONS OF EQUIPMENT.
2. WALL THERMOSTATS AND/OR TEMPERATURE SENSORS SHALL BE INSTALLED AT 48" TO 54" ABOVE FLOOR ADJACENT TO OR ABOVE LIGHT CONTROL DEVICE. DO NOT INSTALL THERMOSTATS AND/OR TEMPERATURE SENSORS ON EXTERIOR WALLS.
3. UNLESS OTHERWISE NOTED, TEMPERATURE CONTROL WIRING/PIPING SHALL BE CONCEALED ABOVE CEILINGS, IN WALLS, OR INSIDE CHASES.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SUPPORTING SYSTEMS FOR TEMPERATURE CONTROL WIRING/PIPING, EQUIPMENT, AND ACCESSORIES.
5. SEE SPECIFICATION FOR CONTROLS & INSTRUMENTATION REQUIREMENTS AND THE SEQUENCE OF OPERATION FOR EQUIPMENT.
6. TEMPERATURE CONTROLS CABLING SHALL BE PLENUM RATED.
7. THE INFORMATION SHOWN ON TEMPERATURE CONTROLS DRAWINGS IS FOR GENERAL ARRANGEMENT OF DDC SYSTEM ONLY. ACTUAL SYSTEM ARCHITECTURE SHALL BE DESIGNED BY CONTROLS CONTRACTOR.
8. COORDINATE LOCATION AND PROVIDE 120V POWER FOR ADDITIONAL TEMPERATURE CONTROL PANELS AS REQUIRED FOR NEW TEMPERATURE CONTROL COMPONENTS.



1 BASEMENT MECHANICAL DEMOLITION PLAN

0 2' 4' 8' 16'

SCALE 1/8" = 1'



NOTES

1. SEE SHEET M0.01 FOR HVAC GENERAL NOTES AND LEGEND.
2. CONTRACTOR SHALL REMOVE AND REPLACE EXISTING CEILING SYSTEMS AS NEEDED TO PERFORM WORK.
3. CONTRACTOR SHALL TEMPORARILY REMOVE EXISTING CEILING-MOUNTED EQUIPMENT AS NEEDED TO PERFORM WORK. REMOVED ITEMS SHALL BE SAVED AND REINSTALLED PRIOR TO COMPLETION OF PROJECT.
4. PROVIDE NEW CEILING TILES WHERE EXISTING CEILING TILES ARE DAMAGED DURING WORK.
5. CONTRACTOR IS RESPONSIBLE FOR REMOVING EXISTING DRYWALL CEILING AS REQUIRED FOR DUCTWORK REMOVAL AND REPLACEMENT.

DEMOLITION KEYNOTES (THIS SHEET)

1. REMOVE EXISTING FIRING PARTITIONS AND BRACKETS. REMOVE EXISTING TARGET EQUIPMENT. RETURN EXISTING RANGE EQUIPMENT TO OWNER OR DISPOSE AT OWNER'S REQUEST.
2. DISCONNECT AND CAP DUCTWORK CONNECTED TO FIRING RANGE SYSTEM.
3. REMOVE EXISTING CEILING GRID, TILES, AND SUPPORT SYSTEM, INCLUDING ALL STEEL FRAMING.
4. REMOVE EXISTING SUPPLY DUCTWORK AND CEILING GRILLES.
5. REMOVE EXISTING SUPPLY AND RETURN DUCTWORK MAIN RUNS, INCLUDING SUPPORTS.
6. REMOVE EXISTING AIR HANDLING UNIT, INCLUDING CONCRETE PAD.
7. REMOVE ALL EXISTING RETURN AIR DUCTWORK, GRILLES, AND SUPPORTS IN FIRING RANGE.
8. REMOVE FIRST ROW OF SOUND Baffles.
9. REMOVE EXISTING PLUMBING PIPING MOUNTED TO WALL, INCLUDING VALVES AND SUPPORTS. REMOVE PLUMBING PIPING BACK TO WHERE IT WILL NOT INTERFERE WITH INSTALLATION OF NEW DUCTWORK. CAP EACH LINE ABOVE CEILING.
10. REMOVE EXISTING WALL MOUNTED RETURN GRILLE.
11. REMOVE EXISTING EXHAUST FAN AND RETURN TO OWNER.
12. REMOVE EXISTING EXHAUST DUCTWORK.
13. REMOVE EXISTING OUTDOOR AIR DUCTWORK.
14. REMOVE EXISTING DOORFRAME, DOOR, AND CMU BLOCKS AS REQUIRED TO FIT NEW AIR HANDLING UNIT. PROVIDE TEMPORARY SUPPORTS.
15. REMOVE ABANDONED TANK AND EQUIPMENT IN THIS AREA. COORDINATE WITH OWNER BEFORE REMOVAL.

KEYNOTES (THIS SHEET)

1. EXISTING VAV BOX AND RETURN DUCTWORK SERVING CONTROL ROOM TO REMAIN.
2. EXISTING AIR HANDLING UNIT S-4 SUSPENDED AT CEILING TO REMAIN.
3. EXISTING OUTDOOR AIR DUCTWORK TO REMAIN.
4. INTERIOR WALL OF MECHANICAL ROOM ABOVE GRADE.
5. INTERIOR WALL OF MECHANICAL ROOM BELOW GRADE.
6. EXISTING EXHAUST LOUVER AND PLENUM TO REMAIN.

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VILLAGE OF OAK PARK
123 MADISON STREET
OAK PARK, IL 60302

PROJECT TITLE

POLICE DEPARTMENT
FIRING RANGE
VENTILATION IMPROVEMENTS
BID NO. 20-135

DESIGNED BY: TAS, AJM
DRAWN BY: TAS, AJM
CHECKED BY: NTP
DATE CHECKED: 07.20.2020

07.22.20 ISSUED FOR BID
DATE REVISION

DRAWING TITLE

BASEMENT MECHANICAL
DEMOLITION PLAN

PROJECT No.
O0400020

DRAWING No.
M1.01

AIR HANDLING UNIT SCHEDULE																											
TAG	SERVICE	ARRANGEMENT	SUPPLY FAN DATA					RETURN FAN DATA					HOT WATER COIL DATA							ELECTRIC DATA					REMARKS	DESIGN BASIS	
	LOCATION		AIR VOL. (CFM)	EXT. S.P. (IN. W.C.)	FAN SPEED (RPM)	MOTOR HP	DRIVE	AIR VOL. (CFM)	EXT. S.P. (IN. W.C.)	FAN SPEED (RPM)	MOTOR HP	DRIVE	EAT (°F) DB	LAT (°F) DB	EWT (°F)	LWT (°F)	SENSIBLE CAP.(MBH)	FLUID FLOW (GPM)	FLUID	V	PH	HZ	MCA (AMPS)	MOP (AMPS)		MANUF.	MODEL NO.
AHU-1	B185 - FIRING RANGE	HORIZONTAL	15600	1.5	2411	2@10	DIRECT	17160	2.0	2391	2@10	DIRECT	47	75	140	120	505	55	30% PG	208	3	60.0	--	--	NOTES 1, 2	TRANE	CSAA
	B147 - MECHANICAL ROOM																										

- NOTES:
- IN ADDITION TO FAN AND HW COIL SECTIONS, AIR HANDLING UNIT SHALL INCLUDE MIXING BOX, PANEL FILTER SECTION, ACCESS SECTION, AND OUTLET SECTION.
 - AIR HANDLING UNIT SHALL BE SHIPPED SPLIT-FRAME WITH LIMITING DIMENSION 48" WIDE. CONTRACTOR SHALL VERIFY FIELD CONSTRAINTS BEFORE ORDERING EQUIPMENT. CONTRACTOR SHALL VERIFY EXACT EQUIPMENT DIMENSIONS, INCLUDING REQUIRED CLEARANCES. CONTRACTOR SHALL BE FULLY RESPONSIBLE TO ENSURE ORDERED EQUIPMENT CAN BE MOVED INTO AND THROUGH THE BUILDING TO ITS FINAL POSITION.

HOT WATER PUMP SCHEDULE																
TAG	SERVICE	PUMP DATA						ELEC. CHAR.						REMARKS	DESIGN BASIS	
	LOCATION	TYPE	OPER. TEMP. (°F)	FLOW (GPM)	T.D.H. (FT. OF H2O)	RPM	MOTOR HP	V	PH	HZ	FLA	MCA	MCOP (AMPS)		MANUFACTURER	MODEL NUMBER
P-1	HEATING HOT WATER MECHANICAL B147	IN-LINE	140	55	15	1760	0.50	--	--	60	--	--	--	--	TACO	1611

HOT WATER BOILER SCHEDULE													
TAG	SERVICE	FUEL DATA		OUTPUT (MBH)	MEDIA	FLOW RATE (GPM)	EWT/LWT (°F)	ELEC. CHAR.			REMARKS	DESIGN BASIS	
	LOCATION	INPUT (CFH)	MIN PRESS (IN WC)					V	PH	HZ		MANUFACTURER	MODEL NUMBER
B-1	HEATING HOT WATER MECHANICAL B147	750	3.5	722	WATER/ 30% PG	55	120/140	120	1	60	50 PSIG RELIEF VALVE	LOCHINVAR	FBN-0751

EXPANSION TANK SCHEDULE											
TAG	SERVICE	TYPE	ASME CONSTR.	WORKING PRESSURE (PSIG)	TANK CAPACITY (GAL)	TANK SIZE (IN.) HEIGHT x DIAM.	OPER. TEMP. (°F)	AIR PRE-CHARGE PRESSURE (PSIG)	REMARKS	DESIGN BASIS	
	LOCATION									MANUFACTURER	MODEL NUMBER
ET-1	HEATING HOT WATER MECHANICAL B147	BLADDER	YES	125	34	38 X 20	140	12		TACO	CBX130-125

AIR FILTER HOLDING CABINET SCHEDULE									
TAG	SERVICE	FILTER	AIR VOL. (CFM)	24"X24" FILTERS HIGH	24"X24" FILTERS WIDE	MAX. FACE VELOCITY(FPM)	REMARKS	DESIGN BASIS	
	LOCATION							MANUFACTURER	MODEL NUMBER
AFC-1	RETURN/EXHAUST RANGE B185	AF-1	2860	1	2	515	1	NORTHLAND FILTER	A2424B

- NOTES:
- SEE AIR FILTER SCHEDULE.
 - MOUNT FRAME DIRECTLY BEHIND RETURN GRILLE.

AIR FILTER SCHEDULE										
TAG	SERVICE	AIR VOL. (CFM)	DIMENSIONS			FILTER TYPE	PRESSURE DROP (IN. W.C.)	REMARKS	DESIGN BASIS	
	LOCATION		W	H	D				MANUFACTURER	MODEL NUMBER
AF-1	RETURN/EXHAUST RANGE B185	1430	24"	24"	12"	HEPA 99%	1.0	--	NORTHLAND FILTER	1E2424XCED211
AF-2	RETURN/EXHAUST RANGE B185	1430	24"	24"	2	MERV 8	0.25	--	AEROSTAR	--

GRILLES & DIFFUSER SCHEDULE											
TAG	TYPE	FACE SIZE	AIR PATTERN	THROW (FEET)	MOUNTING	MATERIAL	FINISH	MAX N.C. LEVEL	NOTES	DESIGN BASIS	
										MANUFACTURER	MODEL NUMBER
SG-1	RADIAL SUPPLY LAMINAR FLOW DIFFUSER	--	LAMINAR	--	NOTE 3	ABS	--	--	NOTES 4,5,6	CAREY'S	CUSTOM
RG-1	3/4" SPACING 45° SINGLE DEFLECTION	24"x48"	--	--	NOTE 1	ALUM.	--	30	NOTE 1,2,3	PRICE	630

- NOTES:
- MOUNT GRILLE TO EXTERIOR OF TWO (2) FILTER FRAMES. SEE DETAIL. SIZE GRILLE TO FIT EXTERIOR OF FILTER FRAME WITHOUT INTERFERING WITH HEPA FILTER INSTALLATION AND REMOVAL.
 - FURNISH GRILLE WITH 1/4 TURN FASTENERS AND REMOVABLE CORE.
 - FURNISH GRILLE WITH FILTER FRAME FOR TWO (2) FILTER AF-2. SEE AIR FILTER SCHEDULE.
 - PROVIDE DIFFUSER WITH PLENUM TO CONNECT TO SUPPLY DUCTWORK.
 - DIFFUSER SHALL INCLUDE INTERNAL BAFFLING TO EQUALIZE AIRFLOW ACROSS FACE OF DIFFUSER.
 - DIFFUSER SHALL BE CAPABLE OF AIRFLOW INDICATED ON PLANS.

AIR INLET/OUTLET CONNECTION SCHEDULE				
SYMBOL	TAG	NECK SIZE	DUCT SIZE	REMARKS
Ⓢ1	SG-1	--	--	NOTE 1
Ⓡ1	RG-1	NOTE 3	--	NOTE 2

- NOTES
- UNLESS OTHERWISE NOTED, ALL BRANCH DUCTWORK TO AIR INLET/OUTLET SHALL EQUAL THE SCHEDULED NECK SIZE. PROVIDE TRANSITIONS AS REQUIRED.
 - AIR INLET CONSISTS OF TWO (2) HEPA FILTER HOLDING FRAMES. SEE SCHEDULE AND DETAIL.
 - SIZE NECK OF GRILLE TO FIT EXTERIOR OF TWO FILTER FRAMES.

P:\00400020_OAK PARK -- PD FIRING RANGE VENTILATION\DESIGN\CAD\MECHANICAL\M5.01.DWG THOMAS A. SCHILLING SAVE TIME 7/21/2020 9:30:36 AM PLOT DATE 7/21/2020 10:11 AM

SEQUENCE OF OPERATION

AIR HANDLING UNIT

SYSTEM INCLUDES CONSTANT SPEED SUPPLY FANS, VAV RETURN FANS, MIXED AIR DAMPERS, & HW HEATING COIL.

GENERAL: THE AIR HANDLER SHALL BE FULLY CONTROLLED BY THE BAS.

SUPPLY FAN SECTION:

- 1. START/STOP: MANUAL STARTER MOUNTED IN THE RANGE SHALL COMMAND THE OPERATION OF THE SUPPLY FAN AND IT SHALL RUN CONTINUOUSLY.
- 2. PROOF: BAS SHALL PROVE FAN OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME. UPON FAILURE OF THE SUPPLY OR RETURN FAN, BAS SHALL DE-ENERGIZE THE OTHER FAN, LOCKOUT THE RUN COMMAND TO BOTH FANS, AND ENUCIATE AN ALARM.

RETURN FAN SECTION:

- 1. START/STOP: MANUAL STARTER MOUNTED IN THE RANGE SHALL COMMAND THE OPERATION OF THE RETURN FAN AND IT SHALL RUN CONTINUOUSLY. FAN START COMMAND SHALL BE WITHHELD FOR 10 SECONDS AFTER THE SUPPLY FAN STATUS HAS BEEN PROVEN.
- 2. PROOF: BAS SHALL PROVE FAN OPERATION AND USE THE STATUS INDICATION TO ACCUMULATE RUNTIME.
- 3. VSD CONTROL: WHENEVER THE FAN IS ENERGIZED, BAS SHALL CONTROL THE SPEED OF THE VSD. THE RETURN FAN SPEED SHALL BE CONTROLLED TO MAINTAIN NEGATIVE 0.05 INCHES (ADJ.) STATIC PRESSURE AS DETERMINED BY THE DIFFERENTIAL PRESSURE SENSOR LOCATED IN THE FIRING RANGE.

