DASNY
DORMITORY AUTHORITY STATE OF NEW YORK

PROJECT MANUAL

BMS Replacement
Building #144, Cook Chill Production Center
Office of Mental Health
44 Holland Avenue
Albany, NY 12229

Rockland Psychiatric Center
145 Old Orangeburg Rd
Orangeburg, NY 10962

JDE NUMBER: 3608809999

BID DOCUMENTS

DATE: 10/15/2021

VOLUME 1 OF 1

515 BROADWAY
ALBANY, NY 12207-2964
518.257.3000

1 PENN PLAZA
NEW YORK, NY 10119-0098
212.273.5000
800.992.2788

539 FRANKLIN STREET
BUFFALO, NY 14202-1109
716.884.9780

EME Consulting Engineering Group, LLC
292 Washington Ave. Ext. Albany, NY 12203 518-862-0882

Seals & Signatures

DASNY | WE FINANCE, BUILD AND DELIVER.

DORMITORY AUTHORITY STATE OF NEW YORK

Construction Front End Documents

CORPORATE HEADQUARTERS

515 Broadway
Albany, New York
12207-2964

T 518.257.3000
F 518.257.3100

NEW YORK OFFICE

One Penn Plaza, 52nd Fl.
New York, New York
10119-0098

T 212.273.5000
F 212.273.5121

BUFFALO OFFICE

539 Franklin Street
Buffalo, New York
14202-1109

T 716.884.9780
F 716.884.9787

www.dasny.org

Construction Front End Documents
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DORMITORY AUTHORITY STATE OF NEW YORK

Construction Bidding Requirements

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NOTICE TO BIDDERS

PLACE HOLDER

PROJECT SPECIFIC NOTICE TO BIDDERS

TO BE PROVIDED BY DASNY CONTRACTS UNIT

UPON APPROVAL FOR BIDDING

INFORMATION FOR BIDDERS

PLACE HOLDER

PROJECT SPECIFIC INFORMATION FOR BIDDERS

TO BE PROVIDED BY DASNY CONTRACTS UNIT

UPON APPROVAL FOR BIDDING

BIDDING REQUIREMENTS for CONSTRUCTION

FORM OF BID

TO THE DORMITORY AUTHORITY OF THE STATE OF NEW YORK
(Owner)

For_____
(Title of Project)

Pursuant to and in compliance with the Owner's Notice to Bidders dated _____
and the Contract Documents relating hereto, the undersigned hereby offers to Provide all plant, labor, materials, supplies, equipment, Allowances, if applicable and other facilities and things necessary or proper for or incidental to the Work of:

_____
(Contract Type or Trade)

as required by, and in strict accordance with applicable Contract Documents, including written changes thereto, and addenda issued by the Owner and sent to the undersigned or delivered to the bidder or available to the bidder prior to the opening of bids, whether received by the undersigned or not, for the total sum of:

_____
(Written Dollar Amount)

($_____)
(Figure Dollar Amount)

The above Written Dollar Amount is the undersigned’s bid and no other number on any page submitted with this page 1 of the FORM OF BID can be the undersigned’s bid under any circumstance.

The bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

If the Letter of Intent is sent or delivered to the undersigned within sixty (60) days after the date of opening of the bids, or any time thereafter before the bid is withdrawn, the undersigned shall, within fourteen (14) days after the date of such Letter of Intent, execute and deliver the Agreement in the form included in the Contract Documents.

The undersigned hereby designates as the undersigned's office to which the Letter of Intent may be sent or delivered:

Name: _____

Firm’s Legal Name: _____

Street Address: _____

PO Box #: _____

City, State, Zip Code: _____

Phone Number: _____

Email Address: _____

FORM OF BID

Date of Bid Submission: _____

Firm's Legal Name: _____

Street Address: _____

PO Box #: _____

City, State, Zip Code: _____

By: _____
(Signature of Officer)

Title: _____

Officer Name: _____
(Print)

Phone Number: _____

Fax Number: _____

E-Mail Address: _____

Taxpayer ID or Social Security Number: _____

Submit Bid to:
DASNY
Attn: CONTRACTS UNIT – BID ENCLOSED
515 Broadway
Albany, New York 12207

DORMITORY AUTHORITY OF THE STATE OF NEW YORK
OMNIBUS PROCUREMENT
CERTIFICATION

I, the undersigned, an authorized signatory of _____ , (the "**Firm**") hereby represent and certify to the Dormitory Authority of the State of New York ("**DASNY**") under penalty of perjury as follows with respect to certain actions taken and to be taken in connection with the Firm's submission of a [bid/proposal] and the execution of any resulting contract (the "**Contract**") in response to DASNY's [notice to bidders/request for proposal] for Project # [ ] as follows:

A. Non-Collusive Bidding Certification

1. The prices in the [bid/proposal], have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other [bidder/proposer] or with any competitor;

2. Unless otherwise required by law, the prices which have been quoted in the [bid/proposal] have not been knowingly disclosed by the [bidder/proposer] and will not knowingly be disclosed by the [bidder/proposer] prior to opening, directly or indirectly, to any other [bidder/proposer] or to any competitor; and

3. No attempt has been made or will be made by the [bidder/proposer] to induce any other person, partnership, or corporation to submit or not to submit a [bid/proposal] for the purpose of restricting competition.

B. Non-Segregated Facilities

The Firm does not, nor shall not, maintain or provide for the employees of such Firm any segregated facilities at any establishments, and that the Firm does not, nor shall not, permit the employees of such Firm to perform the services of such employees at any location under the control of such Firm where segregated facilities are maintained. The Firm agrees that a breach of this certification is a violation of the nondiscrimination clauses of the Contract.

C. Non-discrimination in Employment in Northern Ireland

The Firm stipulates that it, and any individual or legal entity in which the Firm holds a ten percent (10%) or greater ownership interest, and any such entity that holds such an interest in the Firm, either:

1. Has no business operations in Northern Ireland; or

2. Shall take all lawful steps in good faith to conduct any business operations it has or in which it has such an interest in Northern Ireland in accordance with the MacBride Fair Employment Principles as set forth in Chapter 807 of the Laws of 1992 and shall permit any independent monitoring of its compliance with said Principles.

D. Federal Equal Employment Opportunity Act

The Firm is compliant with the Federal Equal Employment Opportunity Act of 1972 (P.L. 92-261), as amended.

E. Commitment to Opportunity Programs

The Firm acknowledges and agrees to be bound in accordance with NYS Executive Law Article 15-A, and in conformance with regulations promulgated by the Division of Minority and Women's Business Development of the NYS Department of Economic Development. A list of NYS certified M/WBEs may be obtained from the ESDC directory of certified businesses located at www.nylovesmwbe.ny.gov.

F. Commitment to Service-Disabled Veteran-Owned Business

The Firm acknowledges and agrees to be bound in accordance with NYS Executive Law Article 17-B, and in conformance with applicable regulations. A list of NYS certified SDVOB may be obtained from the NYS Office of General Services Division of Services-Disabled Veterans' Business Development located at https://ogs.ny.gov/veterans.

G. Transfer of Offset Credits

The Firm acknowledges notice that DASNY may assign or otherwise transfer offset credits created by the Contract to third parties located in New York State.

H. 2005 Procurement Lobbying Law

1. The Firm understands and has to date and agrees hereinafter to comply with DASNY's procedures relative to permissible contacts for this procurement as required by State Finance Law § 139-j (3) and § 139–k (6) (b);

2. No "governmental entity," as defined in State Finance Law § 139-j and § 139-k has made a finding in the last four years that the Firm was not responsible;

   a. If yes, please note the governmental entity, the date of the finding and the basis of the finding regarding each finding of non-responsibility. Attach additional pages, if necessary.

3. No "governmental entity" as defined in State Finance Law § 139-j and § 139-k has terminated or withheld a procurement contract with the Firm due to the intentional provision of false or incomplete information required by such laws and/or the failure to comply with the requirements of State Finance Law § 139-k(3) relating to permissible contacts.

a. If yes, please note the governmental entity, the date of the termination or withholding of contract and the basis of termination or withholding of contract. Attach additional pages, if necessary.

I. Code of Business Ethics

The Firm acknowledges notice of and has read DASNY's Code of Business Ethics attached as **Exhibit A** hereto and acknowledges that the Firm's failure to comply shall justify termination of the Contract by DASNY and may result in the rejection of the Firm's [bid/proposal] for future work with DASNY.

J. Iran Divestment

That to the best of its knowledge and belief, the Firm and each person and each person signing on behalf of any other party, that each person is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State Finance Law.

[Remainder of this page intentionally left blank]

K. Certification

The Firm acknowledges that intentional submission of false or misleading information may constitute a felony under Penal Law Section 210.40 or a misdemeanor under Penal Law Section 210.35 or Section 210.45, and may also be punishable by a fine of up to $10,000 or imprisonment of up to five years under 18 U.S.C. Section 1001 and hereby represents that all information contained here provided to DASNY is complete, true and accurate.

By: _____

Name: _____

Title: _____

Date: _____

Exhibit A: Dormitory Authority of the State of New York - Code of Business Ethics

A. Ethics Programs

1. DASNY is a public-benefit corporation of the State of New York and expects the highest degree of ethical business conduct by its employees and the many contractors, consultants and vendors with whom it interacts on behalf of its clients, bondholders and the people of the State of New York. DASNY, by mandate of its Board of Directors, administers a comprehensive corporate integrity program to ensure that, as public officers, DASNY employees at all levels perform their official duties consistent with the requirements of the *New York State Public Officers Law*; other applicable laws, rules, and regulations; and policies of DASNY.

2. DASNY encourages and supports a fair, open and honest business relationship with its contractors, consultants and vendors based on quality, service and cost. Moreover, DASNY believes that a "level playing field" in the marketplace can only be achieved through adherence to ethical business practices by all participants involved in the process.

3. To promote a working relationship with DASNY based on ethical business practices, contractors, consultants and vendors are expected to:

    a. furnish all goods, materials and services to DASNY as contractually required and specified;
    b. submit complete and accurate reports to DASNY and its representatives as required;
    c. not seek, solicit, demand or accept any information, verbal or written, from DASNY or its representatives that provides an unfair advantage over a competitor;
    d. not engage in any activity or course of conduct that restricts open and fair competition on Authority-related projects and transactions;
    e. not engage in any course of conduct with DASNY employees or representatives that constitutes a conflict of interest or creates the appearance of a conflict of interest;
    f. not offer any unlawful gifts or gratuities to DASNY employees or representatives, or engage in bribery or other criminal activity; and
    g. report to DASNY any activity by an DASNY employee or contractor, consultant or vendor of DASNY that is inconsistent with DASNY's *Code of Business Ethics*.

4. DASNY encourages its contractors, consultants and vendors to advance and support ethical business conduct and practices among their respective directors, officers and employees, preferably through the adoption of corporate ethics awareness training programs and written codes of conduct. In addition to considering technical competence and financial stability, DASNY will consider the *corporate integrity* of all contractors, consultants and vendors prior to the awarding of contracts or issuing of purchase orders.

B. Conduct of DASNY Employees

DASNY employees are expected to conduct business with contractors, consultants and vendors in a fair, consistent and professional manner. DASNY's Code of Business Ethics and Employee Conduct entitled *Serving Responsibly*, and other DASNY policies and procedures, guide the manner in which DASNY employees are required to interact with contractors, consultants and vendors. Additionally,

the New York State Public Officers Law sets forth legal parameters within which DASNY employees must perform their official duties with respect to, among other things, conflicts of interest and the acceptance of gifts.

Limits on Gifts to DASNY Employees

1. Pursuant to Section 73(5) of the Public Officers Law, no person shall offer any gift having more than a nominal value to an DASNY employee under circumstances in which it:

    a. could be reasonably inferred the gift was intended to influence the employee in the performance of his or her official duties;, or
    b. could reasonably be expected to influence the employee in the performance of his or her official duties;, or
    c. was intended as a reward for any official action on the part of the employee.

2. A gift is anything more than nominal in value, in any form, given to an DASNY employee. Gifts include, but are not limited to, money, service, loan, travel, lodging, meals, refreshments, entertainment, discount, forbearance or promise. Any firm or its agents, either doing business or seeking to do business with DASNY (contractors, consultants, vendors, etc.), is prohibited from directly or indirectly offering or giving any gifts, even gifts of nominal value, to DASNY employees as such gifts are deemed to be *per se* improper.

3. As is stated in the *Prohibited Interests* section of the Construction and Consultant Contract documents, violations of these gift provisions may be grounds for immediate contract termination and/or referral for civil action or criminal prosecution.

C. **Employing Relatives of DASNY Employees**

Although contractors, consultants and vendors may employ relatives of DASNY employees, DASNY must be made aware of such circumstances as soon as possible, preferably in writing, to ensure a conflict of interest situation does not arise. DASNY reserves the right to request that contractors, consultants and vendors modify the work assignment of an DASNY employee's relative where a conflict of interest, or the appearance thereof, is deemed to exist. Please be advised that DASNY employees are required to disclose information regarding the hiring of relatives by contractors, consultants and vendors and recuse themselves from matters that may present a conflict of interest. For purposes of this document, the term "relatives" refers to spouses, domestic partners, parents, children, sisters, brothers, sisters-in-law, brothers-in-law, parents-in-law, sons/daughters-in-law, stepparents, stepchildren, aunts, uncles, nieces, nephews, first cousins, grandparents by blood relationship or by marriage, or persons residing in the same household.