MIXED AIR DAMPERS: BAS SHALL CONTROL THE DAMPERS AS FOLLOWS:

- 1. CLOSED: WHEN AHU IS DE-ENERGIZED, THE RELIEF AND OUTDOOR AIR DAMPERS SHALL REMAIN CLOSED AND THE RETURN DAMPER SHALL REMAIN FULLY OPEN.
- 2. OPEN: WHENEVER THE AHU IS IN THE OCCUPIED MODE AND THE SUPPLY AND RETURN FANS HAVE BEEN PROVEN, THE BAS SHALL OPEN THE OUTSIDE AND RELIEF AIR DAMPERS TO THEIR PRESET MINIMUM POSITION AND MODULATE THE RETURN AIR DAMPER IN UNISON.

DISCHARGE AIR TEMPERATURE SETPOINT AND HW CONTROL VALVE:

- 1. DISCHARGE AIR TEMPERATURE SETPOINT SHALL BE 70°F (ADJ.).
- 2. THE HW CONTROL VALVE SHALL MODULATE TO MAINTAIN DISCHARGE AIR TEMPERATURE. WHEN THE DISCHARGE AIR TEMPERATURE IS ABOVE 70°F, THE HW CONTROL VALVE SHALL BYPASS ALL FLOW.

UNOCCUPIED MODE OPERATION:

- 1. ON A CALL FOR HEATING, THE SUPPLY AND RETURN FANS SHALL CYCLE ON MINIMUM FLOW TO MAINTAIN REDUCED SPACE TEMPERATURE OF 55°F (ADJ.).
- 2. DURING UNOCCUPIED MODE, THE OUTSIDE AIR DAMPER SHALL REMAIN CLOSED AND THE RETURN AIR DAMPER OPEN.

WARM-UP (HEATING MODE ONLY): WHEN INDEXED TO THE OCCUPIED MODE, THE SUPPLY AND RETURN FANS SHALL START AND SHALL OPERATE WITH RETURN AIR ONLY UNTIL THE SPACE TEMPERATURE REACHES 72°F (ADJ.). THE SYSTEM WILL THEN RETURN TO THE OCCUPIED MODE.

SAFETY CONTROLS: PROVIDE THE FOLLOWING SAFETY CONTROL SEQUENCES AS REQUIRED: LOW LIMIT CONTROL, FREEZESTAT, FIRE ALARM INTERFACE, AND HIGH STATIC PRESSURE. SEQUENCES SHALL INCLUDE ALARM FOR SAFETY POINTS LISTED.

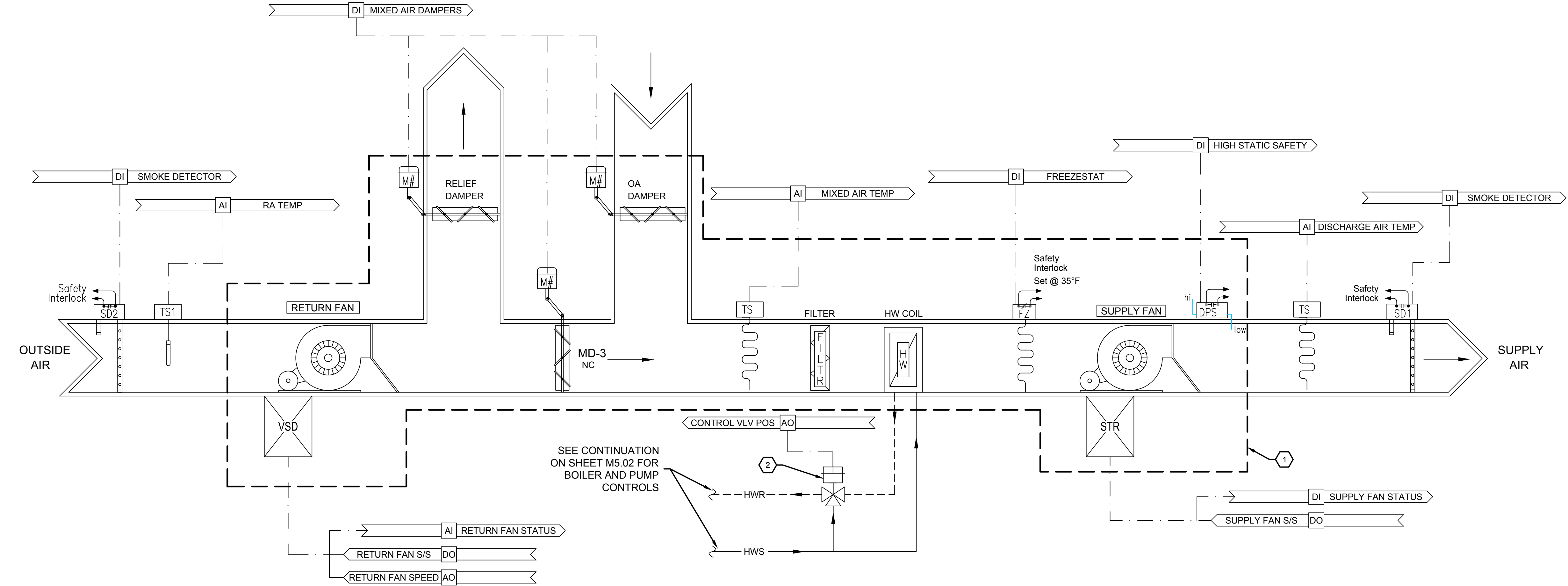
NOTES (THIS SHEET)

- 1. SEE SHEET M0.01 FOR TEMPERATURE CONTROL LEGEND, ABBREVIATIONS, AND GENERAL NOTES.
- 2. THE NEW POINTS SHALL BE INSTALLED AND PROGRAMMED TO INTERFACE WITH THE OWNER'S EXISTING BAS.

KEYNOTES (THIS SHEET)

- 1. NEW AIR HANDLING UNIT, AHU-1.
- 2. MODULATING CONTROL VALVE

POINTS LIST							
ADDRESS	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
	SUPPLY FAN S/S			•			
	SUPPLY FAN STATUS	•					
	RETURN FAN S/S			•			
	RETURN FAN STATUS		•				
	RETURN FAN SPEED				•		
	DISCHARGE AIR TEMP		•				
	RETURN AIR TEMP		•				
	MIXED AIR TEMP		•				
	FREEZESTAT	•					
	SMOKE DETECTOR	•					
	MIXED AIR DAMPERS				•		
	HIGH STATIC SAFETY	•					
	HW CONTROL VALVE				•		



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VILLAGE OF OAK PARK
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OAK PARK, IL 60302

PROJECT TITLE
POLICE DEPARTMENT
FIRING RANGE
VENTILATION IMPROVEMENTS
BID NO. 20-135

DESIGNED BY: TAS, AJM
DRAWN BY: TAS, AJM
CHECKED BY: NTP
DATE CHECKED: 07.20.2020

07.22.20 ISSUED FOR BID
DATE REVISION

DRAWING TITLE
TC SCHEMATIC

PROJECT No.
00400020

DRAWING No.
M5.01

DWG OF DWGS

NOTE: DIMENSIONAL DATA IS NOT TO BE OBTAINED BY SCALING ANY PORTION OF THIS DRAWING.

SEQUENCE OF OPERATION

1. BOILER CONTROLS SHALL BE PROVIDED BY THE UNIT MANUFACTURER AND INSTALLED AT THE FACTORY AND IN THE FIELD. MANUFACTURER SHALL PROVIDE COMMUNICATION INTERFACE TO THE BAS WITH MINIMUM POINTS AS LISTED. THE MANUFACTURER SHALL PROVIDE THE FOLLOWING SEQUENCE OF OPERATION. THE CONTRACTOR SHALL INSTALL CONTROL ELEMENTS SHIPPED LOOSE FOR FIELD INSTALLATION.
2. ALL SETPOINTS SHALL BE ADJUSTABLE THRU THE BAS.
3. WHEN THE OUTDOOR AIR TEMPERATURE IS 55°F (ADJ.) OR ABOVE, BOILER B-1 AND PUMP P-1 SHALL REMAIN OFF.
4. WHEN AIR HANDLING UNIT AHU-1 IS IN UNOCCUPIED MODE, BOILER B-1 AND PUMP P-1 SHALL REMAIN OFF.
5. WHEN THE OUTDOOR AIR TEMP IS BELOW 55°F (ADJ.) AND AHU-1 IS IN OCCUPIED MODE:

a. THE BOILER CONTROL SHALL START BOILER TO MEET THE DISCHARGE HW TEMPERATURE SENSOR SETPOINT (140F ADJ.). THE BOILER CONTROLS SHALL BE ENABLED BY THE BAS.

b. WHEN THR BOILER IS STARTED, THE SYSTEM PUMP SHALL START AND THE BOILER COMBUSTION AIR DAMPER SHALL OPEN.

c. THE BOILER CONTROL PANEL SHALL HAVE THE BAS COMMUNICATION INTERFACE

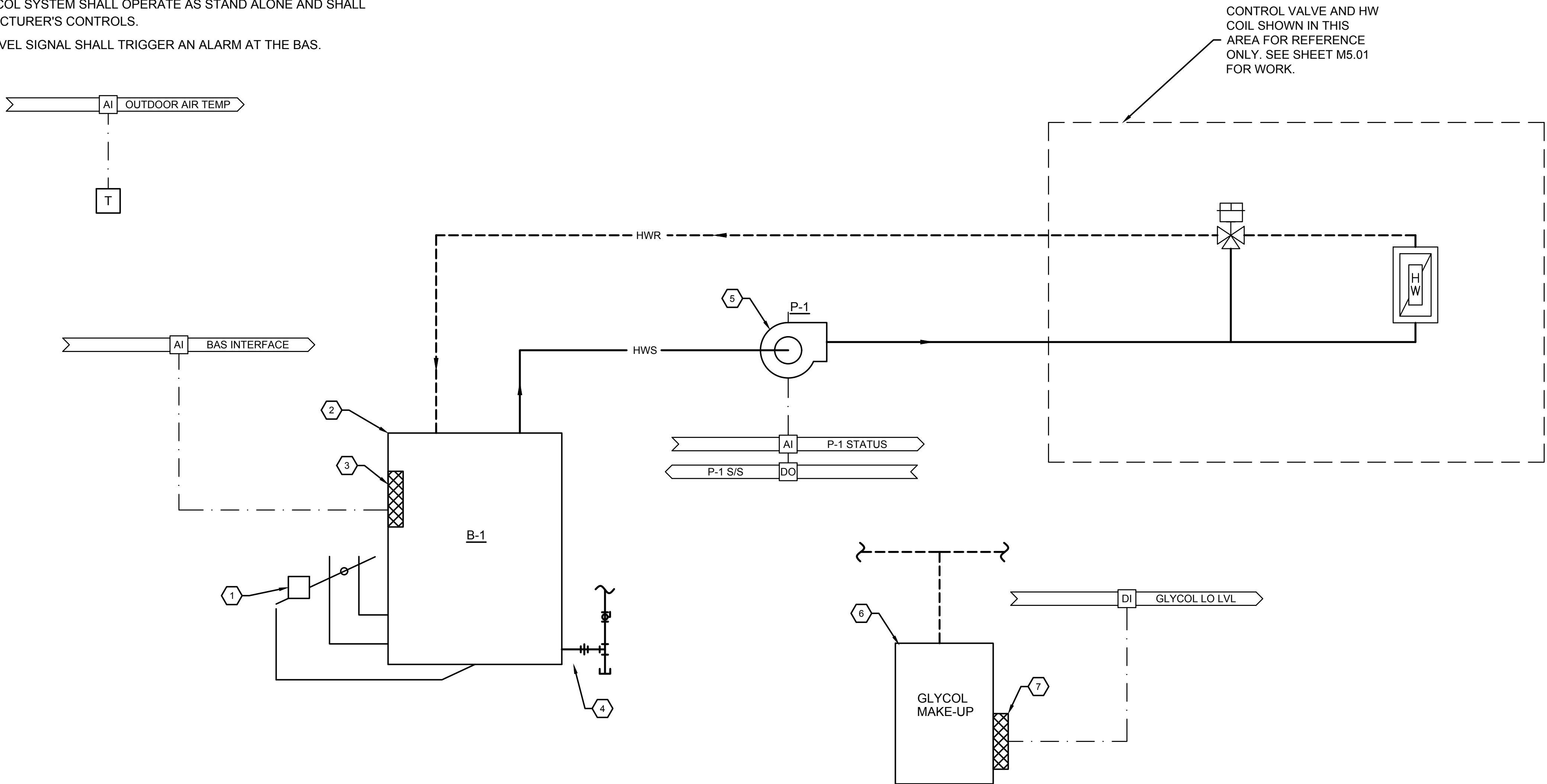
d. THE BOILER CONTROL SYSTEM SHALL HAVE HWS TEMPERATURE RESET BASED ON ADJUSTABLE SCHEDULE. OA SHALL BE COMMUNICATED FROM THE BAS RATHER THAN A DEDICATED SENSOR FROM THE BOILER CONTROLS.
6. PACKAGED GLYCOL SYSTEM SHALL OPERATE AS STAND ALONE AND SHALL UTILIZE MANUFACTURER'S CONTROLS.
7. LOW GLYCOL LEVEL SIGNAL SHALL TRIGGER AN ALARM AT THE BAS.

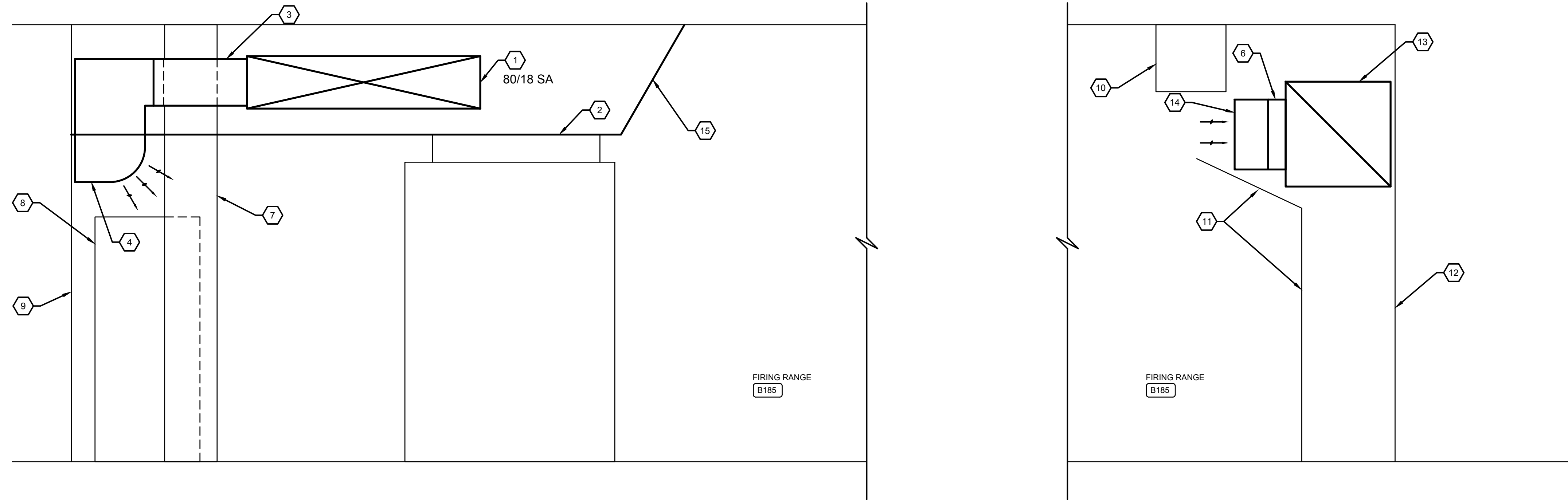
#KEYNOTES (THIS SHEET)

1. COMB. DAMPER
2. HW BOILER
3. CONFIGURED PANEL (INTERFACE WITH BAS).
4. NATURAL GAS CONNECTION
5. BOILER PUMP
6. PACKAGED GLYCOL MAKE-UP SYSTEM
7. MANUFACTURER'S ALARM PANEL WITH LOW LEVEL SWITCH

POINTS LIST

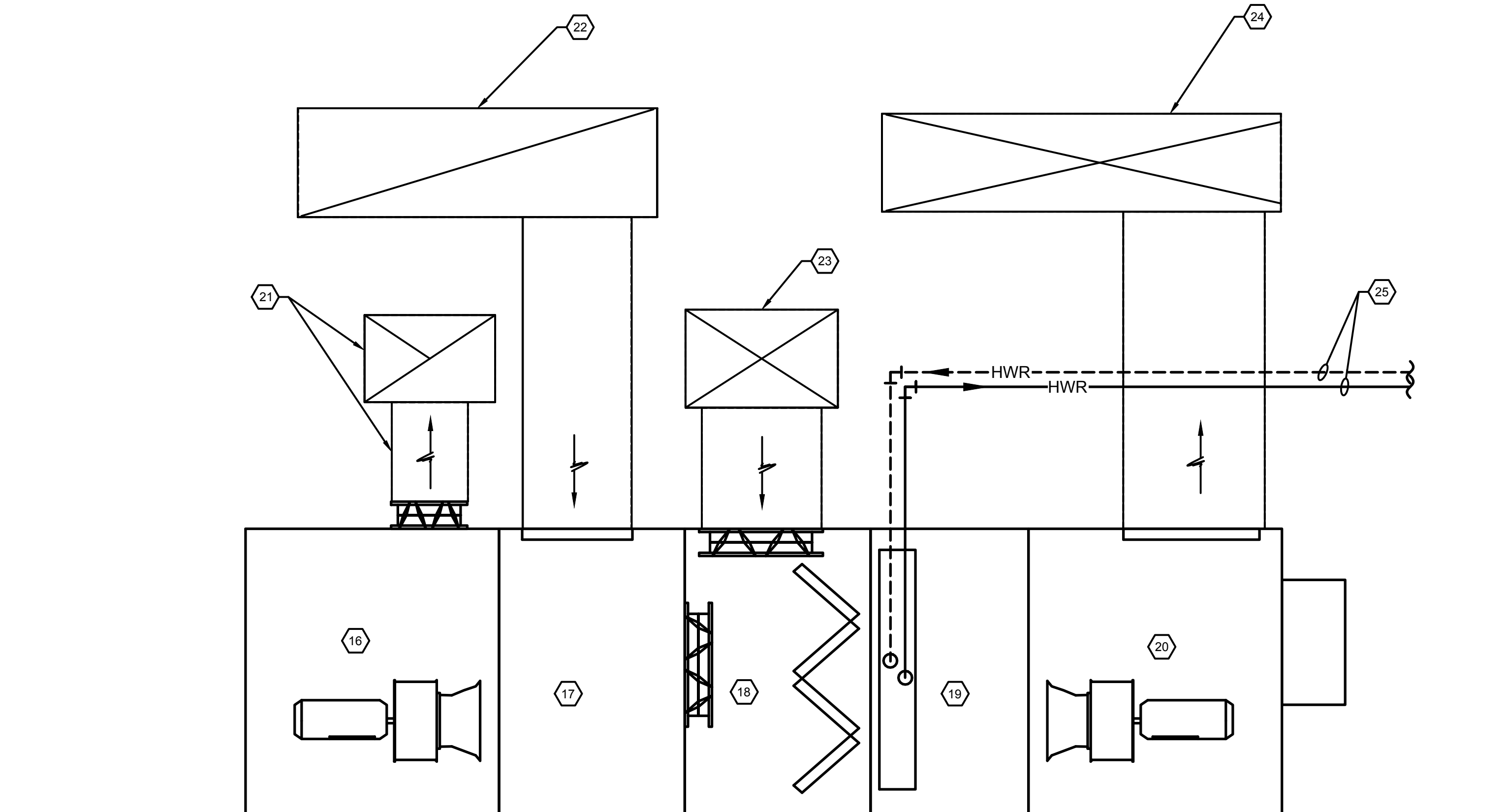
ADDRESS	POINT DESCRIPTOR	POINT TYPE					REMARKS
		DI	AI	DO	AO	VP	
	BAS INTERFACE		•				
	P-1 S/S			•			
	P-1 STATUS	•					
	OUTDOOR AIR TEMP		•				
	GLYCOL LO LVL	•					ALARM





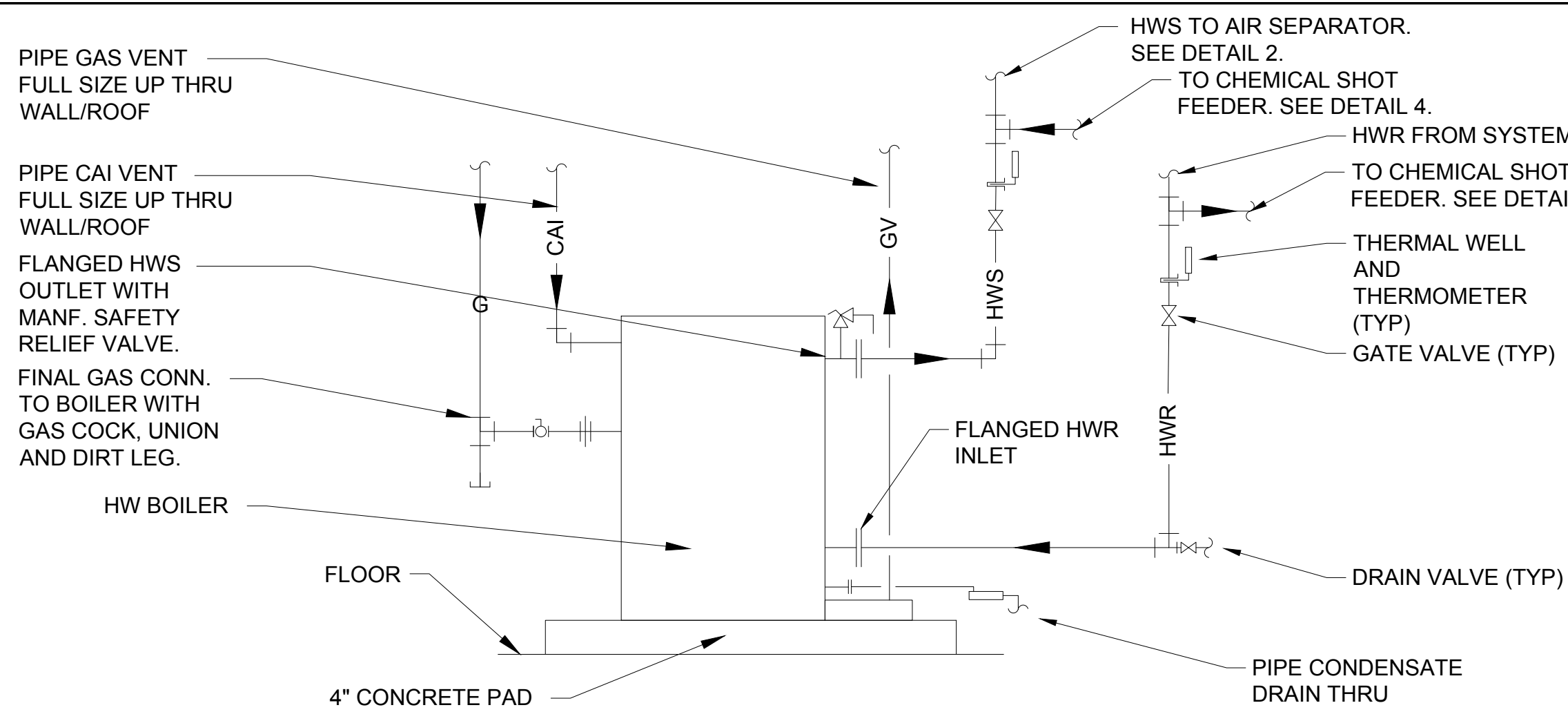


- ## KEYNOTES (THIS SHEET)

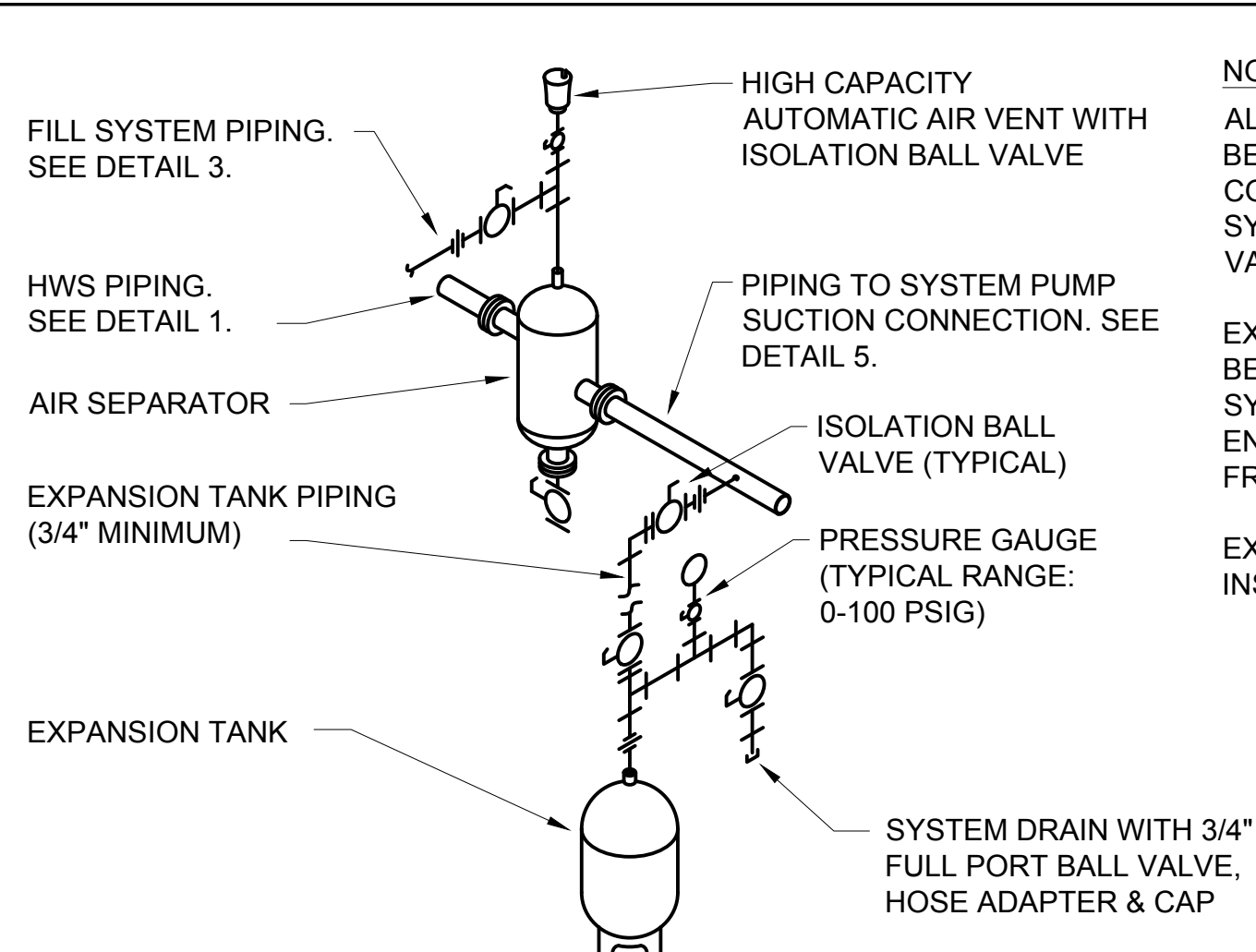
1. NEW SA DUCT ABOVE CEILING.
2. NEW CEILING GRID AND TILE. INSTALL NEW GRID BELOW DUCT AT 8'-0" AFF. ADD NEW ACOUSTIC PANEL CEILING GRID AND TILE. EXTEND GRID AND TILE TO THE EXISTING FIRING RANGE WALL. NEW CEILING TO AVOID CREATING ANY EDGES THAT MAY DISRUPT LAMINAR FLOW FROM RADIAL DIFFUSER.
3. EXTEND NEW SA DUCT TO NEW RADIAL DIFFUSERS AND MAKE CONNECTION.
4. NEW SA RADIAL DIFFUSER BELOW NEW CEILING. COORDINATE WITH EXISTING COLUMN, EXISTING UTILITIES, AND NEW CEILING. INSTALL DIFFUSERS AS HIGH AS POSSIBLE. MINIMUM CLEARANCE TO BE 7'-0".
5. EXISTING WALL TO REMAIN.
6. VOLUME DAMPER. SEE DETAIL.
7. EXISTING COLUMN TO REMAIN.
8. EXISTING DOOR TO REMAIN.
9. EXISTING WEST WALL TO REMAIN.
10. EXISTING BEAM TO REMAIN.
11. EXISTING BACKSTOP TO REMAIN.
12. EAST WALL TO REMAIN.
13. NEW RETURN DUCTWORK. SEE PLANS FOR SIZING. MOUNT DUCTWORK WITH SUFFICIENT CLEARANCES TO ACCESS FILTERS.
14. NEW HEPA FILTERS WITH HOLDING FRAME. SEE DETAIL. MOUNT FILTER FRAME WITH SUFFICIENT CLEARANCES TO ACCESS FILTERS.
15. PROVIDE NEW BULKHEAD CONSTRUCTED OF ACOUSTIC CEILING TILES EXTENDING TO DECKING ABOVE.
16. RETURN FAN.
17. RETURN AIR PLENUM.
18. MIXING AND FILTERS SECTION.
19. HEATING COIL.
20. SUPPLY FAN.
21. EXHAUST DUCTWORK. SEE PLANS.
22. RETURN DUCTWORK. SEE PLANS.
23. OUTSIDE AIR DUCTWORK. SEE PLANS.
24. SUPPLY AIR DUCTWORK. SEE PLANS.
25. HEATING WATER PIPING. SEE PLANS AND DETAIL.