D. **Hiring Former DASNY Employees**

Contractors, consultants and vendors may hire former DASNY employees. However, as a general rule, former employees of DASNY may neither appear nor practice before DASNY, nor receive

compensation for services rendered on a matter before DASNY, for a period of *two years* following their separation from DASNY service. In addition, former DASNY employees are subject to a *"lifetime bar"* from appearing before DASNY or receiving compensation for services regarding any transaction in which they personally participated or which was under their active consideration during their tenure with DASNY. Violations will be referred to the New York State Commission on Public Integrity for appropriate action.

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

▶ **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See **Specific Instructions** on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN,* later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

☐☐☐ – ☐☐ – ☐☐☐☐

or

Employer identification number

☐☐ – ☐☐☐☐☐☐☐

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here **Signature of U.S. person** ▶ **Date** ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9.*

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),

2. Certify that you are not subject to backup withholding, or

3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and

4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting,* later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.

2. The treaty article addressing the income.

3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.

4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,

2. You do not certify your TIN when required (see the instructions for Part II for details),

3. The IRS tells the requester that you furnished an incorrect TIN,

4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or

5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code,* later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships,* earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code,* later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. **Sole proprietor or single-member LLC.** Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. **Partnership, LLC that is not a single-member LLC, C corporation, or S corporation.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. **Disregarded entity.** For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	**THEN check the box for . . .**
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5[2]
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

[1] See Form 1099-MISC, Miscellaneous Income, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester,* later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/Businesses* and clicking on Employer Identification Number (EIN) under Starting a Business. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code,* earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee[1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor*
For this type of account:	**Give name and EIN of:**
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form 1099 Filing Method 2 (see Regulations section 1.671-4(b)(2)(i)(B))	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships,* earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint.* You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Visit *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.

BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we:

_____ as Principal,
(Legal Title of the Bidder)

and _____ as Surety,
(Legal Title of the Surety)

are hereby held and firmly bound unto the Dormitory Authority - State of New York in the penal sum of:

_____,
(Amount)

or in the full and just sum of the difference between the total bid of the Principal and the total bid of the bidder submitting the next lowest bid, whichever sum shall be higher, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____ 20____.

Whereas the Principal has submitted to the Dormitory Authority - State of New York a certain bid, made a part hereof, to enter into a Contract in writing for the:

_____
(Title of Project)

NOW, THEREFORE the conditions of this obligation is such that::

A. This obligation shall be void:

   1. If said bid shall be rejected or in the alternate.

   2. If said bid shall be accepted and the Principal shall execute and deliver the Agreement in the form attached hereto (properly completed; in accordance with said bid) and shall furnish bonds for the faithful performance of said Contract by the Principal, and for the payment of persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the Contract created by the acceptance of said bid.

   Otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

B. The penal sum of this Bond is in addition to any other Bond furnished by the Contractor and in no way shall be impaired or affected by any other Bond.

C. The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and said Surety's Bond in no way shall be impaired or affected by any extension of time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

BID BOND

IN WITNESS WHEREOF:

the parties hereto have executed this Bond the day and year first above written.

IN THE PRESENCE OF:

(Principal)	(Surety)
(Signature)	(Signature)
(Title)	(Title)
(Address)	(Address)
(City, State, Zip Code)	(City, State, Zip Code)
(Phone Number & FAX Number)	(Phone Number & FAX Number)
(Email Address)	(Email Address)

BID BOND

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING BID BOND IF A CORPORATION

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____
(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING BID BOND IF A PARTNERSHIP, LIMITED LIABILITY COMPANY OR INDIVIDUAL

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____
(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____
Notary Public

DASNY | WE FINANCE, BUILD AND DELIVER.

DORMITORY AUTHORITY STATE OF NEW YORK

Construction Contract Forms

CORPORATE HEADQUARTERS

515 Broadway
Albany, New York
12207-2964

T 518.257.3000
F 518.257.3100

NEW YORK OFFICE

One Penn Plaza, 52nd Fl.
New York, New York
10119-0098

T 212.273.5000
F 212.273.5121

BUFFALO OFFICE

539 Franklin Street
Buffalo, New York
14202-1109

T 716.884.9780
F 716.884.9787

www.dasny.org

DORMITORY AUTHORITY - STATE OF NEW YORK
Office of Opportunity Programs

UPSTATE: 515 Broadway * Albany, NY 12207-2964 * Phone: (518) 257-3706 Fax: (518) 257-3100
DOWNSTATE: One Penn Plaza, 52nd Floor * New York, NY * 10119-0098 * Phone: (212) 273-5038 Fax: (212) 273-5121

SCOPE VERIFICATION FORM

This form must be submitted with the Utilization Plan for each MWBE subcontractor listed on the Utilization Plan and each Service-Disabled Veteran Owned Business (SDVOB). Failure to submit will delay acceptance of the Utilization Plan and award of the Contract.

A. PROJECT INFORMATION	
Facility:	Project No:
Contract/Bid No:	Work Authorization (if applicable):

B. PRIME CONTRACTOR	**C. M/WBE SUBCONTRACTOR** MBE☐ WBE☐
COMPANY:	COMPANY:
CONTACT:	CONTACT:
TELEPHONE:	TELEPHONE:
E-MAIL:	E-MAIL:

D. SDVOB SUBCONTRACTOR
COMPANY:
CONTACT:
TELEPHONE:
E-MAIL:

E. MWBE SUBCONTRACTOR SCOPE OF SERVICES

In the box below, provide a detailed scope of services to be performed by the proposed M/WBE Subcontractor listed above.

CSI Number **(Must be 6 Digits)**	**DESCRIPTION OF WORK**	**CONTRACT AMOUNT**

DORMITORY AUTHORITY - STATE OF NEW YORK
Office of Opportunity Programs

UPSTATE: 515 Broadway * Albany, NY 12207-2964 * Phone: (518) 257-3706 Fax: (518) 257-3100
DOWNSTATE: One Penn Plaza, 52nd Floor * New York, NY * 10119-0098 * Phone: (212) 273-5038 Fax: (212) 273-5121

F. SDVOB SUBCONTRACTOR SCOPE OF SERVICES

In the box below, provide a detailed scope of services to be performed by the proposed SDVOB Subcontractor listed above.

CSI Number (Must be 6 Digits)	DESCRIPTION OF WORK	CONTRACT AMOUNT

The official schedule of values for the above scope of services must be submitted along with the applicable subcontract agreement within 30 days of contract award. Failure to do so may delay future payment requisitions.

Contractor will notify and obtain written approval from DASNY for any changes in this Scope Verification Form.

Contractor and M/WBE Subcontractor certify that M/WBE Subcontractor will perform the above scope of work and will not subcontract its work, in whole or in part, to a non-M/WBE entity.

Contractor and SDVOB Subcontractor certify that SDVOB Subcontractor will perform the above scope of work and will not subcontract its work, in whole or in part, to a non-SDVOB entity.

CONTRACTOR

_____
Print Name of Principal or Officer

_____
Signature of Principal or Officer

_____
Date

M/WBE SUBCONTRACTOR

_____
Print Title of Principal or Officer

_____
Signature of Principal or Officer

_____
Date

DORMITORY AUTHORITY - STATE OF NEW YORK
Office of Opportunity Programs

UPSTATE: 515 Broadway * Albany, NY 12207-2964 * Phone: (518) 257-3706 Fax: (518) 257-3100
DOWNSTATE: One Penn Plaza, 52nd Floor * New York, NY * 10119-0098 * Phone: (212) 273-5038 Fax: (212) 273-5121

SDVOB SUBCONTRACTOR

_____
Print Name of Principal or Officer

_____
Signature of Principal or Officer

_____
Date

Instructions for New York State Vendor Responsibility Questionnaires

Although it is recommended that vendors complete their questionnaires online using the New York State VendRep System, the four (4) questionnaires found on the VendRep System are also available in paper format.

The questionnaires are intended to elicit information based on vendor type (For-Profit or Not-for-Profit) and activity (Construction or Non-Construction). Each vendor should select the questionnaire that most closely reflects its business characteristics or as directed by an agency's solicitation instructions. The available vendor questionnaires are:

- For-Profit
- For-Profit Construction
- Not-for-Profit
- Not-for-Profit Construction

Business Entities may print the PDF version of a questionnaire form and complete it manually or may select the MS Word version and complete the questionnaire on a computer. Completing the questionnaire in MS Word allows the questionnaire to be saved on the user's computer and updated in the event that the vendor's information changes.

The person(s) completing the vendor responsibility questionnaire must be knowledgeable about the vendor's business and operations. The certification at the end of each questionnaire must be completed by an owner or officer of the Business Entity and must be notarized to be complete.

Business Entities must answer every question contained in the selected questionnaire.[1] Most questions require "Yes" or "No" answers and request additional information where necessary. Each response must provide all relevant information which can be obtained within the limits of the law. However, information regarding a determination or finding made in error which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required. For paper submissions, responses that require additional information must include an attachment containing this information.

If the submitting Business Entity is a Joint Venture, one questionnaire must be submitted for the Joint Venture plus each Business Entity comprising the Joint Venture must also submit separate questionnaires.

[1] If the Business Entity uses a Social Security Number (SSN) as its identification number, providing the SSN on the questionnaire is optional. Individuals and Sole Proprietors may use an SSN but are encouraged to obtain and use an Employer Identification Number.

New York State
Vendor Responsibility

Definitions List

Administrative Proceeding

Any government entity proceeding in which a determination of the legal rights, duties or privileges of named parties thereto is required by law to be made only on a record and after an opportunity to be heard. Such a proceeding may be solely comprised of an exchange of written materials, which can include, but is not limited to, testimony recorded electronically, transcriptions, letters, documents, etc.

Affiliate

For-Profit:

SEE ASSOCIATED ENTITY

Not-For-Profit:

Any business entity (not-for-profit or for-profit) which is entitled to exercise the membership rights of participation in the election of board members, participation and service on the committees of the not-for-profit and approval of changes to a business entity's governing documents, and any company or other legal entity which controls or is controlled by the not-for-profit business entity.

Construction:

a. Any business entity in which the submitting Business Entity holds 5% or greater ownership interest; and/or
b. Any business entity or organized group of principal owners or officers holding 5% or greater ownership interest of the submitting business entity; and/or
c. Any business entity which is owned
    i. 5% or more by the same entity or group described in (b) or
    ii. by an individual holding 5% or greater ownership in the submitting business entity and/or
d. Any business entity in which the submitting Business Entity directs or has a right to direct such entity's daily operations, regardless of percentage of ownership interest.

Associated Entity

Generally, any entity that the Reporting Entity controls or is controlled by, including:

a. Owner: Any business entity or organized group of principal owners or officers holding 50% or greater ownership interest in the Reporting Entity (i.e., holding company, parent company).
b. Controlling entity: Any business entity which directs or has a right to direct the Reporting Entity's operations, regardless of percentage of ownership interest (i.e., headquarters).
c. Controlled entity: Any business entity in which the Reporting Entity holds 50% or greater ownership interest, or the Reporting Entity directs or has a right to direct operations, regardless of percentage of ownership interest (i.e., subsidiaries, units under the Reporting Entity).

Note: "Associated Entity" does not include "sibling organizations" (i.e., entities owned or controlled by a parent company that owns or controls the Reporting Entity), unless such sibling entity has a direct relationship with or impact on the Reporting Entity.

Business Entity

Includes a Legal Business Entity, a Reporting Entity or an Associated Entity as defined herein.

Business Entity Leaders

An officer, general partner, managing partner, manager of an LLC, and/or director.

Business Entity Officials

Individuals serving in an executive capacity, as staff and/or corporate officers, who have decision-making authority and responsibility for the oversight of a business entity; includes individuals who perform the functions of chief executive officer (CEO), chief operating officer (COO), chief financial officer (CFO), and/or chairman of the board, or their equivalents. (Equivalent titles may include, but are not limited to, President, Executive Vice President, Treasurer, Secretary, Managing Trustee)

Instructions:

Corporations: Identify the Business Entity Officials.

Partnerships: Identify the Senior Managing Partners, and any other partners with powers equivalent to Business Entity Officials.

Limited Liability Companies (LLC): Identify the Executive Managing Directors/Members, Senior Managing Directors/Members, and any other members/managers with powers equivalent to Business Entity Officials.

Sole Proprietors: Identify the individual who is the sole owner and manager of the business entity, or other persons, including staff, with powers equivalent to Business Entity Officials.

Unincorporated Associations: Identify the Executive Committee Members, including President, Vice President, Secretary and Treasurer, Executive or Managing Trustees, or other persons, including staff, with powers equivalent to Business Entity Officials.

Certificate of Good Standing

Certificate issued by the Business Entity's controlling jurisdiction indicating that the Business Entity is current with the filing requirements of the jurisdiction, issued within one year of the date of certification of the Vendor Responsibility Questionnaire.

Charities Registration Number

Number issued by the New York State Attorney General’s Charities Bureau to qualified not-for-profit charitable organizations.

CIK Code

The Central Index Key (CIK) is a designation number established for each entity which has filed disclosures with the Securities and Exchange Commission (SEC). It is used on the SEC's computer systems to identify corporations and individual people who have filed disclosure with the SEC.

Citation, Summons, Notice, Violation Order

A notice to appear in court or at an administrative hearing or administrative proceeding, usually issued by a State or Local Government enforcement agency. Includes court issued writs, police issued orders, administrative orders or writs to appear at a certain time and place to do something demanded in the writ, or to defend against the citation, or to show cause for not doing so.

Claim

A written, formal demand for money due, for property, for damages or for enforcement of a right, e.g., a fine or penalty sought by a Government Entity.

Construction

Contracts for work involving general contracting, building new structures and remodeling existing structures, demolition, concrete, paving and masonry, excavation, heating, ventilation and air conditioning, painting, plumbing, electrical work, roofing, asbestos abatement, lead abatement, and remediation and abatement of hazardous materials or hazardous waste. Construction activity also includes grant and other activities in which a not-for-profit entity contracts with the State for construction services (e.g., the building of permanent and transitional housing, and day care facilities). Includes all construction activities whether provided directly or through the use of subcontractors.

Corporation – For-Profit

Entity organized for the purpose of making profit, created under the laws of a State or United States federal government. Ownership may consist of publicly traded or privately held shares of stock.

Corporation – Not-For-Profit

A corporation formed for purposes other than financial gain, pursuant to and in accordance with a state's Not-For-Profit Corporation Law.

DBA - Doing Business As

An assumed name a business entity uses for doing business, in lieu of using the legal business name or owner's personal name. The entity must have filed a "Business Certificate," otherwise known as a Certificate of Conducting Business Under an Assumed Name, or DBA, in the county clerk's office of the county in which the business entity is located, or in the case of corporate entities with the Department of State.

Debarred

The exclusion of an individual or business entity from participating in the government procurement process for specified period of time.

Disadvantaged Business Enterprise (DBE)

A United States federal designation through a program run by the U.S. Department of Transportation. A for-profit small business concern that is at least 51% owned by one or more individuals who are both socially and economically disadvantaged, or in the case of a corporation, in which 51% of the stock is owned by one or more such individuals. State Agencies designate a business entity as a DBE based upon the federal standards.

Disqualification

Any action taken by a government entity which prevents or precludes a business entity from receiving an award for a particular contract or from being placed on a prequalification list. A business entity may be disqualified for a number of reasons, including but not limited to determinations of non-responsibility or lack of required experience.

DUNS - Data Universal Numbering System

A unique 9-digit number provided by Dun & Bradstreet (D&B), a commercial information company. The DUNS Number is site-specific and division-specific. Therefore, each physical location of an entity may have its own DUNS Number. Further, each separate division or branch of an entity may have its own, unique DUNS Number.

EIN - Employer Identification Number

Federal Employer Identification Number used for federal income tax reporting. Although this number may be the Social Security Number of an individual operating a business as a sole proprietor, vendors are encouraged to obtain an EIN for business purposes.

Federal

Any department, division, board, commission or bureau of any federal department designated by the United States federal government.

Financial Statements

Presentation of financial data including balance sheets, income statements, and statements of cash flow, or any supporting statement(s) intended to communicate a business entity's financial position at a point in time and its results of operations for a period then ended.

Formal Unsatisfactory Performance Assessment

A written (including electronic), unsatisfactory performance assessment or evaluation issued by a government entity, after providing due process to a business entity. May include unsatisfactory past performance assessments determined under audit and/or required by law, rule, regulation, policy or procedure.

Former Name

Any previous name by which Legal Business Entity has done business as, inside or outside the State of New York.

General Partnership

An association of two or more persons to carry on as co-owners of a business.

Good Faith Effort(s)

An effort to achieve a Minority-Owned Business Enterprise, Women-Owned Business Enterprise (M/WBE) or Disadvantaged Business Enterprise (DBE) goal, federal requirement or New York State requirement, which, by its scope, intensity and appropriateness to the objective, can reasonably be expected to fulfill the program requirements.

The code of Federal Regulations 49 C.F.R. Part 26 sets forth the standards to determine whether a contractor has made good faith efforts to reach a DBE goal. Appendix A to Part 26 provides the following guidance for a bidder: "First, the bidder can meet the goal, documenting commitments for participation by DBE firms sufficient for this purpose. Second, even if it doesn't meet the goal, the bidder can document adequate good faith efforts. This means that the bidder must show that it took all necessary and reasonable steps to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not fully successful."

Article 15-A of the Executive Law of the State of New York sets forth the standards for the M/WBE Program. These standards are to be used to determine whether a contractor has made "active and conscientious efforts to employ and to utilize minority group members and women at all levels and in all segments of its work force on state contracts, and the contractor will document these efforts."

Government Audits

Financial, compliance and/or performance audits completed for or by a government entity.

Government Contract

A contract entered into by a United States federal, state or local government entity.

Government Contracting Process

Bidding, evaluation, award and administration of a government contract.

Government Entity

Any United States federal, state or local government-created bureau, agency, department, division, board, commission, public authority or public benefit corporation.

Investigation

An inquiry has been or is being made by any prosecutorial, investigative or regulatory agency concerning an individual or business entity or the activities and/or the business practices thereof.

Joint Venture

When two or more persons or business entities join together for a specific business undertaking in which profits, losses and control are shared. Usually an enterprise with limited scope and duration but with shared liability and responsibility for debts or losses. Joint ventures normally terminate when the contract or project for which the entities have joined is completed. The Joint Venture may be established as a separate legal entity with its own federal Employer Identification Number (EIN).

Judgment

A court decision or judgment that settles the rights of the parties and disposes of all issues in controversy, except for award of costs and enforcement of the judgment. A judgment rendered by a lower court is deemed to be a final judgment, even if such judgment is subject to appeal.

Key Employee

Any officer, managing director or managing trustee, executive director, and persons or entities that manage and/or control the daily operations of the Business Entity, and any person having responsibilities or powers similar to those of officers, managing directors, or managing trustees, including the chief management and administrative officials of the Business Entity (such as executive director or chancellor), but does not include the heads of separate departments or smaller units within the business entity.

A chief financial officer and the officer in charge of administration or program operations are both Key Employees if they have the authority to control the Business Entity's activities, its finances or both. The "heads of separate departments" reference applies to persons such as the head of the radiology department or coronary care unit of a hospital, or the head of the English department at a college. These persons are managers within their specific areas but not for the business entity as a whole and therefore, are not Key Employees.

Legal Business Entity

A Business Entity registered with the Internal Revenue Service and assigned a federal Employer Identification Number.(Note: Individuals and Sole Proprietors may use a Social Security Number but are encouraged to obtain and use an Employer Identification Number.)

Legal Business Entity includes for-profit and not-for-profit entities, and may take the form of:

a. a Corporation, Partnership (including General, Limited or Limited Liability Partnership), Limited Liability Company, Sole Proprietor, Unincorporated Association, or any other business organization , in the case of for-profit entities, or
b. a Not-for-Profit Corporation, Foundation, Partnership, Limited Liability Company, Unincorporated Association, or any other business organization, in the case of not-for-profit entities.

Legal Business Entity Name

The name of the entity as set forth in the Legal Business Entity's creation documents.

a. For Corporations, the name as set forth in the Certificate of Incorporation.
b. For General Partnerships, the name as set forth in the Certificate of Assumed Name.
c. For Limited Partnerships, the name as set forth in the Certificate of Limited Partnership.
d. For Limited Liability Partnerships, the name as set forth in the Certificate of Registration.
e. For Limited Liability Companies, the name as set forth in the Articles of Organization.

For purposes of this questionnaire, a Sole Proprietor or an individual seeking to do business as him/herself may use his/her name anywhere it asks for the name of the Legal Business Entity Name.

Liens

A form of security interest against property or property interest to secure the payment of a debt, judgment, or taxes, including, but not limited to, judgment liens, mechanics' liens, tax liens, attorneys' liens, New York State of Department of Environmental Conservation liens, but shall not include purchase credit liens, Uniform Commercial Code filings, or mortgages.

Liquidated Damages

Compensation that contracting parties have agreed should be paid to one party for any loss or damage arising from breach of the agreement by the other party.

LLC - Limited Liability Company

A Limited Liability Company (LLC) is a type of business structure that offers limited liability for the debts and obligations of the business entity to the owners. An LLC provides management flexibility and the income and losses are passed through the owners of the entity, like a partnership. It must be formed pursuant to and in accordance with the Limited Liability laws of the state. The designation "LLC" must follow and be a part of the business entity's legal name.

LLP - Limited Liability Partnership

A Limited Liability Partnership is a partnership with no limited partners, where each partner is a professional by law and qualified to render a professional service, and is engaged in the practice of such profession. The business entity is registered as an LLP with the New York State Department of State, or a partnership with no limited partners registered or otherwise created under the laws of another jurisdiction. The designation "LLP" must follow and be a part of the business entity's legal name.

LP - Limited Partnership

A Limited Partnership is a type of partnership which has two types of partners; general and limited. A LP has at least one general partner and one or more limited partners. The general partner acts in the same capacity as in a general partnership such as management control, right to use property of the partnership, shared profits and joint/several liability. The limited partner has limited liability, is not involved in the day-to-day activity of the partnership and has no management control. The designation “LP” must follow and be a part of the business entity's legal name.

Material Disallowance

Expenditures which have occurred in a contract or grant which an auditor has determined were not allowed under the guidelines established by the agency, the terms of the contract or grant, or by statute, in an amount that would be material in relation to the total value of the contract or grant.

Minority Community-Based Organization (MCBO)

A not-for-profit, local human service organization having its origins in the geographic area that it serves. Generally, the governing bodies and personnel of community-based organizations reflect the racial, ethnic and cultural makeup of the community being served. These types of organizations are characterized by majority representation of Native Americans, Asian-Americans, African-Americans and/or Hispanic-Americans, in both policy formulation and decision-making regarding management, service delivery and staffing reflective of the geographic area it serves.

Minority-Owned Business Enterprise (MBE)

A business enterprise which is at least 51% owned, operated or controlled by United States citizens or permanent resident aliens who are minority group members (as listed under Article 15-A of the New York State Executive Law).

A business entity must be certified by the New York State Division of Minority and Women-Owned Business Development as a Minority-Owned Business Enterprise in order to qualify for this status.

New York State Small Business (SB)

A business which is a resident of New York State, independently owned and operated, not dominant in its field and which employs one hundred or fewer people.

New York State Vendor ID

The NYS Vendor ID is a ten-character identifier issued by New York State when the vendor is registered on the Vendor File.

Non-Responsibility Finding

A determination by a government entity that a business entity does not have the requisite financial or organizational capacity, and/or legal authority, and/or integrity, and/or acceptable performance on previous government contracts to perform on a government contract.

Not-For-Profit

A business entity organized for the purpose of social, religious, charitable, educational, athletic, literary, and political or other such activities, which is registered with either:

a. the New York State Department of State as a Not-for-Profit Corporation in accordance with Article 13 of the Not-for-Profit Corporation Law; and/or
b. the New York State Attorney General Charities Bureau;

or, is exempt from taxation under Section 501 of the Internal Revenue Code.

Not-For-Profit Corporation

A corporation formed for purposes other than financial gain, pursuant to and in accordance with a state's Not-For-Profit Corporation Law.

Official(s)

Individual who serves in an executive capacity with decision-making authority and responsibility for the oversight of a Legal Business Entity, a Reporting Entity or an Associated Entity; includes individuals who perform the functions of chief executive officer (CEO), chief operating officer (COO), chief financial officer (CFO), and/or chairman of the board, or their equivalents.

Equivalent titles may include, but are not limited to the following:

a. Corporations: The chief executive officer (CEO), chief operating officer (COO), chief financial officer (CFO), and/or chairman of the board
b. Partnerships: The Senior Managing Partners
c. Limited Liability Companies (LLC): The Executive Managing Directors/Members, Senior Managing Directors/Members
d. Sole Proprietors: The individual who is the sole owner and manager of the business entity
e. Unincorporated Associations: The Executive Committee Members, including President, Vice President, Secretary and Treasurer, Executive or Managing Trustees

Organizational Chart

A diagram which illustrates the relationship and management structure of the Reporting Entity to the Legal Business Entity and other Associated Entities as herein defined

Organizational Unit

An established portion of a Legal Business Entity which is within and operating under the authority of the Legal Business Entity, with a designated manager or management team responsible for the operation thereof. For example, a department, division, branch or chapter directly or primarily responsible for fulfilling the terms of the contract. (See Reporting Entity)

OSHA Violation

Serious

A violation designated as “serious” by the Occupational Safety and Health Administration (OSHA). Generally, where there is substantial probability that death or serious physical harm could result and that the employer knew or should have known of the hazard.

Willful

A violation designated as “willful” by the Occupational Safety and Health Administration (OSHA). Generally, a violation that the employer knowingly commits or commits with plain indifference to the law. The employer either knows that what he or she is doing constitutes a violation, or is aware that a hazardous condition exists and makes no reasonable effort to eliminate it.

PC – Professional Service Corporation

A Professional Service Corporation (PC) is organized by one or more individuals authorized to provide a professional service for the purpose of making a profit and for the purpose of rendering such professional service as licensed thereto. Shares may only be issued to those licensed individuals as are authorized to practice their professional service in this state and who have engaged in such profession or will be engaged in the practice of such profession of the PC within 30 days of the issuance of the shares. The designation "PC" must follow and be a part of the business entity's legal name.