 <p style="text-align: right; font-size: small;">DESIGN FIRM REG. - 184-000450 1815 S. MEYERS RD., STE. 4770 OAKBROOK TERRACE, IL 60181 PHONE : 630.413.4130 www.clarkdietz.com</p>	
 Oak Park <small>VILLAGE OF OAK PARK 123 MADISON STREET OAK PARK, IL 60302</small>	
<div>PROJECT TITLE</div> <div>POLICE DEPARTMENT FIRING RANGE VENTILATION IMPROVEMENTS BID NO. 20-135</div>	
DESIGNED BY: _____ DRAWN BY: _____ CHECKED BY: _____ DATE CHECKED: _____	T.A.S., A.J.M. T.A.S., A.J.M. NTP <u>07.20.2020</u>
07.22.20	ISSUED FOR BID
DATE	REVISION
<div>DRAWING TITLE</div> <div>MECHANICAL SECTIONS</div>	
<div>PROJECT No.</div> <div>O0400020</div>	
<div>DRAWING No.</div> <div>M5.03</div>	
DWG OF DWGS	



1 BOILER PIPING SCHEMATIC
NOT TO SCALE

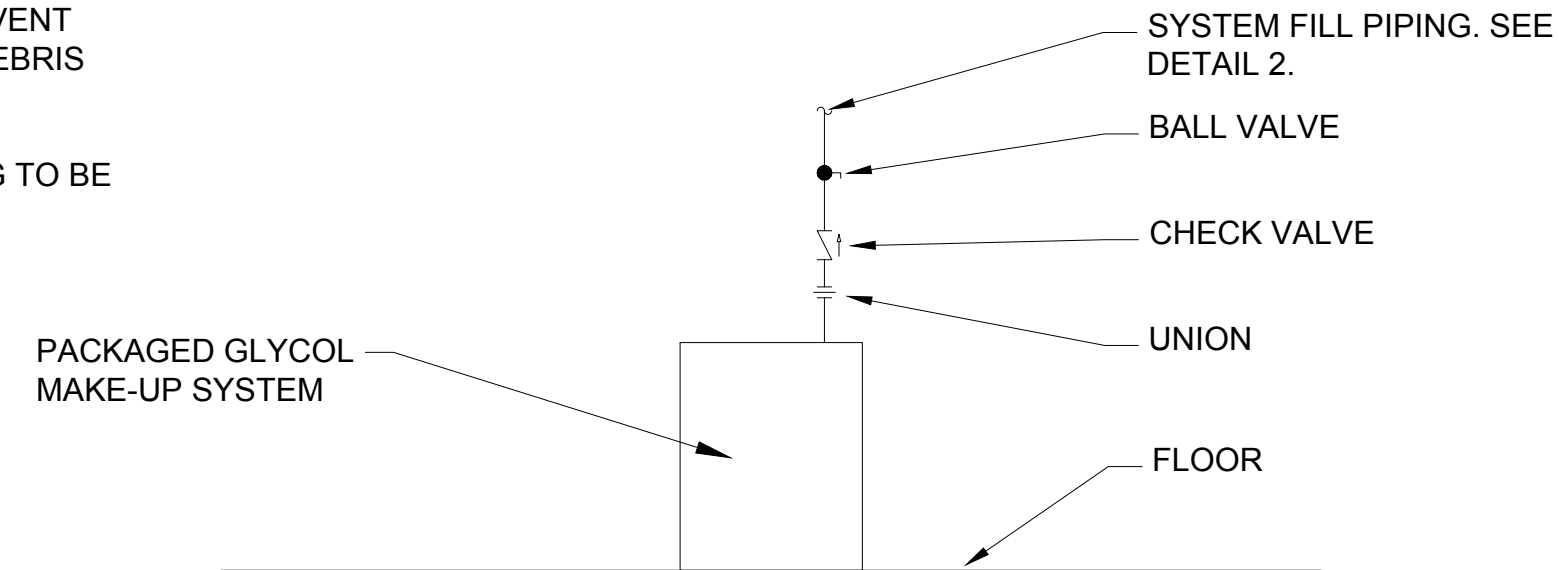


2 AIR SEPARATOR/EXPANSION TANK SCHEMATIC
NOT TO SCALE

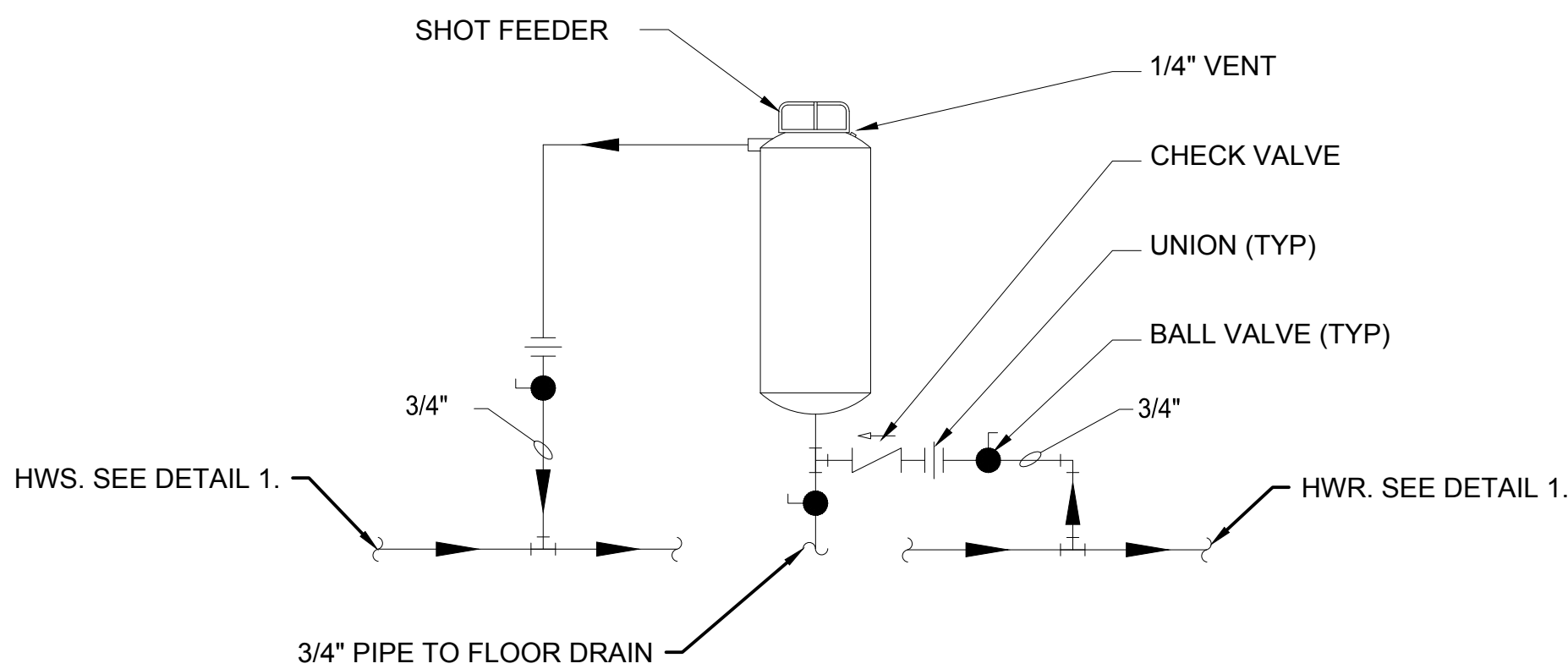
NOTES:
ALL THREADED NIPPLES/PIPING
BETWEEN EACH POINT OF
CONNECTION TO CLOSED LOOP
SYSTEM AND FIRST ISOLATION
VALVE TO BE SCHEDULE 80.

EXPANSION TANK PIPING MUST
BE CONNECTED TO SIDE OF
SYSTEM PIPING TO PREVENT
ENTRANCE OF AIR OR DEBRIS
FROM SYSTEM.