PLLC – Professional Service Limited Liability Company

A Professional Service Limited Liability Company (PLLC) is a limited liability company organized for the purpose of providing professional services. Members may only consist of those licensed individuals as are authorized to practice their professional service in this state, and who have engaged in such profession, or will be engaged in the practice of such profession. The designation "PLLC" must follow and be a part of the business entity's legal name.

Primary Place of Business

The location where the direction and management of the Reporting Entity takes place.

Principal Owner

Any person holding 10% or more of the voting stock of a publicly traded corporation, or 25% or more of a privately held corporation. For construction business entities, any person whose ownership interest is 5% or more.

Principal Place of Business

The location of the primary control, direction and management of the Legal Business Entity.

Registered to do business in New York State

A business entity is registered to do business in New York State, when it has met the statutory filing requirements of filing for authority to do business in New York State, usually by filing with the New York Department of State.

Reporting Entity

The Reporting Entity may be either the entire Legal Business Entity or a portion of the Legal Business Entity, which does or anticipates doing business with the State of New York. If it is not the entire Legal Business Entity, the portion must be an established organizational unit within and operating under the authority of the Legal Business Entity, with a designated manager or management team responsible for the operation thereof. The established organizational unit must have the same Employer Identification Number as the Legal Business Entity. The organizational unit must also be part of the Legal Business Entity, with primary responsibility for fulfilling the terms of the anticipated contract. Examples of a Reporting Entity include, but are not limited to, a department, division or branch.

Sanction

(Sanction or sanctioned) Any fine, penalty, judgment, injunction, violation, debarment, suspension or revocation.

Shared Space

Space is considered to be shared when any part of the space utilized by the submitting Business Entity, at any of its sites, is also utilized on a regular or intermittent basis for any purpose by any other entity, and where there is no lease or sublease in effect between the submitting Business Entity and any other entity that is sharing space with the submitting Business Entity.

Sole Proprietor

A business entity owned and operated by one individual, although there may be employees. All business decisions are made by the sole owner.

State Contracting Entity

Any New York State government-created entity with the authority to enter into a contract. This includes any New York State created agency, department, division, board, commission or bureau, including public authorities and public benefit corporations.

State Government Entity

Any state government-created agency, department, division, board, commission or bureau of any state, including public authorities and public corporations.

Statutory Affirmative Action Requirements

The statutory inclusion of language in government procurement contracts that

a. requires a business entity to affirmatively act to ensure and promote equal opportunity employment on government contracts,
b. prohibits a business-entity from discrimination in employment, and
c. provides for termination of such contracts for a business entity's failure to comply with such terms.

Suspension

(Suspension or suspended) Action taken by a government entity to temporarily restrict the business entity's right to provide new or continuing contractual obligations.

Terminated for Cause

The exercise of a government entity's right to completely or partially terminate a contract due to the business entity's failure to perform its contractual obligations or for the business entity's failure to comply with statutory and/or regulatory responsibilities.

TIN – Taxpayer Identification Number

Taxpayer Identification Number used for federal income tax reporting. This number may be the federal Employer Identification Number (EIN) or the Social Security Number (SSN) of an individual operating a business as a sole proprietor. (Note: Individuals and Sole Proprietors may use a Social Security Number but are encouraged to obtain and use an Employer Identification Number.)

Trade Name

Any name used by a person to identify a business or vocation of such person. A person shall include an individual (natural person), firm, partnership, corporation, union, association or other business entity capable of suing and being sued in a court of law. This also includes any trade, franchise or licensee names.

Unincorporated Association

This is a type of business entity that may be created contractually. The contractual relationship is between the members of the association, all of whom have agreed to join together for a particular purpose. These types of business entities include, but are not limited to, unions, historical societies, professional membership associations, and recreational societies.

Women-Owned Business Enterprise (WBE)

A business enterprise which is at least 51% owned, operated or controlled by U.S. citizens or permanent resident aliens who are women. A business entity must be certified by the New York State Division of Minority and Women-Owned Business Development as a Women-Owned Business Enterprise in order to qualify for this status.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

You have selected the For-Profit Construction questionnaire, commonly known as the "CCA-2," which may be printed and completed in this format or, **for your convenience**, **may be completed online using the New York State VendRep System.**

COMPLETION & CERTIFICATION

The person(s) completing the questionnaire must be knowledgeable about the vendor's business and operations. An owner or official must certify the questionnaire and the signature must be notarized.

NEW YORK STATE VENDOR IDENTIFICATION NUMBER (VENDOR ID)

The Vendor ID is a ten-digit identifier issued by New York State when the vendor is registered on the Statewide Vendor File. This number must now be included on the questionnaire. If the business entity has not obtained a Vendor ID, contact the OSC Help Desk at ciohelpdesk@osc.state.ny.us or call 866-370-4672.

DEFINITIONS

All underlined terms are defined in the "New York State Vendor Responsibility Definitions List," found at http://www.osc.state.ny.us/vendrep/documents/questionnaire/definitions.pdf. These terms may not have their ordinary, common or traditional meanings. Each vendor is strongly encouraged to read the respective definitions for any and all underlined terms. By submitting this questionnaire, the vendor agrees to be bound by the terms as defined in the "New York State Vendor Responsibility Definitions List" existing at the time of certification.

RESPONSES

Every question must be answered. Each response must provide all relevant information which can be obtained within the limits of the law. However, information regarding a determination or finding made in error which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required. Individuals and Sole Proprietors may use a Social Security Number but are encouraged to obtain and use a federal Employer Identification Number (EIN).

NYS VENDOR ID: 000000000

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

BUSINESS ENTITY INFORMATION		
Legal Business Name	EIN ____	
Address of the Principal Place of Business (street, city, state, zip code)	New York State Vendor Identification Number	
	Telephone ext.	Fax
	Website	
Authorized Contact for this Questionnaire		
Name	Telephone ext.	Fax
Title	Email	

Additional Business Entity Identities: If applicable, list any other DBA, Trade Name, Former Name, Other Identity, or EIN used in the last five (5) years, the state or county where filed and the status (active or inactive).

Type	Name	EIN	State or County where filed	Status

I. BUSINESS CHARACTERISTICS		
1.0 Business Entity Type – Check appropriate box and provide additional information:		
a) ☐ Corporation (including PC)	Date of Incorporation	
b) ☐ Limited Liability Company (LLC or PLLC)	Date Organized	
c) ☐ Limited Liability Partnership	Date of Registration	
d) ☐ Limited Partnership	Date Established	
e) ☐ General Partnership	Date Established	County (if formed in NYS)
f) ☐ Sole Proprietor	How many years in business?	
g) ☐ Other	Date Established	
If Other, explain:		
1.1 Was the Business Entity formed in New York State?		☐ Yes ☐ No
If "No," indicate jurisdiction where the Business Entity was formed:		
☐ United States	State	
☐ Other	Country	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

I. BUSINESS CHARACTERISTICS	
1.2 Is the Legal Business Entity publicly traded?	☐ Yes ☐ No
If "Yes," provide the CIK code or Ticker Symbol:	
1.3 Is the Business Entity currently registered to do business in New York State? *Note: Select "Not Required" if the Business Entity is a Sole Proprietor or General Partnership*	☐ Yes ☐ No ☐ Not Required
If "No," explain why the Business Entity is not required to be registered to do business in New York State:	
1.4 Is the responding Business Entity a Joint Venture? Note: If the submitting Business Entity is a Joint Venture, also submit a separate questionnaire for each Business Entity comprising the Joint Venture.	☐ Yes ☐ No
1.5 If the Business Entity's Principal Place of Business is not in New York State, does the Business Entity maintain an office in New York State? *(Select "N/A" if Principal Place of Business is in New York State.)*	☐ Yes ☐ No ☐ N/A
If "Yes," provide the address and telephone number for one office located in New York State.	
1.6 Is the Business Entity a New York State certified Minority-Owned Business Enterprise, or Women-Owned Business Enterprise, or New York State Small Business, or federally certified Disadvantaged Business Enterprise?	☐ Yes ☐ No
If "Yes," check all that apply: ☐ New York State certified Minority-Owned Business Enterprise (MBE) ☐ New York State certified Women-Owned Business Enterprise (WBE) ☐ New York State Small Business ☐ Federally certified Disadvantaged Business Enterprise (DBE)	
1.7 Identify each person or business entity that is, or has been within the past five (5) years, Principal Owner of 5.0% or more of the firm's shares; a Business Entity Official; or one of the five largest shareholders, if applicable. *(Attach additional pages if necessary.)* Joint Ventures: Provide information for all firms involved.	

Name *(For each person, include middle initial)*	Title	Percentage of ownership (Enter 0%, if not applicable)	Employment status with the firm
			☐ Current ☐ Former
			☐ Current ☐ Former
			☐ Current ☐ Former
			☐ Current ☐ Former

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

II. AFFILIATE and JOINT VENTURE RELATIONSHIPS		
2.0 Are there any other construction-related firms in which, now or in the past five years, the submitting Business Entity or any of the individuals or business entities listed in question 1.7 either owned or owns 5.0% or more of the shares of, or was or is one of the five largest shareholders or a director, officer, partner or proprietor of said other firm? *(Attach additional pages if necessary.)*		☐ Yes ☐ No
Firm/Company Name	Firm/Company EIN (If available)	Firm/Company's Primary Business Activity
Firm/Company Address		
Explain relationship with the firm and indicate percent of ownership, if applicable (enter N/A, if not applicable):		
Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with this firm?		☐ Yes ☐ No
Individual's Name *(Include middle initial)*	Position/Title with Firm/Company	
2.1 Does the Business Entity have any construction-related affiliates not identified in the response to question 2.0 above? *(Attach additional pages if necessary.)*		☐ Yes ☐ No
Affiliate Name	Affiliate EIN (If available)	Affiliate's Primary Business Activity
Affiliate Address		
Explain relationship with the affiliate and indicate percent of ownership, if applicable *(enter N/A, if not applicable)*:		
Are there any shareholders, directors, officers, owners, partners or proprietors that the submitting Business Entity has in common with this affiliate?		☐ Yes ☐ No
Individual's Name *(Include middle initial)*	Position/Title with Firm/Company	
2.2 Has the Business Entity participated in any construction-related Joint Ventures within the past three (3) years? *(Attach additional pages if necessary.)*		☐ Yes ☐ No
Joint Venture Name	Joint Venture EIN (If available)	Identify parties to the Joint Venture

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

III. CONTRACT HISTORY	
3.0 Has the Business Entity completed any construction contracts?	☐ Yes ☐ No
If "Yes," list the ten most recent construction contracts the Business Entity has completed using Attachment A – Completed Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3294s.doc. *If less than ten, include most recent subcontracts on projects up to that number.*	
3.1 Does the Business Entity currently have uncompleted construction contracts?	☐ Yes ☐ No
If "Yes," list all current uncompleted construction contracts by using Attachment B – Uncompleted Construction Contracts, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3295s.doc. *Note: Ongoing projects must be included.*	

IV. INTEGRITY – CONTRACT BIDDING ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
4.0 Been suspended or debarred from any government contracting process or been disqualified on any government procurement?	☐ Yes ☐ No
4.1 Been subject to a denial or revocation of a government prequalification?	☐ Yes ☐ No
4.2 Had any bid rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	☐ Yes ☐ No
4.3 Had a proposed subcontract rejected by a government entity for lack of qualifications, responsibility or because of the submission of an informal, non-responsive or incomplete bid?	☐ Yes ☐ No
4.4 Had a low bid rejected on a government contract for failure to make good faith efforts on any Minority-Owned Business Enterprise, Women-Owned Business Enterprise or Disadvantaged Business Enterprise goal or statutory affirmative action requirements on a previously held contract?	☐ Yes ☐ No
4.5 Agreed to a voluntary exclusion from bidding/contracting with a government entity?	☐ Yes ☐ No
4.6 Initiated a request to withdraw a bid submitted to a government entity or made any claim of an error on a bid submitted to a government entity?	☐ Yes ☐ No
For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, project(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.	

V. INTEGRITY – CONTRACT AWARD ***Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:***	
5.0 Defaulted on or been suspended, cancelled or terminated for cause on any contract?	☐ Yes ☐ No
5.1 Been subject to an administrative proceeding or civil action seeking specific performance or restitution (except any disputed work proceeding) in connection with any government contract?	☐ Yes ☐ No
5.2 Entered into a formal monitoring agreement, consent decree or stipulation settlement as specified by, or agreed to with, any government entity?	☐ Yes ☐ No
5.3 Had its surety called upon to complete any contract whether government or private sector?	☐ Yes ☐ No
5.4 Forfeited all or part of a standby letter of credit in connection with any government contract?	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

V. INTEGRITY – CONTRACT AWARD

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity/owners involved, project(s), contract number(s), relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

VI. CERTIFICATIONS/LICENSES

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

6.0	Had a revocation or suspension of any business or professional permit and/or license?	☐ Yes ☐ No
6.1	Had a denial, decertification, revocation or forfeiture of New York State certification of Minority-Owned Business Enterprise, Women-Owned Business Enterprise or a federal certification of Disadvantaged Business Enterprise status, for other than a change of ownership?	☐ Yes ☐ No

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

7.0	Been the subject of a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or federal law?	☐ Yes ☐ No
7.1	Been the subject of:	
	(i.) An indictment, grant of immunity, judgment or conviction (including entering into a plea bargain) for conduct constituting a crime; or	☐ Yes ☐ No
	(ii.) Any criminal investigation, felony indictment or conviction concerning the formation of, or any business association with, an allegedly false or fraudulent Minority-Owned Business Enterprise, Women-Owned Business Enterprise, or a Disadvantaged Business Enterprise?	☐ Yes ☐ No
7.2	Received any OSHA citation, which resulted in a final determination classified as serious or willful?	☐ Yes ☐ No
7.3	Had a government entity find a willful prevailing wage or supplemental payment violation?	☐ Yes ☐ No
7.4	Had a New York State Labor Law violation deemed willful?	☐ Yes ☐ No
7.5	Entered into a consent order with the New York State Department of Environmental Conservation, or a federal, state or local government enforcement determination involving a violation of federal, state or local environmental laws?	☐ Yes ☐ No

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

VII. LEGAL PROCEEDINGS/GOVERNMENT INVESTIGATIONS

Within the past five (5) years, has the Business Entity, an affiliate, or any predecessor company or entity:

7.6	Other than previously disclosed, been the subject of any citations, notices or violation orders; a pending administrative hearing, proceeding or determination of a violation of: • Federal, state or local health laws, rules or regulations; • Federal, state or local environmental laws, rules or regulations; • Unemployment insurance or workers compensation coverage or claim requirements; • Any labor law or regulation, which was deemed willful; • Employee Retirement Income Security Act (ERISA); • Federal, state or local human rights laws; • Federal, state or local security laws?	☐ Yes ☐ No

For each "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

Note: Information regarding a determination or finding made in error, which was subsequently corrected or overturned, and/or was withdrawn by the issuing government entity, is not required.

VIII. LEADERSHIP INTEGRITY

If the Business Entity is a Joint Venture Entity, answer "N/A - Not Applicable" to questions in this section.

Within the past five (5) years has any individual previously identified or any individual currently or formerly having the authority to sign, execute or approve bids, proposals, contracts or supporting documentation on behalf of the Business Entity with any government entity been:

8.0	Sanctioned relative to any business or professional permit and/or license?	☐ Yes ☐ No ☐ N/A
8.1	Suspended, debarred or disqualified from any government contracting process?	☐ Yes ☐ No ☐ N/A
8.2	The subject of a criminal investigation, whether open or closed, or an indictment for any business-related conduct constituting a crime under local, state or federal law?	☐ Yes ☐ No ☐ N/A
8.3	Charged with a misdemeanor or felony, indicted, granted immunity, convicted of a crime or subject to a judgment for: (i.) Any business-related activity, including but not limited to fraud, coercion, extortion, bribe or bribe-receiving, giving or accepting unlawful gratuities, immigration or tax fraud, racketeering, mail fraud, wire fraud, price-fixing or collusive bidding; or (ii.) Any crime, whether or not business-related, the underlying conduct of which related to truthfulness, including but not limited to the filing of false documents or false sworn statements, perjury or larceny	☐ Yes ☐ No ☐ N/A

For each "Yes," provide an explanation of the issue(s), the individual involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer(s) below or attach additional sheets with numbered responses.

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
FOR-PROFIT CONSTRUCTION (CCA-2)

IX. FINANCIAL AND ORGANIZATIONAL CAPACITY

9.0 Within the past five (5) years, has the Business Entity or any affiliate received any formal unsatisfactory performance assessment(s) from any government entity on any contract?	☐ Yes ☐ No
If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, the government entity involved, relevant dates, any remedial or corrective action(s) taken and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.	
9.1 Within the past five (5) years, has the Business Entity or any affiliate had any liquidated damages assessed over $25,000?	☐ Yes ☐ No
If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the contracting party involved, the amount assessed and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.	
9.2 Within the past five (5) years, has the Business Entity or any affiliate had any liens, claims or judgments over $25,000 filed against the Business Entity which remain undischarged or were unsatisfied for more than 90 days? (*Note: Including but not limed to tax warrants or liens. Do not include UCC filings.)*	☐ Yes ☐ No
If "Yes," provide an explanation of the issue(s), the Business Entity involved, the relationship to the submitting Business Entity, relevant dates, the Lien holder or Claimants' name(s), the amount of the lien(s) and the current status of the issue(s). Provide answer below or attach additional sheets with numbered responses.	
9.3 In the last seven (7) years, has the Business Entity or any affiliate initiated or been the subject of any bankruptcy proceedings, whether or not closed, or is any bankruptcy proceeding pending?	☐ Yes ☐ No
If "Yes," provide the Business Entity involved, the relationship to the submitting Business Entity, the bankruptcy chapter number, the court name and the docket number. Indicate the current status of the proceedings as "Initiated," "Pending" or "Closed." Provide answer below or attach additional sheets with numbered responses.	

9.4 What is the Business Entity's Bonding Capacity?	
a. Single Project	b. Aggregate (All Projects)
9.5 List Business Entity's Gross Sales for the previous three (3) Fiscal Years:	

1st Year (Indicate year) Gross Sales	2nd Year (Indicate year) Gross Sales	3rd Year (Indicate year) Gross Sales
9.6 List Business Entity's Average Backlog for the previous three (3) fiscal years: (Estimated total value of uncompleted work on outstanding contracts)		
1st Year (Indicate year) Amount	2nd Year (Indicate year) Amount	3rd Year (Indicate year) Amount
9.7 Attach Business Entity's most recent annual financial statement and accompanying notes or complete Attachment C – Financial Information, found at www.osc.state.ny.us/vendrep/documents/questionnaire/ac3296s.xls. *(This information must be attached.)*		

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

X. FREEDOM OF INFORMATION LAW (FOIL)	
10.0 Indicate whether any information provided herein is believed to be exempt from disclosure under the Freedom of Information Law (FOIL). *Note: A determination of whether such information is exempt from FOIL will be made at the time of any request for disclosure under FOIL. Attach additional pages if necessary.*	☐ Yes ☐ No
If "Yes," indicate the question number(s) and explain the basis for the claim.	

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE FOR-PROFIT CONSTRUCTION (CCA-2)

Certification

The undersigned: (1) recognizes that this questionnaire is submitted for the express purpose of assisting New York State government entities (including the Office of the State Comptroller (OSC)) in making responsibility determinations regarding award or approval of a contract or subcontract and that such government entities will rely on information disclosed in the questionnaire in making responsibility determinations; (2) acknowledges that the New York State government entities and OSC may, in their discretion, by means which they may choose, verify the truth and accuracy of all statements made herein; and (3) acknowledges that intentional submission of false or misleading information may result in criminal penalties under State and/or Federal Law, as well as a finding of non-responsibility, contract suspension or contract termination.

The undersigned certifies that he/she:

- is knowledgeable about the submitting Business Entity's business and operations;
- has read and understands all of the questions contained in the questionnaire;
- has not altered the content of the questionnaire in any manner;
- has reviewed and/or supplied full and complete responses to each question;
- to the best of his/her knowledge, information and belief, confirms that the Business Entity's responses are true, accurate and complete, including all attachments, if applicable;
- understands that New York State government entities will rely on the information disclosed in the questionnaire when entering into a contract with the Business Entity; and
- is under an obligation to update the information provided herein to include any material changes to the Business Entity's responses at the time of bid/proposal submission through the contract award notification, and may be required to update the information at the request of the New York State government entities or OSC prior to the award and/or approval of a contract, or during the term of the contract.

Signature of Owner/Official _____

Printed Name of Signatory _____

Title _____

Name of Business _____

Address _____

City, State, Zip _____

Sworn to before me this _____ day of _____, 20___;

_____ Notary Public

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT A – COMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.0:	**List the ten most recent construction contracts the Business Entity has completed. If less than ten, include most recent subcontracts on projects up to that number:**				
1.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
2.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
3.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
4.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
5.	Agency/Owner		Award Date	Amount	Date Completed
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT A – COMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.0: List the ten most recent construction contracts the Business Entity has completed. If less than ten, include most recent subcontracts on projects up to that number:						
6.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
7.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
8.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
9.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
10.	Agency/Owner			Award Date	Amount	Date Completed
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT B – UNCOMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.1: List all current uncompleted construction contracts:					
1.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others		Uncompleted Amount
2.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others		Uncompleted Amount
3.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others		Uncompleted Amount
4.	Agency/Owner			Award Date	Completion Date
	Contact Person	Telephone No.	Designer Architect and /or Design Engineer		
	Contract No. / Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
		Total Contract Amount	Amount Sublet to others		Uncompleted Amount

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT B – UNCOMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.1: List all current uncompleted construction contracts:

5.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
6.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
7.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
8.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount

NEW YORK STATE

VENDOR RESPONSIBILITY QUESTIONNAIRE

ATTACHMENT B – UNCOMPLETED CONSTRUCTION CONTRACTS

Vendor Name: **NYS Vendor ID:**

Question 3.1: List all current uncompleted construction contracts:

9.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount
10.	Agency/Owner				Award Date	Completion Date
	Contact Person		Telephone No.	Designer Architect and /or Design Engineer		
	Contract No.	Prime or Sub	Joint Venture (JV) Name, if applicable			EIN of JV, if applicable
			Total Contract Amount	Amount Sublet to others		Uncompleted Amount

Grand Total All Uncompleted Contracts	**$0.00**

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

As of Date: _____

ASSETS

Current Assets

1. Cash			$ -
2. Accounts receivable - less allowance for doubtful accounts	$ -		
Retainers included in accounts receivable	$ -		
Claims included in accounts receivable not yet approved or in litigation	$ -		
Total Accounts Receivable			$ -
3. Notes receivable - due within one year			$ -
4. Inventory - materials			$ -
5. Contract costs in excess of billings on uncompleted contracts			$ -
6. Accrued income receivable			
Interest	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Accrued Income Receivable			$ -
7. Deposits			
Bid and Plan _____	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Deposits			$ -
8. Prepaid Expenses			
Income Taxes	$ -		
Insurance	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Prepaid Expenses			$ -
9. Other Current Assets			
Other (list) _____	$ -		
_____	$ -		
Total Other Current Assets			$ -
10. Total Current Assets			$ -
11. Investments			
Listed securities-present market value	$ -		
Unlisted securities-present value	$ -		
Total Investments			$ -

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

12. Fixed Assets			
Land	$ -		
Building and improvements	$ -		
Leasehold improvements	$ -		
Machinery and equipment	$ -		
Automotive equipment	$ -		
Office furniture and fixtures	$ -		
Other (list) _____	$ -		
_____	$ -		
Total		$ -	
Less: Accumulated depreciation		$ -	
Total Fixed Assets - Net			$ -
13. Other Assets			
Loans receivable			
Officers	$ -		
Employees	$ -		
Shareholders	$ -		
Cash surrender value of officers' life insurance	$ -		
Organization expense – net of amortization	$ -		
Notes receivable - due after one year	$ -		
Other (list) _____	$ -		
_____	$ -		
Total Other Assets			$ -
14. TOTAL ASSETS			$ -

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

LIABILITIES

Current Liabilities		
15. Accounts payable		$ -
16 a. Loans from shareholders - due within one year		$ -
16 b. Other Loans - due within one year		$ -
17. Notes payable - due within one year		$ -
18. Mortgage payable - due within one year		$ -
19. Other payables - due within one year		
Other (list) _____	$ -	
_____	$ -	
Total Other Payables - due within one year		$ -
20. Billings in excess of costs and estimated earnings		$ -
21. Accrued expenses payable		
Salaries and wages	$ -	
Payroll taxes	$ -	
Employees' benefits	$ -	
Insurance	$ -	
Other	$ -	
Total Accrued Expenses Payable		$ -
22. Dividends payable		$ -
23. Income taxes payable		
State	$ -	
Federal	$ -	
Other	$ -	
Total Income Taxes Payable		$ -
24. Total current liabilities		$ -
25. Deferred income taxes payable		
State	$ -	
Federal	$ -	
Other	$ -	
Total Deferred Income Taxes		$ -
26. Long Term Liabilities		
Loans from shareholders - due after one year	$ -	
Other Loans - due within one year		
Principle	$ -	
Interest	$ -	
Notes payable - due after one year	$ -	
Mortgage - due after one year	$ -	
Other payables - due after one year	$ -	
Other (list) _____	$ -	
_____	$ -	
Total Long Term Liabilities		$ -

NEW YORK STATE VENDOR RESPONSIBILITY QUESTIONNAIRE
ATTACHMENT C - FINANCIAL INFORMATION

NYS Vendor ID: _____

27. Other Liabilities			
Other (list) _____	$ -		
_____	$ -		
Total Other Liabilities		$ -	
28. TOTAL LIABILITIES			$ -

NET WORTH

29. Net Worth (if proprietorship or partnership)			$ -
30. Stockholders' Equity			
Common stock issued and outstanding	$ -		
Preferred stock issued and outstanding	$ -		
Retained earnings	$ -		
Total	$ -		
Less: Treasury stock	$ -		
31. TOTAL STOCKHOLDERS' EQUITY			$ -
32. TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY			$ -

ACORD

CERTIFICATE OF INSURANCE

(DORMITORY AUTHORITY SAMPLE)

DATE (MM/DD/YY)