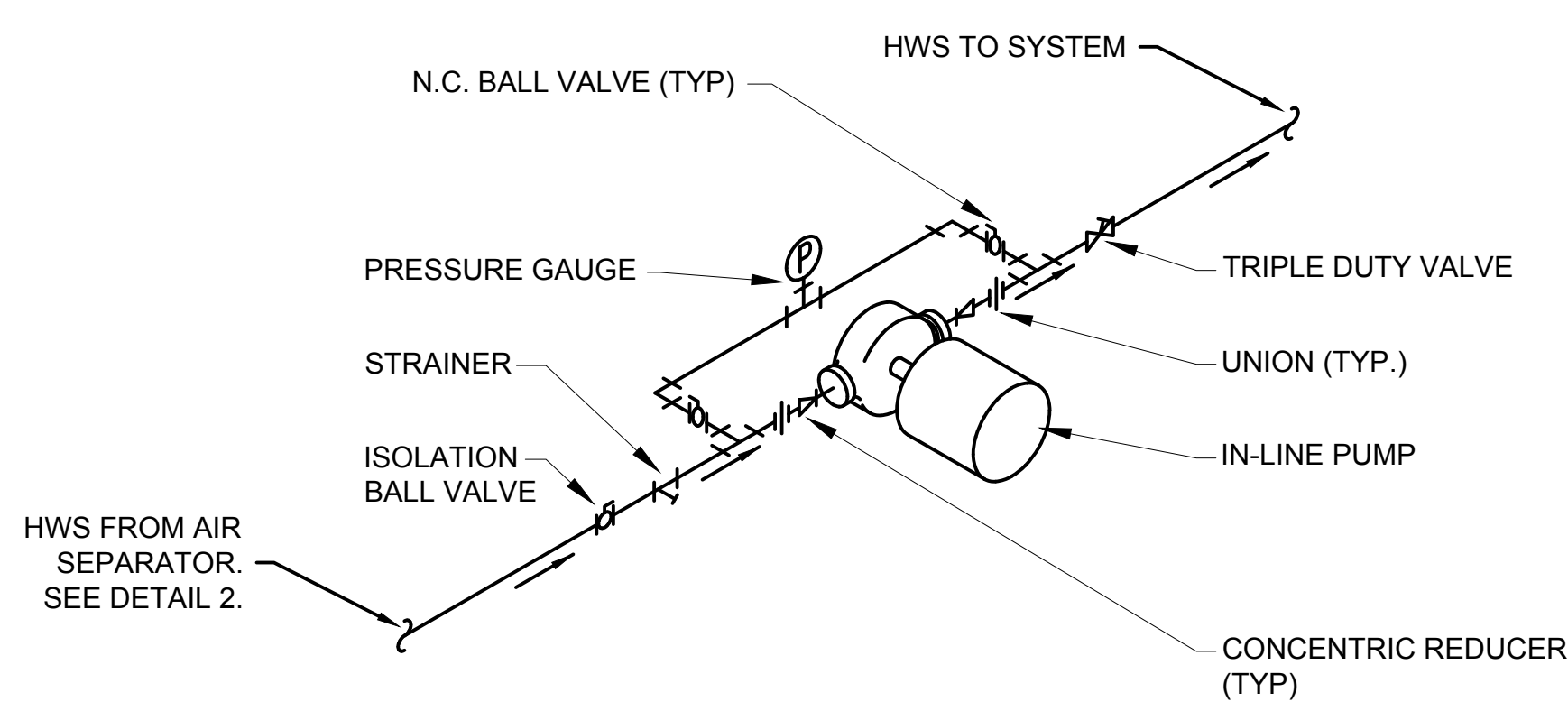
EXPANSION TANK PIPING TO BE
INSULATED



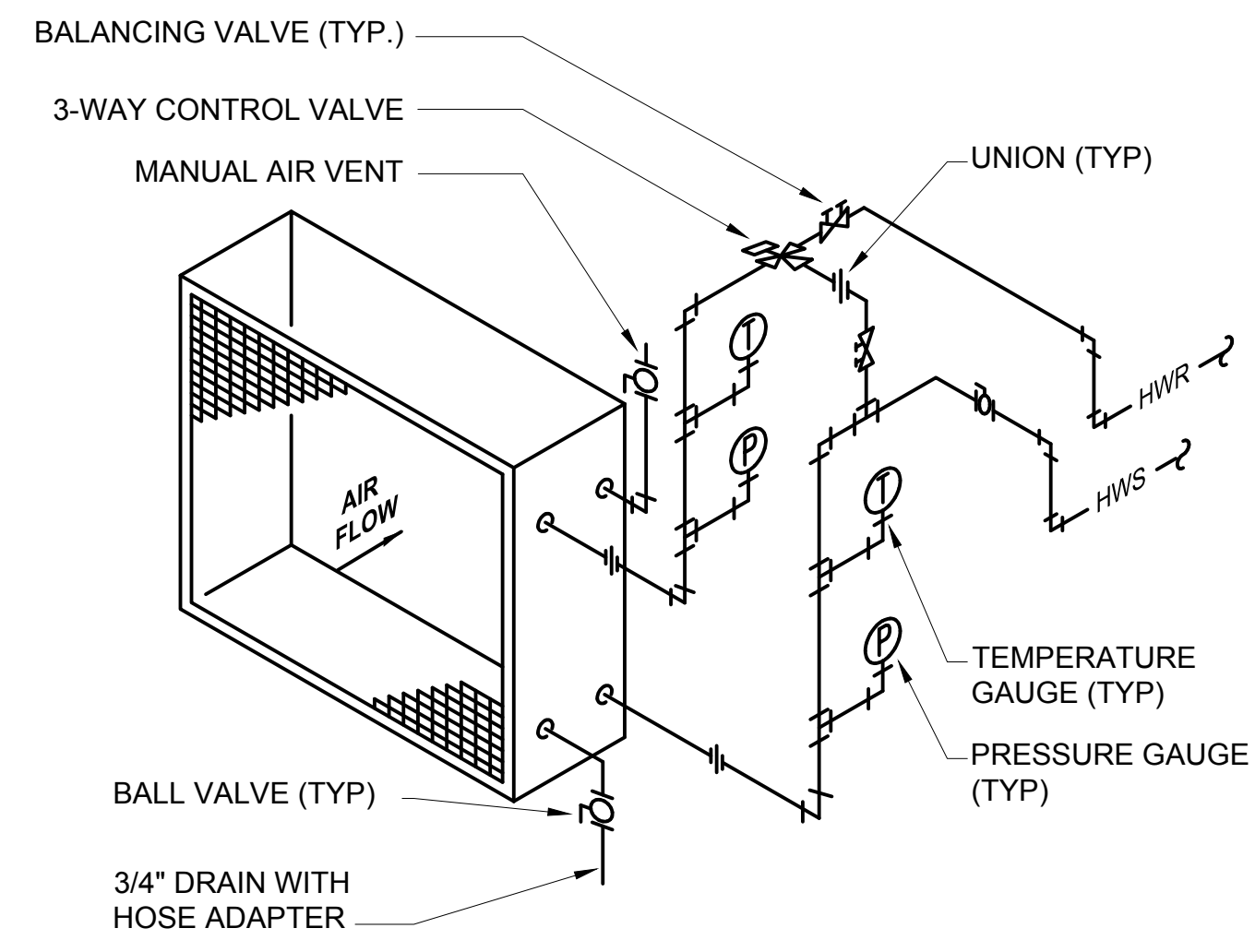
3 PACKAGED GLYCOL MAKEUP SYSTEM
NOT TO SCALE



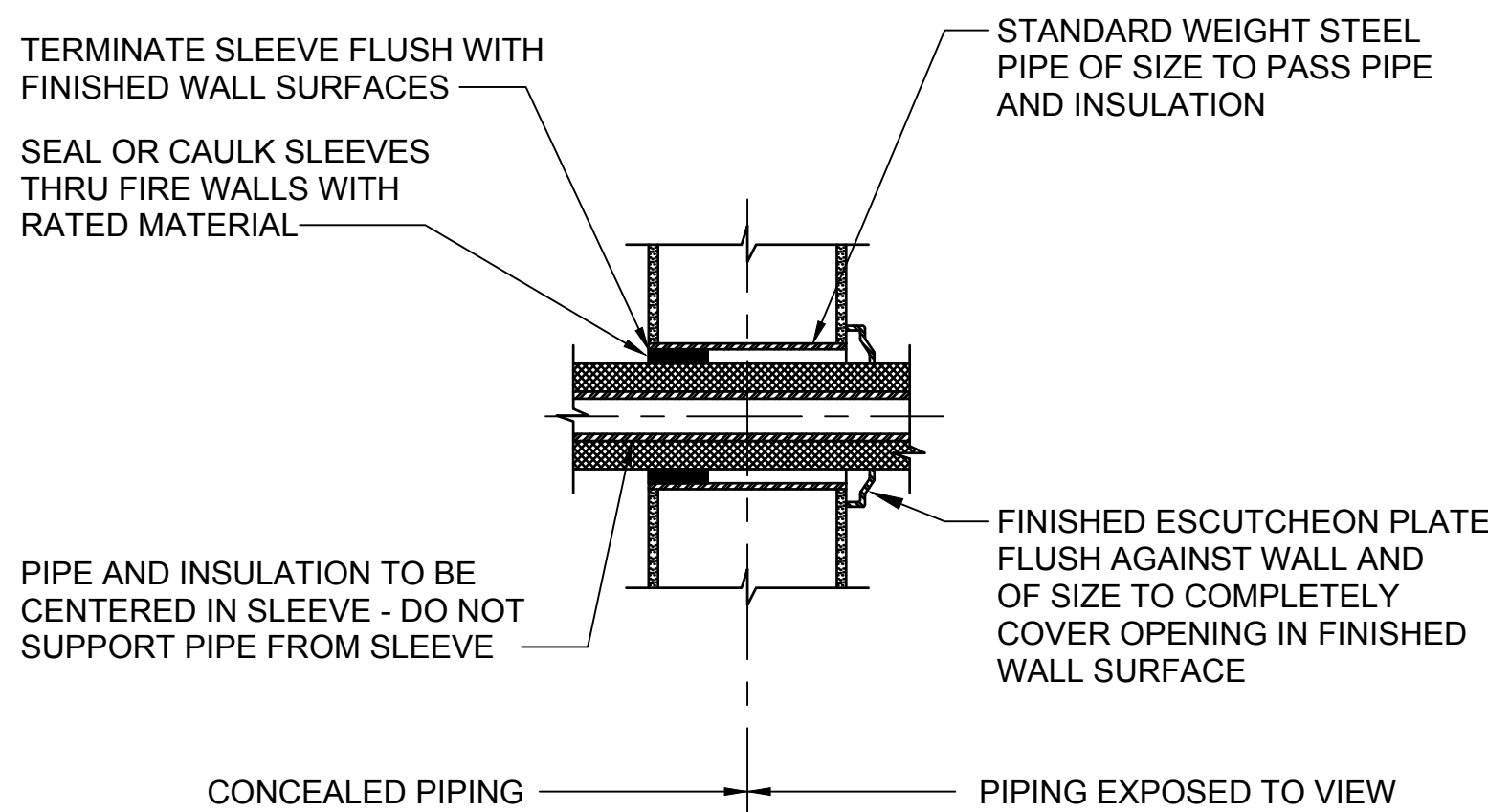
4 CHEMICAL SHOT FEEDER SCHEMATIC
NOT TO SCALE



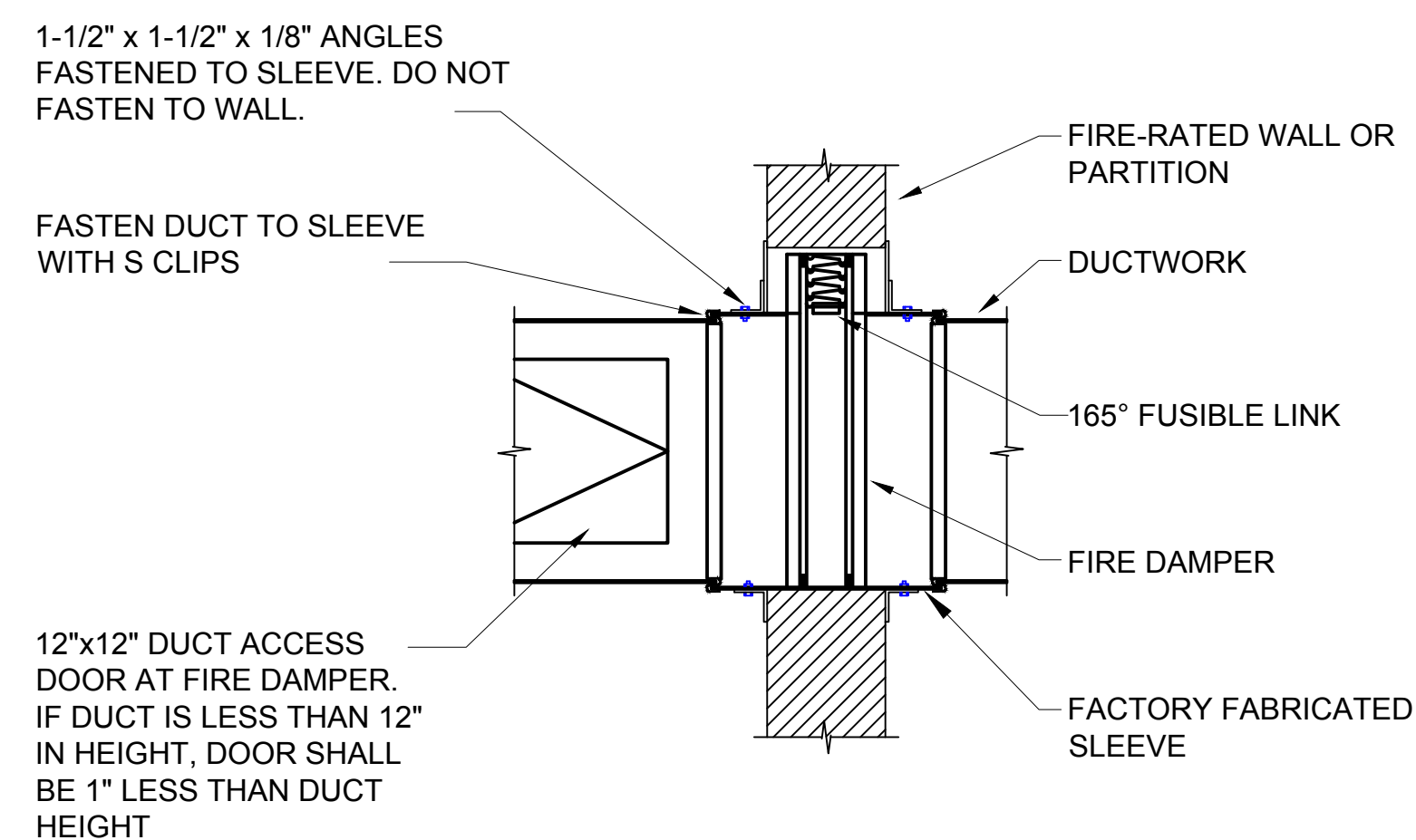
5 INLINE PUMP DETAIL
NOT TO SCALE



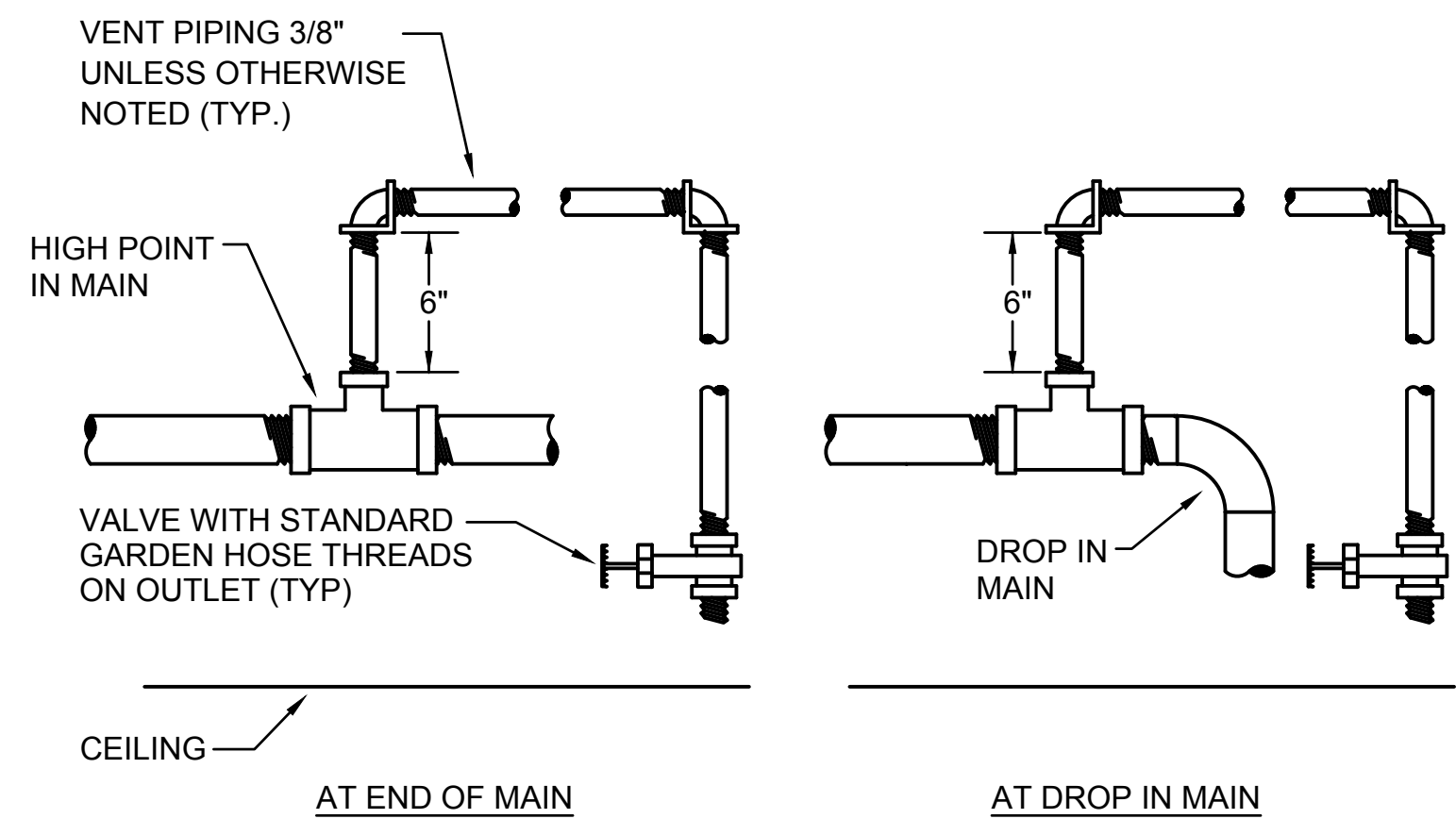
6 HW HEATING COIL CONNECTION PIPING
NOT TO SCALE



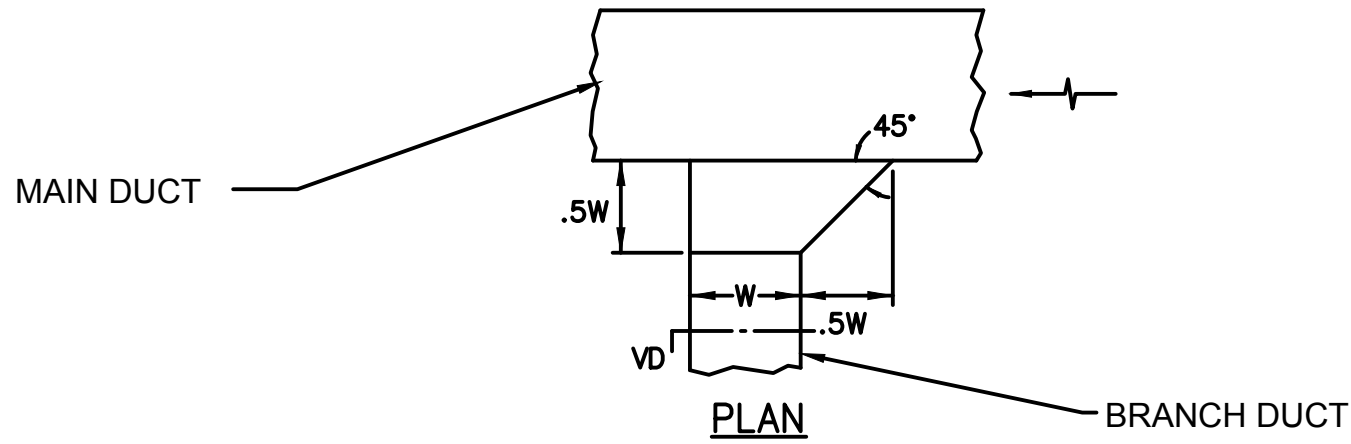
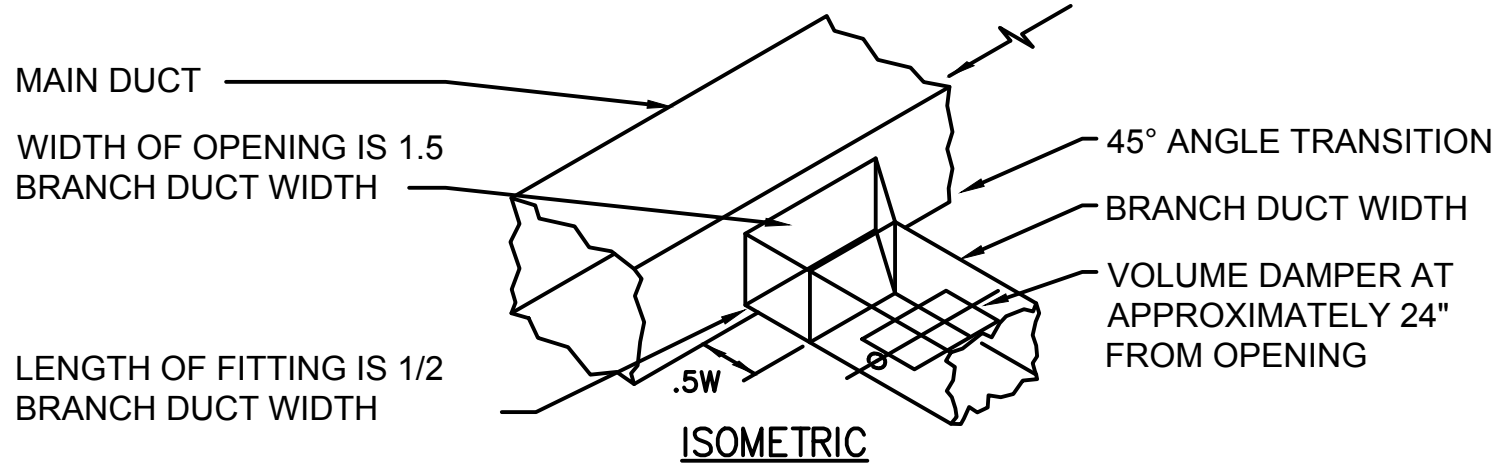
7 PIPE SLEEVE THROUGH INTERIOR WALLS
NOT TO SCALE