PRODUCER

Your Agent or Broker

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED

Your Name

COMPANIES AFFORDING COVERAGE

COMPANY **A** **Your Insurance Company**

COMPANY **B** **Your Insurance Company**

COMPANY **C** **Your Insurance Company**

COMPANY **D** **Your Insurance Company**

COMPANY **E** **Your Insurance Company**

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
	GENERAL LIABILITY				GENERAL AGGREGATE	**$2,000,000**
	X COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OP AGG	**$2,000,000**
	☐☐ CLAIMS MADE **X** OCCUR	**XYZ - 123**	**04/01/XX**	**04/01/XY**	PERSONAL & ADV INJURY	**$2,000,000**
A	☐ OWNER'S & CONT PROT				EACH OCCURRENCE	**$2,000,000**
	X Include Independent Consultants				FIRE DAMAGE (Any one fire)	**$ 50,000**
					MED EXP (Any one person)	**$ 5,000**
	AUTOMOBILE LIABILITY					
	X ANY AUTO				COMBINED SINGLE LIMIT	**$1,000,000**
	X ALL OWNED AUTOS					
B	**X** SCHEDULED AUTOS	**ABC-345**	**04/01/XX**	**04/01/XY**	BODILY INJURY (Per Person)	
	X HIRED AUTOS					
	X NON-OWNED AUTOS				BODILY INJURY (Per accident)	
	X GARAGE LIABILITY					
					PROPERTY DAMAGE	
	EXCESS LIABILITY				EACH OCCURRENCE	**AS NEEDED**
	X UMBRELLA FORM	**LLL-555**	**04/01/XX**	**04/01/XY**	AGGREGATE	
C	☐ OTHER THAN UMBRELLA FORM					
D	EMPLOYERS' LIABILITY	**WCP-678**	**04/01/XX**	**04/01/XY**	DISEASE - POLICY LIMIT	**$ 1,000,000**
					DISEASE - EACH EMPLOYEE	**$ 1,000,000**
	OTHER					
E	**Asbestos Abatement Liability**	**AAL - 111**	**04/01/XX**	**04/01/XY**	**IF REQUIRED**	**$2,000,000**
	Builder's Risk	**BR-111**	**04/01/XX**	**04/01/XX**	**IF REQUIRED**	**Contract Value**

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS
DASNY CONTRACT NO:
PROJECT NAME:
FACILITY**:**
The following are Additional Insureds under General Liability as respects this project:

CERTIFICATE HOLDER

Dormitory Authority--State of New York
515 Broadway
Albany, NY 12207
Attn: Procurement Unit

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY MAIL __30_____DAYS WRITTEN NOTICE TO THE CERTIFICATE holder NAMED TO THE LEFT

AUTHORIZED REPRESENTATIVE
Your Agent/Broker Representative

FACILITY

PROJECT NAME

CONTRACTOR

DA#

CORPORATE HEADQUARTERS

515 Broadway
Albany, New York
12207-2964

T 518.257.3000
F 518.257.3100

NEW YORK OFFICE

One Penn Plaza, 52nd Fl.
New York, New York
10119-0098

T 212.273.5000
F 212.273.5121

BUFFALO OFFICE

539 Franklin Street
Buffalo, New York
14202-1109

T 716.884.9780
F 716.884.9787

www.dasny.org

AGREEMENT

This Agreement made as of the _____, by and between the DORMITORY AUTHORITY, a public benefit corporation and public authority established by the Public Authorties Law of the State of New York, hereinafter referred to as the Owner and; _____, a business corporation organized and existing under the laws of the State of New York, hereinafter referred to as the Contractor, for the Work at _____.

WITNESSETH: That the Owner and the Contractor for the consideration named agree as follows:

A. The Contractor shall Provide the Work of every kind or nature whatsoever required and all other things necessary to complete in a proper and workmanlike manner the _____, Contract number _____, Project number _____, in strict accordance with the Contract Documents (defined in the General Conditions), of which a listing of technical Specifications and Drawings is attached hereto and in strict accordance with Addenda issued by the Owner pursuant to the Contract, and Provide all other obligations imposed on such Contractor by the Contract.

B. The Contractor agrees to Provide the Work of the Contract Documents necessary or proper for, or incidental to the Work of the Contract, for the total sum of _____ Dollars (_____), which sum shall be deemed to be in full consideration for the performance by the Contractor of all the duties and obligations of such Contractor under the Contract.

C. The Contractor shall commence the Work of the Contract Documents at the time to be specified in the Notice to Proceed, issued by the Owner, and shall achieve Substantial Completion no later than the _____**.** The Contractor shall pay to the Owner as liquidated damages the sum of ( ) for each and every day that the Contractor fails to achieve Substantial Completion of the Work.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

_____	_____
* Contractor Signature Date	Dormitory Authority Signature Date
_____	_____
Title	Title

*If a corporation, signer must be President, Vice-President or other authorized officer.
If a Limited Liability Company (LLC), signer must be a member or manager.
If a Limited Liability Partnership (LLP), signer must be a partner.
If a Limited Partnership, signer must be an authorized partner.
If a general partnership, signer must be a partner.
If a sole proprietorship, signer must be the owner.

ACKNOWLEDGEMENT OF DORMITORY AUTHORITY OFFICER EXECUTING AGREEMENT

STATE OF _____

COUNTY OF _____

On the _____day of _____ in the year 2018, before me personally came Louis R. Cirelli, Jr., D.B.A., P.E., CMQ/OE to me known, who, being by me duly sworn, did depose and say that he resides at Schenectady, New York, that he is the Director, Procurement of Dormitory Authority, the corporation described in and which executed the above instrument; and that he signed his name thereto by order of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING AGREEMENT
IF A CORPORATION

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:
_____
(street, city, state, zip code)
that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING AGREEMENT
IF A PARTNERSHIP, LIMITED LIABILITY COMPANY OR INDIVIDUAL

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

Iran Divestment Certification

1. By signing this certification and by signing this Contract, each person and each person signing on behalf of any other party certifies, and in the case of a joint bid or partnership each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each person is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State Finance Law.

2. Contract means the contract between the Dormitory Authority of the State of New York ("DASNY") and _____ ("Contractor") for the _____ Project, DASNY Project Number _____.

3. This certification is part of the Contract and is subscribed by and affirmed by the person entering into the Contract as true under the penalties of perjury.

Contractor Name

By:_____

Print Name:_____

Title:_____

SPECIFICATIONS AND DRAWINGS LISTING

Following is a list of technical Specifications and Drawings, which are a part of the Contract Documents placed for bid. Addenda issued by the Owner may not be listed but remain a part of the Contract Documents. In addition to the documents listed below, and Addenda issued by the Owner, the Contract Documents include those documents in the definition of Contract Documents in Article 1 of the General Conditions which are included in the Project manual.

Extended Warranty Service Maintenance

D. In the event the Form of Bid includes an Alternate for an extended warranty service maintenance agreement, and the Owner's Letter of Intent accepts that Alternate, funds for said Alternate shall be encumbered upon the execution of said agreement. If the extended warranty service maintenance agreement is not signed concurrent with this Contract, the warranty service provider, by execution of this Agreement, agrees that the warranty service provider shall execute the extended warranty service agreement which is included with the Contract Documents for the amounts stated in the accepted Alternate.

List the warranty service provider associated with the bid and the annual cost of the contract.

_____
Legal Name of Firm

_____
Street Address

_____
City, State, Zip Code

_____
* Warranty Service Provider Signature Date

_____
Title

Annual Cost

1st Year_____

2nd Year_____

3rd Year_____

4th Year_____

5th Year_____

*If a corporation, signer must be President, Vice-President or other authorized officer.
If a Limited Liability Company (LLC), signer must be a member or manager.
If a Limited Liability Partnership (LLP), signer must be a partner.
If a Limited Partnership, signer must be an authorized partner.
If a general partnership, signer must be a partner.
If a sole proprietorship, signer must be the owner.

ACKNOWLEDGEMENT OF WARRANTY SERVICE PROVIDER
IF A CORPORATION

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20____, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____
(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF WARRANTY SERVICE PROVIDER
IF A PARTNERSHIP, LIMITED LIABILITY COMPANY OR INDIVIDUAL

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we:

_____ as Principal,
(Legal title of the Contractor)

_____
(Street, City, State, Zip Code)

and _____ asSurety,
(Legal title of the Surety)

_____
(Street, City, State, Zip Code)

are held and firmly bound unto the Dormitory Authority, 515 Broadway, Albany, New York 12207, as Obligee, hereinafter called the Owner, for the use and benefit of the claimants as hereinbelow defined, in the amount of:

Dollars _____

() _____

WHEREAS, CONTRACTOR, has by written Agreement dated _____

entered into a Contract with the Owner for:

_____
(Title of Project)

in accordance with the Contract Documents and any changes thereto, which are made a part hereof, and are hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise such obligation shall remain in full force and effect, subject, however, to the following conditions:

A. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

B. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this Payment Bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

C. No suit or action shall be commenced hereunder by any claimant:

1. Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to the Principal above named, within one hundred twenty (120) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal at any place where the Principal maintains an office or regularly conducts the Principal's business, or at Principal's residence or served on Principal in any manner in which legal process may be served in the State of New York.
2. Except as provided in section 220-g of the New York State Labor Law, after the expiration of one (1) year following the date on which the public improvement has been Completed and Accepted by the Owner; however, if any limitation embodied in this Payment Bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.
3. Other than in a New York State court of competent jurisdiction in and for the county in which the Contract, or any part thereof, was to be performed, or in the United States District Court for the district in which the Contract, or any part thereof, was to be performed, and not elsewhere.

D. The penal sum of this Payment Bond is in addition to any other bond furnished by the Contractor and in no way shall be impaired or affected by any other bond.

E. The amount of this Payment Bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

Signed this_____day of_____20___

IN THE PRESENCE OF:

_____	_____
(Principal)	(Surety)
_____	_____
(Signature)	(Signature)
_____	_____
(Title)	(Title)
_____	_____
(Street Address)	(Street Address)
_____	_____
(City, State, Zip Code)	(City, State, Zip Code)
_____	_____
(Phone Number & FAX Number)	(Phone Number & FAX Number)
_____	_____
(Email Address)	(Email Address)

PAYMENT BOND

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING PAYMENT BOND IF A CORPORATION

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____

(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____

Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING PAYMENT BOND IF A PARTNERSHIP, LIMITED LIABILITY COMPANY OR INDIVIDUAL

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____

Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____

(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____

Notary Public

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS, that we:

_____ as Principal,
(Legal title of the Contractor)

_____
(Street, City, State, Zip Code)

and _____ as Surety,
(Legal title of the Surety)

_____
(Street, City, State, Zip Code)

are held and firmly bound unto the Dormitory Authority, 515 Broadway, Albany, New York 12207, as Obligee, hereinafter called the Owner, in the amount of:

Dollars _____
(Written Dollar Amount)

() _____
(Figure Dollar Amount)

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, CONTRACTOR, has by written agreement dated _____

entered into a Contract with the Owner for:

_____
(Title of Project)

in accordance with the Contract Documents and any changes thereto, which are made a part hereof, and are hereinafter referred to as the Contract.

A. If the Contractor well and fully performs the Contract, the Surety and the Contractor shall have no obligation under this Performance Bond, except to participate in conferences as provided in paragraph B1.

B. If there is no Owner Default, the Surety's obligation under this Performance Bond shall arise after:

   1. The Owner has notified the Contractor and Surety that the Owner is considering declaring a Contractor Default; and
   2. The Owner has declared a Contractor Default.

C. When the Owner has satisfied the conditions of paragraph B, the Surety shall, at the Owner's option, and at the Surety's expense take one the following actions within twenty (20) days after written notice is sent by the Owner to the Surety declaring a Contractor Default:

1. Arrange for the Contractor, with consent of the Owner, to perform and complete the Contract.
2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors.
3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the Owner and the contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Payment Bond and Performance Bond issued on the Contract, with a contract price between the Owner and contractor equal to the Balance of the Contract Price, and pay to the Owner the amount of damages as described in paragraph E in excess of the Balance of the Contract Price incurred by the Owner resulting from the Contractor Default.
4. Tender to the Owner the amount of this Performance Bond.

D. If the Surety does not proceed within the time prescribed in paragraph C , the Surety shall be deemed to be in default on this Performance Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

E. After the Owner has declared a Contractor Default, and when the Surety acts under paragraph C1, C2, or C3 above, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Contract. When the Surety acts under paragraph C1, C2 or C3 above, the Owner will agree to pay the Balance of the Contract Price to the Surety in accordance with and subject to the terms of the Contract or to a contractor selected to perform and complete the Contract in accordance with and subject to the terms of the contract between the Owner and contractor. When the Surety acts under paragraph C1 or C2 above, the Surety's obligation to perform and complete the Contract is not limited by the amount of this Performance Bond and the Balance of the Contract Price. When the Surety acts under paragraph C1, C2 or C3 above or fails to act under paragraph C, the Surety, in addition to its other obligations, is obligated without duplication for:

1. Additional legal, Design Professional, Consultant and delay costs resulting from the Contractor Default, or resulting from the actions or failure to act of the Surety under paragraph C.
2. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages for loss of beneficial use of the Work caused by delayed performance or non-performance of the Contractor.

F. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Performance Bond to any person or entity other than the Owner or its successors or assigns.

G. This Performance Bond and the Surety's obligations shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the Contract or the Work to be performed thereunder, or by the payment thereunder before the time required therein, or by any waiver of any provision or condition precedent or subsequent thereof, or by settlement or compromise of any claim or dispute related there to, or by assignment, subcontract or other transfer of the Work or any part thereof, or of any monies due or to become due thereunder; and the Surety hereby waives notice of any

and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers.

H. Any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to the Surety as though done or omitted to be done by or in relation to the Principal.

I. The obligations of the Surety under this Performance Bond shall be in no way impaired or affected by any winding up, insolvency, bankruptcy, or reorganization of the Principal or by any other rearrangement of the Principal for the benefit of creditors.

J. The Owner's acceptance of this Performance Bond shall in no way, for any purpose, limit or be claimed to limit the liability of the Principal under the Contract, but such liability shall remain in all respects to the same extent as is provided for in the Contract.

K. Notice to the Surety and the Contractor shall be mailed or delivered to the address shown on the signature page. Notice to the Owner shall be mailed or delivered to the address shown in the preamble.

L. Definitions:

1. ***Balance of the Contract Price*** - The total amount payable by the Owner to the Contractor under the Contract after all proper adjustments (increases and reductions) allowed by the Contract have been made, including, but not limited to, allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Contract.
2. ***Contract*** - The agreement between the Owner and the Contractor identified on the signature page, including all Contract Documents as defined in the General Conditions of the Contract and all changes, modifications, amendments, additions, and alterations thereto after the date of this Performance Bond.
3. ***Contractor Default*** - Failure of the Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
4. ***Owner Default*** - Failure of the Owner, which has neither been remedied nor waived, to pay the Contractor as required by the Contract or to perform and complete or comply with the other material terms thereof.

M. The penal sum of this Performance Bond is in addition to any other bond furnished by the Contractor and in no way shall be impaired or affected by any other bond.

N. Any suit under this Performance Bond must be instituted before the expiration of two (2) years from the date on which Final Payment is made under this Contract.

Signed as of this___day of_____20___

IN THE PRESENCE OF:

_____	_____
(Principal)	(Surety)
_____	_____
(Signature)	(Signature)
_____	_____
(Title)	(Title)
_____	_____
(Address)	(Address)
_____	_____
(City, State, Zip Code)	(City, State, Zip Code)
_____	_____
(Phone Number & FAX Number)	(Phone Number & FAX Number)
_____	_____
(Email Address)	(Email Address)

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING PERFORMANCE BOND
IF A CORPORATION

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____
(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____
Notary Public

ACKNOWLEDGEMENT OF CONTRACTOR EXECUTING PERFORMANCE BOND
IF A PARTNERSHIP, LIMITED LIABILITY COMPANY OR INDIVIDUAL

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me, the undersigned, a Notary Public in and for said State, personally appeared _____, personally known or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

ACKNOWLEDGEMENT OF SURETY

STATE OF _____

COUNTY OF _____

On the ___ day of _____ in the year 20___, before me personally came _____, to me known, who, being by me duly sworn, did depose and say that he/she resides at:

_____
(street, city, state, zip code)

that he/she is the _____ of _____, the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name thereto by authority of the Board of Directors of said corporation.

_____
Notary Public

DASNY | WE FINANCE, BUILD AND DELIVER.

DORMITORY AUTHORITY STATE OF NEW YORK

Construction General Conditions

CORPORATE HEADQUARTERS

515 Broadway
Albany, New York
12207-2964

T 518.257.3000
F 518.257.3100

NEW YORK OFFICE

One Penn Plaza, 52nd Fl.
New York, New York
10119-0098

T 212.273.5000
F 212.273.5121

BUFFALO OFFICE

539 Franklin Street
Buffalo, New York
14202-1109

T 716.884.9780
F 716.884.9787

www.dasny.org

Table of Contents

ARTICLE 1 -- DEFINITIONS

Section 1.01 - Definitions

The following terms as used in the Contract Documents shall be defined as follows:

Addendum or Addenda – Additional provisions of the Contract Documents issued in writing prior to the receipt of bids.

Alternate – Scope(s) of Work stated in the Contract documents to be added or deducted from the Contractor's base bid amount for alternate labor, materials and/or methods of construction.

Allowance – A sum of money set aside in the Agreement and included in the Contractor's lump sum base bid for a scope of work which has been specified in the Allowance section of the General Requirements. Reimbursement for Allowance work shall be as per General Conditions Article 7 – Changes in the Work.

Application for Payment – A Contractor's written billing request, on a form:

A. prepared by the Owner from the Schedule of Values approved by the Owner;

B. completed by the Contractor;

C. adjusted by the Owner; and

D. signed by the Contractor,

requesting partial or full payment for partial or full performance of the Contract.

Beneficial Occupancy – The stage in the performance of the Work prior to Substantial Completion when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents so the Owner or Client can occupy or utilize such portion of the Work for its intended use, evidenced by the Notice of Beneficial Occupancy executed by the Owner following approval from the Authority Having Jurisdiction. Beneficial Occupancy may or may not allow for completion of outstanding punchlist items, as required by the Contract Documents. Notice of Beneficial Occupancy requires that the designation portion of Beneficial Occupancy Work function in a safe, reliable and warrantable manner.

Change Order – Written notice, in a standard Owner's form, to the Contractor, signed by the Contractor and executed by the Owner, changing the Contract Documents in accordance with General Conditions Article 7 - Changes in the Work, or a Forced Change Order.

Claim - A demand by the Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, an extension of time, or other relief with respect to the terms of the Contract. The term Claim also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract.

Client - The entity for whom the Dormitory Authority is performing services, including subsidiaries, agents, related corporations, or fiduciaries of the entity.

Construction Manager - A natural person, partnership, limited liability company, corporation, or other legal entity regularly engaged in management of construction projects, and so designated by the Owner.

Consultant **-** A natural person, partnership, limited liability company, corporation, or other legal entity providing architectural, engineering, construction management, testing, inspection, commissioning, or other professional services, and so designated by the Owner.

Contract **-** The agreement between the Owner and the Contractor consisting of the Contract Documents.

Contract Amendment **–** A written instrument, signed by an authorized officer of the Dormitory Authority and an authorized officer of Contractor, amending, modifying, changing, or supplementing the Contract.

Contract Completion and Acceptance **-** The stage in the performance of the Work when all Work required to be performed by the Contract, including but not limited to submission of all documentation required for final payment, except any Work that may be required in the future with respect to:

A. any warranty or guarantee in the Contract Documents;

B. General Conditions Article 6 – Subcontracts, Sections 6.01 E through I;

C. General Conditions Article 14 - Protection of Persons and Property; or

D. General Conditions Article 15 – Insurance and Bonds,

is complete in accordance with the Contract Documents, evidenced by the Notice of Contract Completion and Acceptance executed by the Owner. Contract Completion and Acceptance follows or may be concurrent with Physical Completion.

Contract Documents **-** The Notice to Bidders, Information for Bidders, Form of Bid, Agreement, Payment Bond, Performance Bond, General Conditions, General Requirements, Drawings, Specifications, Addenda, Change Orders, Contract Amendments, and all provisions of law deemed to be included in the Contract.

Contractor **-** A natural person, partnership, limited liability company, corporation, or other legal entity with whom the Owner enters into the Contract to perform the Work.

Design Professional **-** A natural person, partnership, limited liability company, corporation, or other legal entity providing architectural or engineering professional services, and so designated by the Owner.

Disputed Work Directive **-** Written directive, in a standard Owner's form, from and executed by the Owner to the Contractor directing the Contractor to proceed with the Work described in the Disputed Work Directive in accordance with General Conditions Article 10 – Claims and Disputes.

Dormitory Authority **-** Dormitory Authority of the State of New York, a public benefit corporation established by the laws of the State of New York with its principal office located at 515 Broadway, Albany, New York, 12207-2964.

Extra Work **-** Any work in addition to the Work initially required to be performed by the Contractor pursuant to the Contract Documents.

Facility – the operating unit of the Client where the Site is located.

False Claim – Any Claim which is, either in whole or part, false or fraudulent.

False Representation – This action takes place when a person has knowledge of the value of the work and materials supplied, performed, or proposed (the "Information") constituting the Claim, Change Order, or Application for Payment and either:

A. acts in deliberate ignorance of the truth or falsity of the Information or

B. acts in reckless disregard of the truth or falsity of the Information.

Forced Change Order –Written notice, in a standard Owner's form, to the Contractor, without the Contractor's signature and executed by the Owner, changing the Contract Documents in accordance with General Conditions Article 7 – Changes in the Work.

Furnish - To deliver to the Site ready for installation.

Hazardous Material – any substance (gas, liquid, or solid) or agent (biological, chemical, radiological, physical, or having two or more of the preceding characteristics) which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors, including but not limited to heavy metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides, dioxins, biological wastes, carcinogens, asbestos or any substance containing asbestos, polychlorinated biphenyls, lead, urea formaldehyde, explosives, radionuclides, radioactive materials, chemicals known or suspected to cause cancer or reproductive toxicity, pollutants, effluents, contaminants, emissions, infectious wastes, any petroleum or petroleum-derived waste or product or related materials, and any item defined as a hazardous, special, or toxic material, substance, or waste under any Hazardous Material Law, including, but not limited to, the NYS Environmental Conservation Law and Title 6 of the New York Code of Rules and Regulations.

Hazardous Material Laws – collectively, any present federal, state or local law, including all valid amendments, relating to public health, safety, or the environment, including without limitation, the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §6901 et seq.; the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 ("SARA"); the Clean Air Act, 42 U.S.C. §7401 et seq.; the Hazardous Materials Transportation Act, 49 U.S.C. §5101 et seq.; the Clean Water Act, 33 U.S.C. §1215 et seq.; the Toxic Substances Control Act, 15 U.S.C. §2601 et seq.; the Safe Drinking Water Act, 42 U.S.C. §300f et seq.; the Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §136 et seq.; the Emergency Planning and Community Right-to-Know Act, 42 U.S.C. §11001 et seq.; the Occupational Safety and Health Act of 1970, 29 U.S.C. §651 et seq.; the Atomic Energy Act, 42 U.S.C. §2201 et seq.; the NYS Environmental Conservation Law; the NYS Labor Law; the NYS Public Health Law; and the amendments, regulations, orders, decrees, permits, licenses or deed restrictions now or hereafter enacted or promulgated under any such statute.

Install - To unload at the delivery point at the Site and perform every operation necessary to establish secure mounting and correct operation at the proper location.

Letter of Intent - Written notice, signed by the Owner, to the Contractor, which accepts the Contractor's Form of Bid and transmits the Agreement, Payment Bond, Performance Bond, and other documents to the Contractor for execution. The Letter of Intent is not the formal notice to begin the physical Work of the Contract.

Means and Methods of Construction - Labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by the Contract Documents.

Notice of Beneficial Occupancy – Written notice, in a standard Owner's form, to the Contractor, executed by the Owner and delivered to the Contractor prior to Substantial Completion, that certain Work of the Contract Documents, identified in such Notice of Beneficial Occupancy, satisfies the criteria for Beneficial Occupancy and will be occupied or utilized by the Owner or Client.

Notice of Contract Completion and Acceptance – Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, that the Work required to be performed by the Contract Documents, except any Work required by any warranty or guarantee in the Contract Documents, satisfies the criteria for Contract Completion and Acceptance.

Notice of Physical Completion - Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, that the Work of the Contract Documents satisfies the criteria for Physical Completion.

Notice of Substantial Completion - Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, that the Work of the Contract Documents satisfies the criteria for Substantial Completion and constitutes the start of the guarantee period.

Notice to Proceed –

A. Written notice, signed by the Owner, to the Contractor, that acknowledges receipt by the Owner of the signed Agreement, Payment Bond, and Performance Bond from the Contractor and directs the Contractor to start performance of the Work; or

B. Written notice, in a standard Owner's form, to the Contractor, executed by the Owner, directing the Contractor to proceed with the change in the Work described therein in accordance with General Conditions Article 7 – Changes in the Work. A Notice to Proceed cannot change the Contract amount or the date to achieve Substantial Completion. A Notice to Proceed can change only the General Requirements, the Drawings, or the Specifications.

NYS – New York State

Other Contractor(s) – The one or more natural persons, partnerships, limited liability companies, corporations, or other legal entities who have entered into a contract with the Owner to perform work (including services) at or near the Site, identified in the Contract Documents or in writing by the Owner, including, but not limited to, contractors, Construction Managers, Consultants, and Design Professionals. Other Contractors does not include the Contractor.

Owner - Dormitory Authority of the State of New York.

Owner's Representative - A natural person, partnership, limited liability company, corporation, or other legal entity so designated by the Owner to act on behalf of the Owner. See General Conditions Section 2.03 for limitations and further provisions on the Owner's Representative.

Physical Completion – The stage in the performance of the Work when all Work to be performed at the Site, except any Work that may be required in the future by any warranty or guarantee in the Contract Documents, is complete in accordance with the Contract Documents, evidenced by the Notice of Physical Completion executed by the Owner. Physical Completion precedes or may be concurrent with Completion and Acceptance. Physical Completion requires that all punchlist work be completed by the Contractor such that the Contractor no longer is required to perform Work at the site. All insurances must remain in effect

until the Contractor achieves Physical Completion and the Contractor is required to submit certified payrolls through the date of Notice of Physical Completion.

Project - The work at or near the Site(s) carried out pursuant to the Contract and one or more other contracts.

Project Management Program – The software program used by the Owner to manage, monitor, and oversee performance of the Contract.