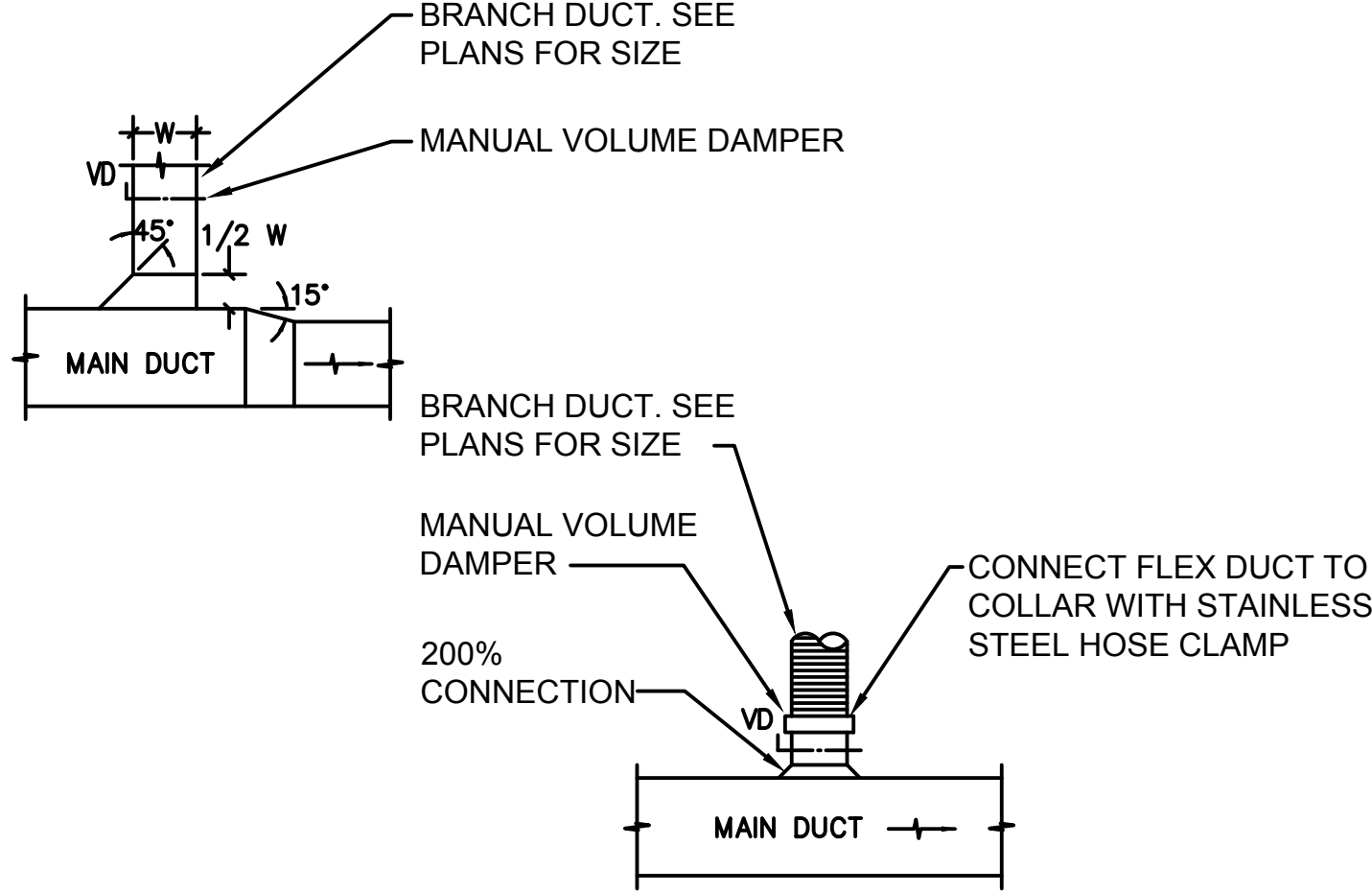
8 FIRE DAMPER IN WALL
NOT TO SCALE



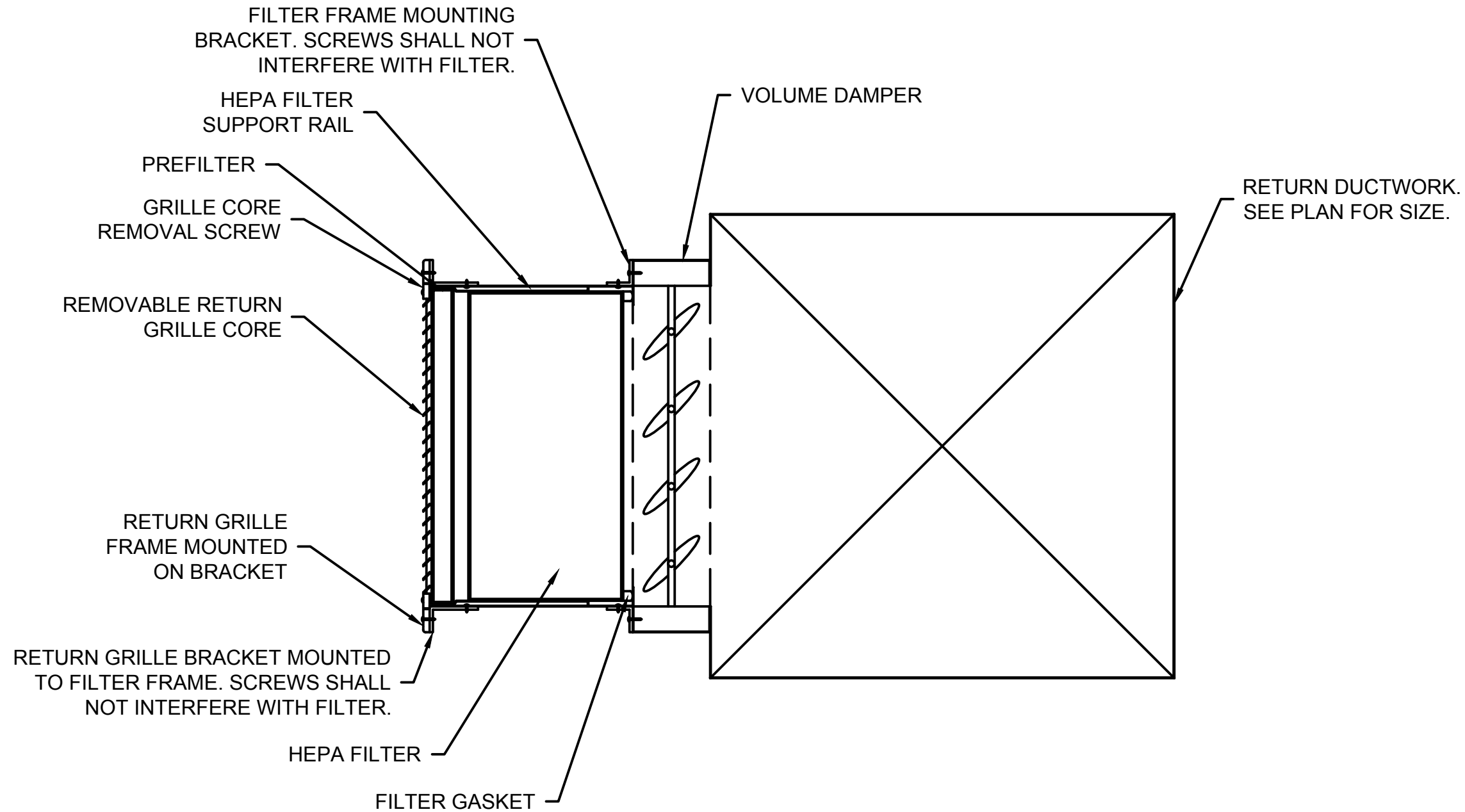
9 TYPICAL PIPING MAIN VENT DETAIL
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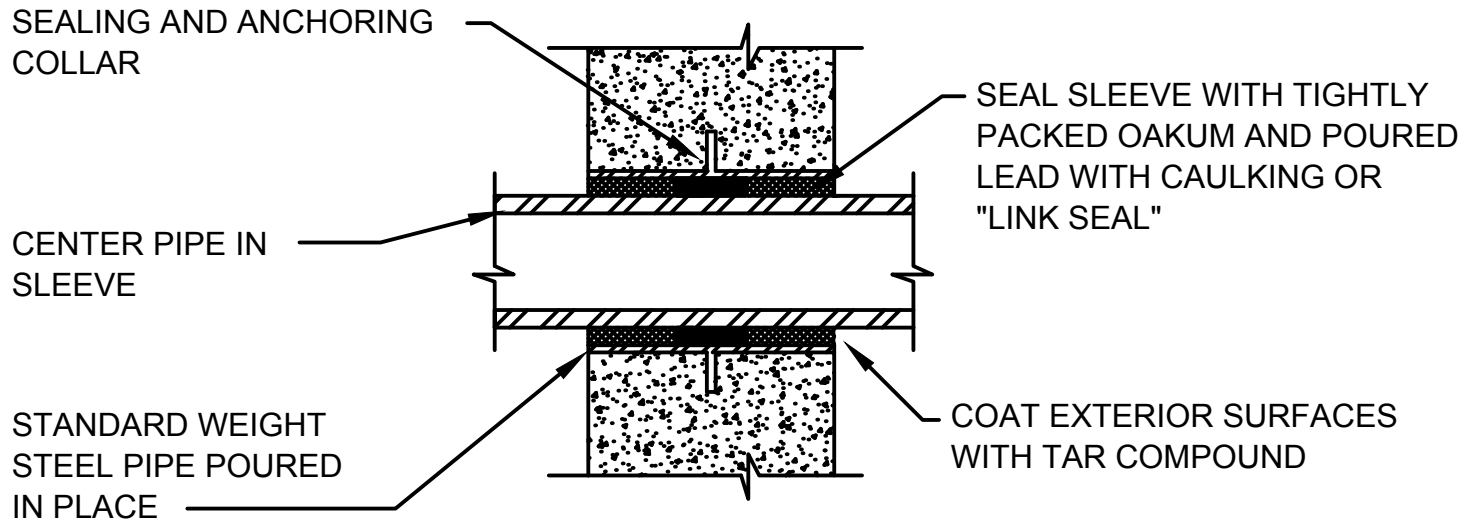
1 BRANCH TAKEOFF FITTING W/ VD
NOT TO SCALE



2 DUCT CONNECTIONS
NOT TO SCALE



3 HEPA FILTER MOUNTING FRAME DETAIL
NOT TO SCALE



4 PIPE SLEEVE THRU EXTERIOR WALL
NOT TO SCALE

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PROJECT TITLE

POLICE DEPARTMENT
FIRING RANGE
VENTILATION IMPROVEMENTS
BID NO. 20-135

DESIGNED BY: TAS, AJM
DRAWN BY: TAS, AJM
CHECKED BY: NTP
DATE CHECKED: 07.20.2020

07.22.20 ISSUED FOR BID
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DRAWING TITLE

MECHANICAL DETAILS

PROJECT No.
00400020

DRAWING No.
M6.02

P:\00400020_OAK PARK -- PD FIRING RANGE VENTILATION\DESIGN\CAD\ELECTRICAL\E0.01 ELECTRICAL GENERAL NOTES, LEGEND AND ABBREVIATIONS.DWG THOMAS A. SCHILLING SAVE TIME 7/20/2020 3:39:30 PM PLOT DATE 7/21/2020 10:11 AM

ELECTRICAL GENERAL NOTES

A. GENERAL NOTES

- 1. ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF THE 2020 NATIONAL ELECTRICAL CODE, THE MOST CURRENT EDITION OF THE NATIONAL ELECTRICAL SAFETY CODE AND ALL APPLICABLE LOCAL ORDINANCES.
- 2. CONTRACTOR SHALL FURNISH ALL MATERIALS FOR A COMPLETE AND WORKABLE SYSTEM.
- 3. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS AND FOR PROVIDING ALL SUPERVISION, LABOR AND TOOLS FOR THE PROJECT.
- 4. ALL WORK IS TO CONFORM TO A TIME SCHEDULE TO BE ESTABLISHED BY THE OWNER.
- 5. CONTRACTOR SHALL COORDINATE THE WORK SCHEDULE WITH THE OWNER AND OBTAIN THE OWNER'S APPROVAL BEFORE ANY WORK INVOLVING A SHUTDOWN IS DONE.
- 6. ALL MATERIALS FURNISHED BY THE CONTRACTOR ARE TO BE NEW AND APPROVED BY THE OWNER AS TO MANUFACTURER AND TYPE.
- 7. ALL CONDUITS SHALL BE PROVIDED WITH AN INSULATED COPPER EQUIPMENT GROUNDING CONDUCTOR SIZED IN ACCORDANCE WITH THE 2020 NATIONAL ELECTRICAL CODE.
- 8. ALL LOCATIONS AND DIMENSIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ALL ELECTRICAL EQUIPMENT LOCATIONS AND EQUIPMENT DIMENSIONS.

B. RACEWAY NOTES

- 1. POWER, INSTRUMENTATION AND CONTROL WIRING SHALL BE INSTALLED IN SEPARATE CONDUITS. SHIELDED CONDUCTORS SHALL NOT BE INSTALLED IN THE SAME CONDUIT AS ANY UNSHIELDED CONDUCTORS.
- 2. REMOVE ALL UNUSED CONDUIT AND WIRE BACK TO SOURCE ASSOCIATED WITH EQUIPMENT BEING REMOVED OR RELOCATED. CONCEALED CONDUIT BELOW FLOOR OR UNDERGROUND MAY BE ABANDONED IN PLACE.
- 3. ALL CONDUIT FOR POWER, LIGHTING, CONTROL AND INSTRUMENTATION SHALL BE EMT TYPE CONDUIT UNLESS OTHERWISE INDICATED. MINIMUM CONDUIT SIZE SHALL BE 3/4".
- 4. CONDUIT RUNS SHALL BE ROUTED TO AVOID, AND NEVER RUN BELOW, STEAM, WATER OR OTHER PIPE WHICH MAY HAVE AN ADVERSE EFFECT DUE TO HEAT OR LEAKS. WHERE CONDUIT PARALLELS OR CROSSES SUCH PIPES, A MINIMUM SEPARATION OF 12 INCHES SHALL BE MAINTAINED.
- 5. LIQUID-TIGHT FLEXIBLE CONDUIT (MAXIMUM OF 24") SHALL BE USED IN CONNECTING MOTORS, SENSING ELEMENTS, INSTRUMENTS, SOLENOID VALVES, OR ANY OTHER DEVICE WHICH TRANSMIT VIBRATION OR NOISE, REQUIRE MOVEMENT FOR ADJUSTMENT, OR REQUIRE REMOVAL FOR MAINTENANCE. MINIMUM SIZE OF FLEXIBLE CONDUIT SHALL BE 1/2".
- 6. JUNCTION BOXES, CABINETS, SWITCHES AND OTHER ELECTRICAL EQUIPMENT SHALL BE SOLIDLY ATTACHED PRIOR TO INSTALLATION OF CONDUIT.
- 7. CONDUIT, PULL BOXES, CABINETS, ETC. SHALL FORM A CONTINUOUS CONDUCTIVE GROUND SYSTEM. AT TRANSITIONS AND BREAKS, CONDUIT SHALL BE BONDED.
- 8. CONDUIT SHALL NOT BE FASTENED TO OTHER EQUIPMENT OR SO INSTALLED AS TO PREVENT THE READY REMOVAL OF OTHER EQUIPMENT FOR REPAIRS. INSTALLATION OF CONDUITS MUST NOT INTERFERE WITH ACCESS WAYS OR LADDERS.
- 9. ONLY PULLBOXES SPECIFICALLY REQUIRED BY THE ENGINEER IN LOCATIONS SHOWN ARE IDENTIFIED. CONTRACTOR SHALL PROVIDE ALL PULLBOXES REQUIRED TO MEET APPLICABLE CODES.
- 10. CONDUITS ENTERING EXTERIOR ENCLOSURES SHALL BE TERMINATED WITH STEEL OR IRON FITTINGS AND T&B EFCOR HUB CONNECTORS.
- 11. ALL CONDUITS INSTALLED IN DUCTBANK SHALL BE SCHEDULE 40 PVC EXCEPT FOR THE FIRST 10' OUT FROM A BUILDING, MANHOLE OR HANDHOLE WHICH SHALL BE HOT-DIPPED GALVANIZED HEAVY WALL RIGID STEEL. HOT-DIPPED GALVANIZED HEAVY WALL RIGID STEEL CONDUIT SHALL ALSO BE USED WHEREVER THE DUCTBANK CROSSES BENEATH A ROAD.

C. GROUNDING NOTES

- 1. ALL GROUNDING ELECTRODE CONDUCTORS SHALL BE STRANDED BARE COPPER UNLESS OTHERWISE NOTED AND SIZED AS SHOWN 20. ON THE DRAWINGS.
- 2. BURIED GROUND LOOP SHALL BE BARE COPPER AS INDICATED ON THE DRAWINGS. GROUND LOOP SHALL BE INSTALLED A MINIMUM OF 3'-0" BELOW GROUND SURFACE.
- 3. GROUND RODS SHALL BE 3/4" DIA x 10'-0" LONG COPPER CLAD. CONNECTIONS TO GROUNDING CONDUCTOR SHALL BE WITH EXOTHERMIC WELDS.

D. WIRING NOTES

- 1. WIRING SHALL BE IDENTIFIED BY PERMANENT WIRE MARKERS AT EACH TERMINATION AND SHALL CORRESPOND WITH THE 23. IDENTIFICATION NUMBERS ON THE DRAWINGS.
- 2. CONDUCTORS SHALL BE CONTINUOUS FROM POINT OF ORIGIN TO THE TERMINATION. NO CABLE SHALL BE SPLICED EXCEPT AS SHOWN ON THE DRAWINGS OR ON EXPLICIT INSTRUCTIONS OF THE OWNER.
- 3. TERMINALS ON THE TERMINAL BLOCK SHALL BE PLAINLY AND PERMANENTLY MARKED TO CORRESPOND WITH THE IDENTIFICATION NUMBERS ON THE DIAGRAMS.
- 4. ALL CABLE AND WIRE SHALL BE STRANDED COPPER. ALUMINUM CABLE AND WIRE ARE NOT ACCEPTABLE. ALL POWER AND CONTROL CABLE SHALL BE CROSS-LINKED POLYETHYLENE (XLP) OR POLYVINYL CHLORIDE (PVC) INSULATION (XHHW OR THHN-THWN), RATED 90°C FOR 600 VOLT. ALL POWER WIRE SHALL BE #12 AWG MINIMUM, UNLESS OTHERWISE NOTED. ALL CONTROL WIRE SHALL BE #14 AWG MINIMUM, UNLESS OTHERWISE NOTED.

E. BOX NOTES

- 1. FABRICATED BOXES 24 x 24 INCHES OR SMALLER SHALL BE MADE FROM 10 GAUGE STEEL SHEET. 27. FABRICATED BOXES LARGER THAN 24 x 24 INCHES SHALL BE MADE FROM 1/8" STEEL SHEET.
- 2. IN DRY AND/OR CLEAN AREAS CONDUIT ATTACHMENT TO THE BOX SHALL BE MADE BY THE USE OF DOUBLE STEEL LOCK NUT (ONE OF WHICH SHALL BE OF THE BONDING TYPE) AND AN INSULATING BUSHING ON THE END OF EACH CONDUIT TERMINATION IN THE BOX.
- 3. IN WET AND/OR DUSTY AREAS AND OUTDOORS, CONDUIT ATTACHMENT TO BOXES SHALL BE MADE WITH A WATERTIGHT CONDUIT HUB AS MANUFACTURED BY EFCOR CO. OR OWNER APPROVED EQUAL.
- 4. CONTRACTOR SHALL LEAVE SLACK IN ALL CABLE IN ALL BOXES.
- 5. CONTRACTOR SHALL FURNISH AND INSTALL BARRIERS IN BOXES AS CALLED FOR ON THE DRAWINGS. BARRIERS SHALL BE MADE FROM A MINIMUM OF 10 GAUGE STEEL SHEET AND HELD IN PLACE WITH CLIP ANGLES. ALL BARRIERS SHALL BE INSTALLED UPON COMPLETION OF THE INSTALLATION OF CABLE AND SHALL BE REMOVABLE TO PERMIT FUTURE CABLE INSTALLATION.
- 6. ALL CABLES WITHIN THE BOX SHALL BEAR A CABLE IDENTIFICATION TAG IN ACCORDANCE WITH THE OWNERS ELECTRICAL SPECIFICATION.

ELECTRICAL PLAN SYMBOLS

- JUNCTION BOX, WALL OR CEILING MOUNTED
- MANUAL MOTOR STARTER
- NON-FUSIBLE DISCONNECT SWITCH
- COMBINATION STARTER AND FUSED DISCONNECT SWITCH
- MOTOR, HORSEPOWER AS INDICATED
- EXISTING PANELBOARD

ELECTRICAL ABBREVIATIONS

- A AMPERE(S), AUTO
- AFF ABOVE FINISHED FLOOR
- AL., ALUM. ALUMINUM
- AWG AMERICAN WIRE GAUGE
- C.B. CIRCUIT BREAKER
- CIR. BRKR. CIRCUIT BREAKER
- CKT. NO. CIRCUIT NUMBER
- CSDS COMBINATION STARTER / DISCONNECT SWITCH
- CT CONTROL TRANSFORMER, CURRENT TRANSFORMER
- D DEPTH
- DEM DEMAND
- DIA DIAMETER
- EA EACH
- ETM ELAPSED TIME METER
- FLA FULL LOAD AMPS
- FVNR FULL VOLTAGE NON REVERSING
- G GREEN, GROUND
- GFI GROUND FAULT INTERRUPTER
- GND, GRD GROUND
- H HEIGHT, HAND, HIGH
- HP HORSEPOWER
- HPS HIGH PRESSURE SODIUM
- HV HIGH VOLTAGE
- I/O INPUT/OUTPUT
- INFL INFLUENT
- ITC INSTRUMENTATION TERMINATION CABINET
- KA KILO AMPERES
- KV KILO VOLT
- KVA KILO VOLT AMPERES
- L LOW
- LA LIGHTNING ARRESTOR
- LCP LOCAL CONTROL PANEL
- LED LIGHT EMITTING DIODE
- LG LINE TO GROUND
- LL LINE TO LINE
- LTS LIGHTS
- L.O. LOCK OUT
- LP LIGHTING PANEL
- MAX MAXIMUM
- MIN MINIMUM
- MCC MOTOR CONTROL CENTER
- MCP MOTOR CIRCUIT PROTECTOR
- MD MOTORIZED DAMPER
- MFR MANUFACTURER
- MMS MANUAL MOTOR STARTER
- N.C. NORMALLY CLOSED
- N.L. NIGHT LIGHT
- N.O. NORMALLY OPEN
- N.E.C. NATIONAL ELECTRICAL CODE
- O OFF
- OC OVER CURRENT
- OL'S OVERLOAD RELAYS
- P POLE(S), PUMP
- PB PUSHBUTTON
- PH PHASE
- PLC PROGRAMMABLE LOGIC CONTROLLER
- PRI PRIMARY
- PVC POLY-VINYL CHLORIDE
- QTY QUANTITY
- R RED
- RECEP RECEPTACLE
- REPL REPLACE
- RGS RIGID GALVANIZED STEEL
- SEC. SECONDARY
- SEL. SW. SELECTOR SWITCH
- SPEC. SPECIFICATION
- SS STAINLESS STEEL
- T.D.O. TIME DELAY OPENING
- TSP TWISTED SHIELDED PAIR
- TYP. TYPICAL
- V VOLT
- VA VOLT AMPERES
- VT VARIABLE TORQUE
- VFD VARIABLE FREQUENCY DRIVE
- W WHITE, WIDTH
- W/ WITH
- XFMR, XF TRANSFORMER

EQUIPMENT CONNECTION SCHEDULE

EQUIPMENT			MOTOR OR LOAD			POWER SOURCE	MCCP AMP RATING/ POLES	CONDUCTORS			CONDUIT		MOTOR CONTROLLER				DISCONNECT SWITCH				NOTES				
TAG	DESCRIPTION	LOCATION	FLA	HP OR KW	VOLTS / PH			SETS	QTY.	SIZE	GND	SIZE	TYPE	TYPE	SIZE (NEMA)	ENCL. (NEMA)	MOUNT	BY	SIZE	FUSE SIZE		ENCL. (NEMA)	MOUNT	BY	
AHU-1	AHU - CIRCUIT #1 (SUPPLY FANS)	MECHANICAL ROOM	87.0	2@10HP	208/3	MCC-2	125/3	1	3	2	6	1 1/4"	EMT	VFD			WU	ES					ES	1,2,3,4,7	
AHU-1	AHU - CIRCUIT #2 (RETURN FANS)	MECHANICAL ROOM	84.0	2@10HP	208/3	MCC-2	125/3	1	3	2	6	1 1/4"	EMT	VFD			WU	ES					ES	1,2,3,4,8	
AHU-1	AHU - CIRCUIT #3 (RECEPTACLE)	MECHANICAL ROOM	8.0		120/1	LPB-9F	20/1	1	2	12	12	3/4"	EMT											2,3,5	
B-1	BOILER	MECHANICAL ROOM	15.0		120/1	LPB-9F	20/1	1	2	12	12	3/4"	EMT							TS	-	12	NU	EC	1,2,3,6,10
P-1	HOT WATER PUMP	MECHANICAL ROOM		1/2HP	208/3	MCC-2	15/3	1	3	12	12	3/4"	EMT	FVNR	1	12	MCC-2	EXIST	30	N/F	12	NU	EC	1,2,3,9	
P-12	EXISTING POOL CIRC. PUMP	MECHANICAL ROOM		10HP	208/3	SWBD	60/3	1	4	6	10	1"	EMT	COMB	2	12	NU	EC	60	50	12	NU	EC	1,2,3,11,12,13	
ABBREVIATIONS: COMB - COMBINATION NEMA STARTER / DISCONNECT WITH FUSED DISCONNECT SWITCH EC - ELECTRICAL CONTRACTOR EMT - ELECTRICAL METALLIC TUBING ES - EQUIPMENT SUPPLIER FMC - FLEXIBLE METALLIC CONDUIT HVAC - HEATING / VENTILATION CONTRACTOR LFMC - LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT MAG - MAGNETIC STARTER MAN - MANUAL STARTER NU - NEAR UNIT OU - ON UNIT PLGC - PLUMBING CONTRACTOR RGS - RIGID GALVANIZED STEEL SS - SOFT STARTER TS - MOTOR-RATED TOGGLE SWITCH VFD - VARIABLE-FREQUENCY DRIVE WU - WITH UNIT																									
NOTES: 1. SEE PLANS FOR APPROXIMATE DISCONNECT LOCATION. 2. PROVIDE BREAKERS, FUSES, CONDUCTORS, CONDUITS, DRIVES, STARTERS, AND DISCONNECTS AS SHOWN, UNLESS DRAWINGS STATE OTHERWISE. 3. FINAL CONNECTION TO EQUIPMENT SHALL BE LFMC (FOR EXTERIOR/WET LOCATIONS) OR FMC (INTERIOR DRY LOCATIONS). 4. TERMINATE POWER CONDUCTORS TO UNIT DISCONNECT. DISCONNECT BY EQUIPMENT SUPPLIER. REFER TO MANUFACTURER DATASHEET FOR CONDUIT ENTRY POINT. 5. PROVIDE 1P, 20A BREAKER IN EXISTING PANEL LPB-9F TO FEED AHU - CIRCUIT #3 (RECEPTACLE). 6. PROVIDE MANUAL MOTOR STARTER W/O OVERLOADS FOR LOCAL DISCONNECTING MEANS. FURNISH WITH LOCK-OUT FEATURE. 7. UTILIZE EXISTING SPARE 3P, 200A FUSED SWITCH IN MOTOR CONTROL CENTER MCC-2 TO FEED AHU - CIRCUIT #1. (SUPPLY FANS). PROVIDE 125A FUSES. 8. REMOVE TWO EXISTING SPARE BUCKETS IN MOTOR CONTROL CENTER MCC-2 AND PROVIDE BUCKET WITH 3P, 200A, FUSED SWITCH WITH 125A FUSES TO FEED AHU - CIRCUIT #2 (RETURN FANS). 9. UTILIZE EXISTING SPARE COMBINATION FUSED DISCONNECT SWITCH / STARTER IN MOTOR CONTROL CENTER MCC-2 TO FEED HOT WATER PUMP. PROVIDE FUSES AND O.L.S PER MOTOR NAMEPLATE. 10. PROVIDE 1P, 20A BREAKER IN EXISTING PANEL LPB-9F TO FEED BOILER. 11. PROVIDE 60A FUSES IN EXISTING SPARE SWITCH IN SWITCHBOARD TO FEED EXISTING POOL CIRC. PUMP. 12. PROVIDE COMBINATION STARTER DISCONNECT SWITCH WITH THE FOLLOWING ACCESSORIES AS A MINIMUM: 120V CONTROL TRANSFORMER, H-O-A SWITCH, START PUSHBUTTON, STOP PUSHBUTTON, RED RUN PILOT LIGHT, 2 SETS OF N.O. AND N.C. AUXILIARY CONTACTS. 13. PROVIDE #14 WIRE IN 3/4" CONDUIT FROM NEW STARTER/DISCONNECT SWITCH TO INTERCEPT EXISTING CONTROL WIRING AT EXISTING MOTOR CONTROL CENTER MCC-2. CONTROL OF POOL CIRC. PUMP SHALL MATCH EXISTING INSTALLATION.																									



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PROJECT TITLE
POLICE DEPARTMENT
FIRING RANGE
VENTILATION IMPROVEMENTS
BID NO. 20-135

DESIGNED BY: MLS
DRAWN BY: MLS
CHECKED BY: -
DATE CHECKED: 07/2020

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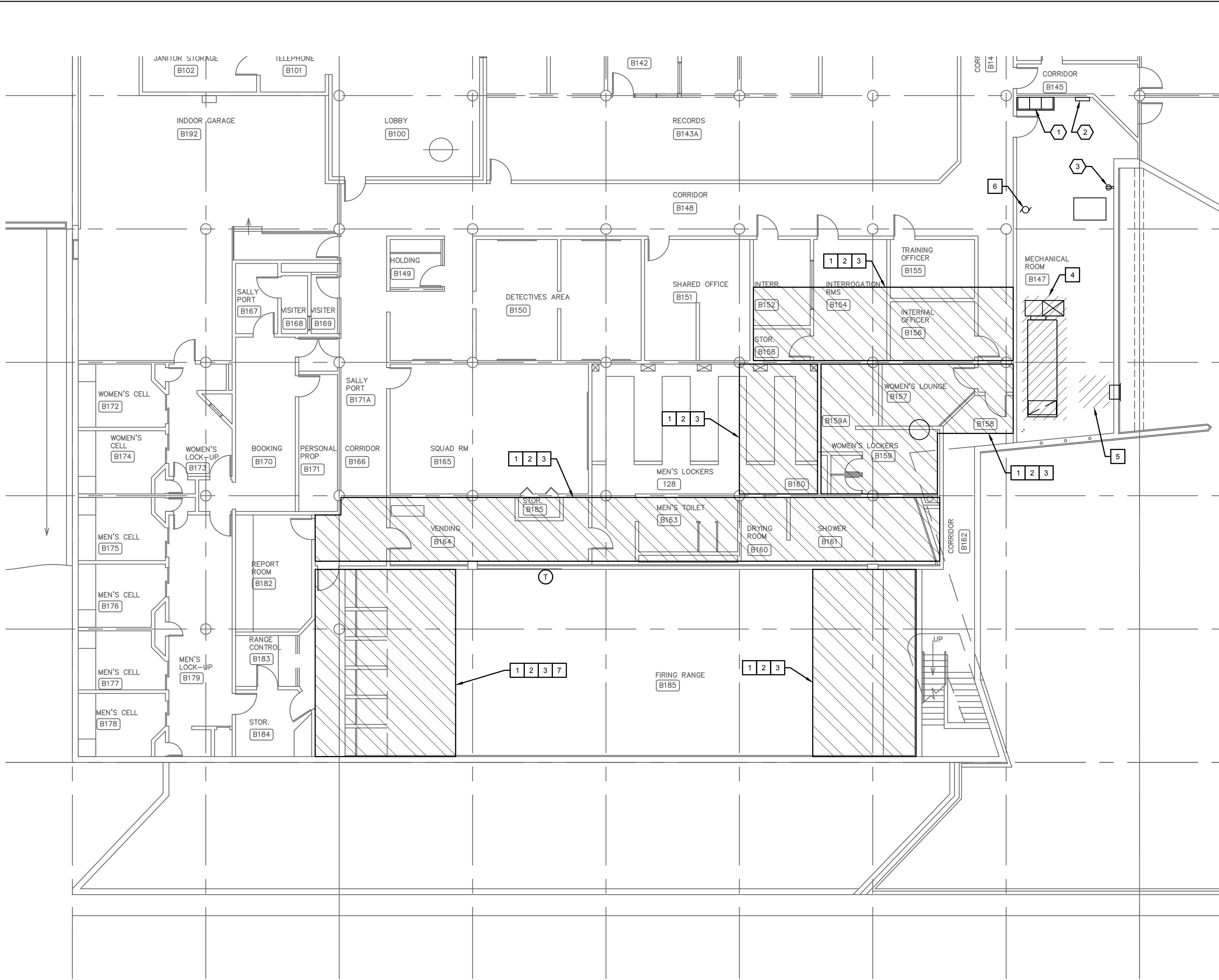
DRAWING TITLE
ELECTRICAL GENERAL NOTES,
LEGEND, ABBREVIATIONS AND
SCHEDULE

PROJECT No.

00400020

DRAWING No.

E0.01



NOTES

- SEE SHEET E0.01 FOR ELECTRICAL GENERAL NOTES AND LEGEND.

DEMOLITION KEYNOTES (THIS SHEET)

- CONTRACTOR SHALL REMOVE EXISTING LIGHTING FIXTURES IN THIS AREA AS REQUIRED TO ALLOW FOR INSTALLATION OF NEW DUCTWORK. DISPOSE OF LIGHTING FIXTURES OFF-SITE IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS.
- CONTRACTOR SHALL TEMPORARILY RELOCATE/REMOVE ALL EXISTING ELECTRICAL EQUIPMENT, CONDUIT AND WIRING IN THIS AREA AS REQUIRED TO ALLOW FOR INSTALLATION OF NEW DUCTWORK.
- CONTRACTOR SHALL TEMPORARILY RELOCATE/REMOVE EXISTING SPEAKERS AND ASSOCIATED CONDUIT AND WIRING IN THIS AREA AS REQUIRED TO ALLOW FOR INSTALLATION OF NEW DUCTWORK. STORE SPEAKERS FOR REINSTALLATION.
- DISCONNECT EXISTING AIR HANDLING UNIT FOR REMOVAL. REMOVE ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE PANEL. COORDINATE WITH MECHANICAL CONTRACTOR.
- DISCONNECT EXISTING EXHAUST FAN FOR REMOVAL. REMOVE ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE PANEL. COORDINATE WITH MECHANICAL CONTRACTOR.
- DISCONNECT EXISTING POOL CIRCULATION PUMP P-12. REMOVE ASSOCIATED CONDUIT AND WIRING TO STARTER IN MOTOR CONTROL CENTER MCC-2. EXISTING POOL CIRCULATION PUMP P-12 TO REMAIN AND BE REFEED. SEE NEW WORK PLAN.
- CONTRACTOR SHALL DISCONNECT FOR REMOVAL ALL EXISTING ELECTRICAL MOTORS, AND EQUIPMENT ASSOCIATED WITH THE MOTORIZED TARGET SYSTEM, AS REQUIRED TO ALLOW FOR INSTALLATION OF NEW DUCTWORK. CONTRACTOR SHALL REMOVE ALL ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE PANEL.

KEYNOTES (THIS SHEET)

- EXISTING MOTOR CONTROL CENTER TO REMAIN AS PRESENTLY INSTALLED.
- EXISTING PANEL TO REMAIN AS PRESENTLY INSTALLED.
- EXISTING DUPLEX RECEPTACLE TO REMAIN.

1

BASEMENT ELECTRICAL DEMOLITION PLAN

0 2' 4' 8' 16'
SCALE 1/8" = 1'



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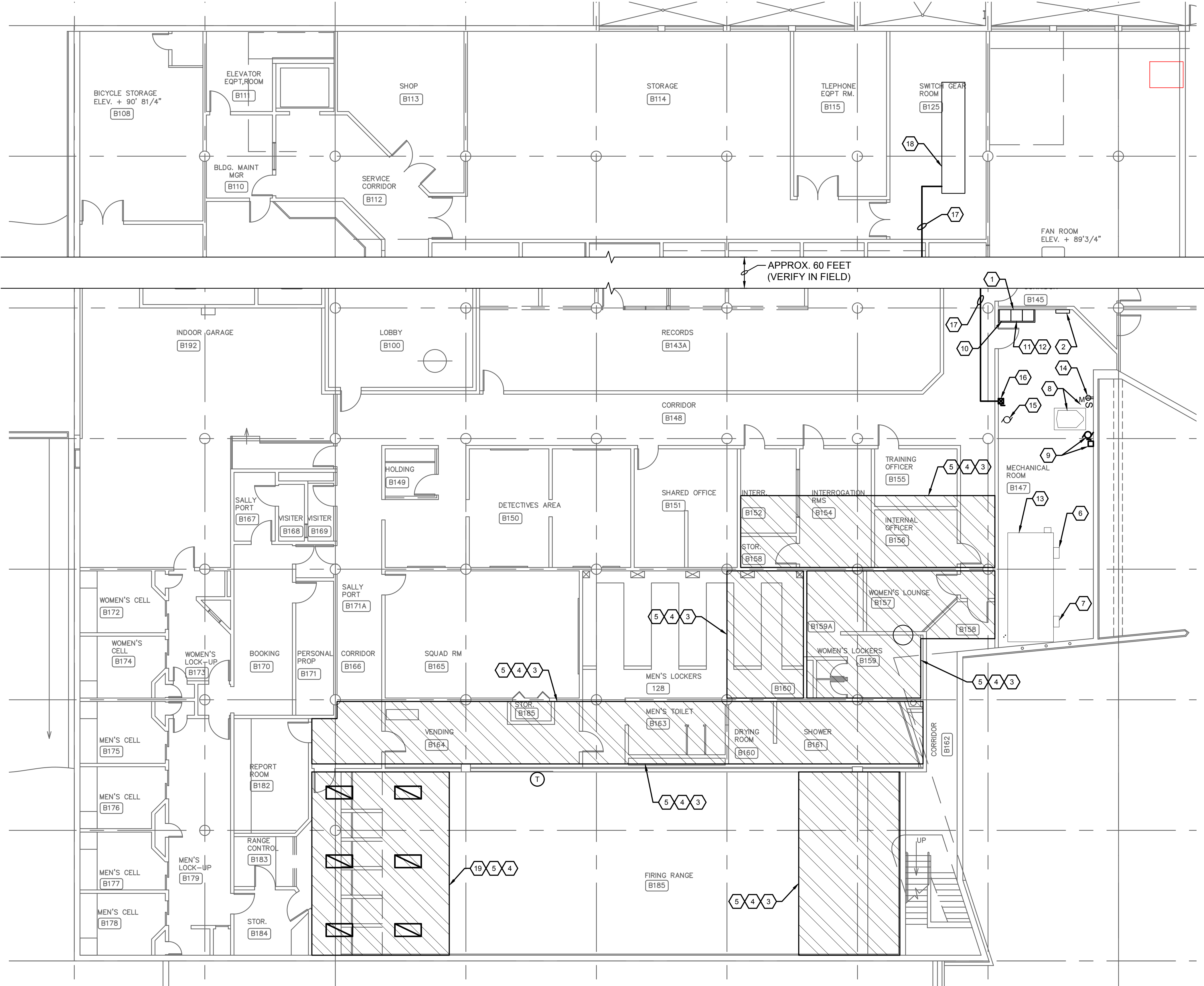
BASEMENT ELECTRICAL
DEMOLITION PLAN

PROJECT No.

00400020

DRAWING No.

E1.01



1 BASEMENT ELECTRICAL NEW WORK PLAN
0 2' 4' 8' 16'
SCALE 1/8" = 1'



NOTES

- SEE SHEET E0.01 FOR ELECTRICAL GENERAL NOTES AND LEGEND.

KEYNOTES (THIS SHEET)

- EXISTING MOTOR CONTROL CENTER MCC-2 TO REMAIN AS PRESENTLY INSTALLED. MOTOR CONTROL CENTER MANUFACTURER IS SQUARE D. CONFIRM TYPE IN FIELD.
- EXISTING PANEL LPB-9F TO REMAIN AS PRESENTLY INSTALLED. PROVIDE TWO 1P, 20A BREAKERS. ONE BREAKER TO FEED BOILER B-1 AND ONE BREAKER TO FEED AHU CIRCUIT #3 (RECEPTACLE). CONFIRM PANEL MANUFACTURER AND TYPE IN FIELD.
- CONTRACTOR SHALL PROVIDE LED TYPE LIGHTING FIXTURES IN THIS AREA AFTER INSTALLATION OF NEW DUCTWORK. PROVIDE CONDUIT AND WIRING TO CONNECT TO EXISTING SWITCHED LIGHTING CIRCUITS.
- CONTRACTOR SHALL REINSTALL ALL REMOVED/RELOCATED EXISTING ELECTRICAL EQUIPMENT, CONDUIT AND WIRING IN THIS AREA AS REQUIRED AFTER INSTALLATION OF NEW DUCTWORK.
- CONTRACTOR SHALL REINSTALL ALL REMOVED/RELOCATED EXISTING SPEAKERS AND ASSOCIATED CONDUIT AND WIRING IN THIS AREA AS REQUIRED AFTER INSTALLATION OF NEW DUCTWORK.
- AIR HANDLING UNIT CIRCUIT #1 (SUPPLY FANS) CONTROL UNIT. MAKE FINAL CONNECTIONS. SEE EQUIPMENT CONNECTION SCHEDULE.
- AIR HANDLING UNIT CIRCUIT #2 (RETURN FANS) CONTROL UNIT. MAKE FINAL CONNECTIONS. SEE EQUIPMENT CONNECTION SCHEDULE.
- BOILER B-1. MAKE FINAL CONNECTIONS. PROVIDE MANUAL MOTOR STARTER. SEE EQUIPMENT CONNECTION SCHEDULE.
- HOT WATER PUMP P-1. PROVIDE LOCAL DISCONNECT SWITCH. MAKE FINAL CONNECTIONS. SEE EQUIPMENT CONNECTION SCHEDULE.
- UTILIZE EXISTING SPARE 3P, 200A FUSED SWITCH TO FEED AIR HANDLING UNIT - CIRCUIT #1 (SUPPLY FANS). PROVIDE 125A FUSES. MAKE FINAL CONNECTIONS.
- REMOVE TWO EXISTING SPARE COMBINATION DISCONNECT SWITCH / STARTER BUCKETS AND PROVIDE ONE 3P, 200A FUSED SWITCH WITH 125A FUSES TO FEED AIR HANDLING UNIT - CIRCUIT #2 (RETURN FANS). MAKE FINAL CONNECTIONS TO FEEDER.
- UTILIZE EXISTING SPARE COMBINATION DISCONNECT SWITCH / STARTER TO FEED NEW HOT WATER CIRCULATING PUMP. PROVIDE FUSES AND REPLACE OVERLOADS TO MATCH MOTOR BEING FURNISHED. MAKE FINAL CONNECTIONS.
- AIR HANDLING UNIT CIRCUIT #3 (RECEPTACLE). CONFIRM LOCATION OF CONNECTION IN FIELD. MAKE FINAL CONNECTIONS. SEE EQUIPMENT CONNECTION SCHEDULE.
- UTILIZE EXISTING DUPLEX RECEPTACLE FOR GLYCOL FEED UNIT POWER.
- POOL CIRC. PUMP P-12. MAKE FINAL CONNECTIONS FROM PUMP TO NEW COMBINATION STARTER/DISCONNECT SWITCH. SEE KEYNOTE 16 AND EQUIPMENT CONNECTION SCHEDULE.
- PROVIDE COMBINATION STARTER/DISCONNECT SWITCH FOR POOL CIRC. PUMP P-12. SEE EQUIPMENT CONNECTION SCHEDULE.
- PROVIDE 4#6, 1#10G IN 1" CONDUIT FOR POOL CIRC. PUMP P-12 FEEDER FROM COMBINATION STARTER/DISCONNECT SWITCH TO SPARE SWITCH IN MAIN DISTRIBUTION SWITCHBOARD MDSB (LOCATED IN ROOM B125). ROUTE CONDUIT AND WIRE ABOVE CEILINGS THROUGH CORRIDOR B144 AND TRAINING ROOM B123. REMOVE AND REPLACE CEILING TILES AS REQUIRED. REPLACE ANY DAMAGED CEILING TILES TO MATCH EXISTING.
- EXISTING MAIN DISTRIBUTION SWITCHBOARD MDSB. PROVIDE 3-60A FUSES IN EXISTING SPARE 3P, 100A FUSIBLE SWITCH. LABEL SWITCH "POOL CIRC. PUMP P-12 FEEDER".
- CONTRACTOR SHALL PROVIDE LED TYPE LIGHTING FIXTURES IN DROPPED CEILING, IN THIS AREA, AFTER INSTALLATION OF NEW DUCTWORK. PROVIDE CONDUIT AND WIRING TO CONNECT TO EXISTING SWITCHED LIGHTING CIRCUITS.

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