Provide - To Furnish and Install the Work complete in place and ready for its intended use.
Resume Work Order or Directive – Written notice, signed by the Owner, to the Contractor, to recommence or continue Work of the Contract Documents.

Schedule of Values – a form provided by the Owner, completed by the Contractor, and submitted to the Owner for review and written approval; the completed, approved form establishes a minimum level of allocation of the Contract amount among the items of Work to formulate the Contractor's billing requests.

Site - The area(s) within the Contract limit, as indicated by the Contract Documents.

Stop or Suspend Work Order or Directive- Written notice, signed by the Owner, to the Contractor, to cease or hold Work of the Contract Documents.

Subcontract - An agreement between the Contractor and Subcontractor for Work on the Site.

Subcontractor - A natural person, partnership, limited liability company, corporation, or other legal entity under contract with the Contractor, or under contract with any Subcontractor, to perform any portion of the Work, or to provide any labor, material, equipment, or service at the Site.

Substantial Completion – The stage in the performance of the Work when all Work is sufficiently complete in accordance with the Contract Documents so the Owner or Client can occupy or utilize the Work for its intended use, evidenced only by the Notice of Substantial Completion executed by the Owner. Issuance of a temporary certificate of occupancy or a temporary approval for occupancy does not establish Substantial Completion. Work at the site (Physical Completion), and Work required by the Contract (Completion and Acceptance) may still be required.

Unit Price – The price for one measured unit (i.e. cu. ft., sq. foot etc.) of completed Work activity. Each Unit Price includes all labor, material, equipment, overhead, and profit attributable to that scope of Work. Unit Prices shall be based upon estimated quantities specified in the Unit Prices section of the General Requirements and as listed on the Form of Bid and will be paid based upon actual quantities of Work performed as verified by the Owner.

Unmanned Aircraft System (UAS or ***DRONES***)- An aircraft and its associated elements (including communication links and the components that control the unmanned aircraft) operated without the possibility of direct human intervention from within or on the aircraft.

Work - All obligations explicitly and implicitly imposed upon the Contractor by the Contract Documents.

ARTICLE 2 -- CONTRACT DOCUMENTS

Section 2.01 - Captions

The table of contents, titles, captions, headings, running headlines, and marginal notes contained herein and in the Contract Documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect the interpretation of the provisions to which they refer.

Section 2.02 – Electronic Data Transfer

A. Electronic data includes, but is not limited to, all digital versions of any Contract Document, all digital files produced by mechanical, facsimile, electronic, magnetic, digital or other programs, programming notes or instructions, activity listings of electronic mail receipts or transmittals, output resulting from the use of any software program, including but not limited to, word processing documents, spreadsheets, database files, charts, graphs, drawings, specifications, outlines, electronic mail, personal digital assistant messages, instant messenger messages, PDF files, PRF files, batch files, ASCII files, DWG files and any other type of files now or hereafter allowed by Owner.

B. The Owner reserves the right to implement an electronic payment program for payments due the Contractor. Prior to implementation, the Owner, in writing, shall notify the Contractor one hundred twenty (120) calendar days prior to the effective date of the electronic payment program. Commencing on or after the electronic payment effective date, all payments, due the Contractor, shall only be rendered electronically, unless payment by paper check is authorized in writing by the Owner. Commencing on or after the electronic payment effective date, the Contractor, further acknowledges and agrees that the Owner may withhold payments, if the Contractor has not complied with the Owner's policies and procedures relating to the electronic payment program in effect at such time, unless payment by paper check is authorized in writing by the Owner.

C. Electronic data produced in connection with the Contract is proprietary information of the Owner and to be treated as confidential and not to be disclosed to or shared with others outside the limits of the Contract without the express written consent of the Owner. The Owner makes no warranty, express or implied, as to the accuracy of the information transferred.

D. The Contractor shall pay, on behalf of the Owner, any loss which the Owner becomes legally liable to pay as a result of a claim by any person or entity against the Contractor or Owner, which results directly from an act, error, or omission of the Contractor in the provision of electronic data in respect to the Contract.

Section 2.03 - Owner

A. The Contract constitutes the entire agreement and understanding between the Contractor and the Owner with respect to the Project and supersedes all prior agreements, arrangements and understandings, and all trade custom and trade usage, and the construction of any provision of the Contract shall not be affected by the wording of any other agreement, whether between the Contractor and the Owner or involving other parties. The Contract may not be amended, modified, supplemented, or changed in any way except in accordance with General Conditions Article 7 – Changes in the Work or a Contract Amendment. The legal relationship between the Owner and the Contractor shall be governed solely by the Contract and no rights shall arise on any other basis, including but not limited to, oral agreement, partial performance, estoppel, conduct of the parties, course of conduct or any other course of dealing

involving the Project or any other project. The meaning and intent of the Contract Documents shall be interpreted solely by the Owner.

B. The Owner shall give all orders and directions contemplated under the Contract relative to the execution of the Work. The Owner shall determine the amount, quality, and acceptability of the Work and shall decide all questions which may arise in relation to said Work. The Owner's estimates and decisions shall be final except as otherwise expressly provided herein.

C. The Owner may, at its sole and exclusive discretion, waive certain provisions of the Contract Documents. Such waiver shall only be done by written instrument signed by a duly authorized officer of the Owner, and any such waiver shall apply solely in accordance with its terms and shall not act as a waiver of any provision of the Contract Documents, or estoppel against the enforcement thereof, in connection with any subsequent or separate event involving the Project or other projects.

D. Any differences or conflicts concerning performance which may arise between the Contractor and Other Contractors performing work for the Owner shall be analyzed and resolved by the Owner as warranted by the circumstances. The Owner's exercise of discretion in this regard shall be sole and exclusive and its decision concerning such differences and conflicts shall be final and binding.

E. The Owner may act through an Owner's Representative designated as such in writing by the Owner. Unless otherwise designated by the Owner, the Owner's Representative is the Owner's employee assigned to the Project as the project manager. Unless otherwise stated in writing by the Owner, the Owner's Representative is not an authorized officer of the Owner, does not have authority to approve a Labor Rate Worksheet on behalf of the Owner, does not have authority to waive the requirement for a narrative and fragnet schedule of General Conditions Section 7.01 C. 4, does not have authority to waive any provision of the Contract Documents and does not act for the Owner for General Conditions Article 15 – Insurance and Bonds. Unless otherwise stated in writing by the Owner and notwithstanding the other provisions of this paragraph, the Owner's Representative does have authority to issue a direction to attend a meeting in accordance with General Conditions Section 4.04, a Notice to Proceed in accordance with General Conditions Section 7.01 and a Disputed Work Directive in accordance with General Conditions Section 10.01. The Owner may change the Owner's Representative and the scope of her, his or its duties by written notice to the Contractor in accordance with General Conditions Section 2.04. The Owner's Representative's signature by itself on a Change Order is not execution of a Change Order by the Owner. See General Conditions Section 7.01 A. 5 for the requirements for execution of a Change Order by Owner.

Section 2.04 - Notice and Service Thereof

A. Any notice to the Contractor from the Owner relative to any part of the Contract shall be in writing and service considered complete when said notice is sent or delivered in person to the Contractor or its authorized representative, at the street address, postal address or email address given by the Contractor in the Form of Bid. The Contractor may change any of these addresses by written notice to the Owner's Procurement Unit, 515 Broadway, Albany, New York 12207 - 2964; such change shall not be effective until Contractor receives from the Owner's Procurement Unit a written acknowledgement that the change has been received.

B. Any notice from the Contractor to the Owner required by any part of the Contract shall be in writing and shall be sent or delivered to the Owner's Representative at the street address, postal address or email address for the Owner's Representative given in the Notice to Bidders. The Owner may change the Owner's Representative or any of these addresses by written notice to the Contractor. If any part of the Contract shall require the Contractor to provide notice to any other employee or unit of the

Owner, the notice to such employee or unit is in addition to, and does not replace, the notice to the Owner's Representative. Notice to the Owner may be delivered by certified mail, overnight delivery by a nationally recognized courier or, if an email address is provided, email. The Owner's Representative will endeavor to provide a written acknowledgment of receipt of the notice but any failure to provide such written acknowledgment shall not be a breach of the Contract, shall not in any way alter the Contractor's obligation to provide timely notice and shall not in any way alter any of the other obligations of the Contractor under the Contract.

C. For all notices from the Contractor to the Owner required by any part of the Contract, the Contractor shall have the burden of proving the Owner's receipt of the notice.

Section 2.05 - Nomenclature

Materials, equipment, or other Work not defined or specified in the Contract but described in words that have a generally accepted technical or trade meaning shall be interpreted as having said meaning in connection with the Contract.

Section 2.06 - Invalid Provisions

If any term or provision of the Contract Documents or the application thereof to any natural person, partnership, limited liability company, corporation or other legal entity or circumstance shall, to any extent, be determined to be invalid or unenforceable, the remainder of the Contract Documents, or the application of such terms or provisions to natural persons, partnerships, limited liability companies, corporations or other legal entities or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby and each term or provision of the Contract Documents shall be valid and be enforced to the fullest extent permitted by law. It is the intent of the Owner and the Contractor that all provisions of the Contract shall be construed to be valid under applicable law and shall be enforced to the maximum extent possible.

Section 2.07 – Interpretation of Contract Documents

A. Should any provision in the Contract Documents be in conflict or inconsistent with the General Conditions or supplements thereto, the General Conditions or supplements thereto shall govern.

B. Figured dimensions shall take precedence over scaled dimensions. Larger scale Drawings shall take precedence over smaller scale Drawings. Latest Addenda shall take precedence over previous Addenda and earlier dated Drawings and Specifications.

C. Should a conflict occur in or between or among any parts of the Contract Documents that are entitled to equal preference, the better quality or greater quantity of material or more onerous provision in the Owner's judgment shall govern, regardless of cost, unless the Owner directs otherwise in writing. In each conflict, the Owner, in its sole and exclusive discretion, shall determine whether the quality, quantity or onerous provision method will be used to resolve the conflict.

D. Drawings and Specifications are complementary. Anything shown on the Drawings and not mentioned in the Specifications, or mentioned in the Specifications and not shown on the Drawings, shall have the same effect as if shown or mentioned in both.

E. The term "materials" includes "supplies".

F. Words of the masculine gender shall be deemed and construed to include correlative words of the feminine and neuter genders. Unless the context shall otherwise indicate, words importing the singular number shall include the plural number and vice versa.

Section 2.08 - Copies of Contract Documents

The Owner may furnish to the Contractor up to three (3) paper copies and one electronic (PDF) copy of the Contract Documents without charge. Additional sets may be furnished at the costs of reproduction and mailing.

ARTICLE 3 -- SITE CONDITIONS

Section 3.01 - Subsurface or Site Conditions Found Different

A. The Contractor acknowledges that the Contract amount set forth in its bid includes such provisions which the Contractor deems sufficient for all subsurface or site conditions the Contractor could reasonably anticipate encountering as indicated in the Contract Documents, or borings, reports, rock cores, foundation investigation reports, topographical maps, or other information available to the Contractor or from the Contractor's inspection and examination of the Site prior to submission of bids.

B. The Owner assumes no responsibility for the correctness of any boring or other subsurface information and makes no representation whatsoever regarding subsurface conditions and test borings, reports, rock cores, foundation investigation and topographical maps which may be made available to the Contractor.

C. Should the Contractor encounter subsurface or site conditions at the Site materially differing from those shown on or described in or indicated in the Contract Documents, the Contractor shall immediately give written notice to the Owner of such conditions and shall not disturb said conditions until authorized to do so by the Owner in writing.

D. Subsurface or site conditions found materially differing from those that could have been reasonably anticipated may be cause for change to the Contract amount and time of completion. This determination will be made at the sole and exclusive discretion of the Owner.

Section 3.02 - Verifying Dimensions and Conditions

A. The Contractor shall take all measurements at the Site and shall verify all dimensions and conditions at the Site before proceeding with the Work. If said dimensions or conditions are found to conflict with the Contract Documents, the Contractor immediately shall refer said conflict to the Owner in writing. The Contractor shall comply with any revised Contract Documents.

B. During the performance of the Work, the Contractor shall verify all field measurements prior to fabrication of building components or equipment, and proceed with the fabrication to meet field conditions.

C. The Contractor shall review all Contract Documents to determine exact location of all Work and verify spatial relationships of all the Work. Any question concerning said location or spatial relationships shall be submitted in a manner approved by the Owner.

D. Special locations for equipment, pipelines, ductwork, and other such items of the Work, where not dimensioned on plans, shall be coordinated with affected Other Contractors.

E. The Contractor shall be responsible for the proper fitting of the Work in place.

Section 3.03 - Surveys

Unless otherwise expressly provided in the Contract Documents, the Owner shall furnish the Contractor all surveys of the property necessary for the Work, but the Contractor shall lay out the Work.

ARTICLE 4 -- CONTRACTOR

Section 4.01 - Representations of Contractor

The Contractor represents and warrants:

A. That it is financially solvent and is experienced in and competent to perform the Work, and has the staff, workers, equipment, subcontractors, and suppliers to complete the Work within the time specified for the Contract amount.

B. That it is familiar with all federal, state, and local laws, codes, ordinances, orders, rules, and regulations which may affect the Work, the Contractor, or the Project.

C. That all temporary and permanent Work required by the Contract Documents can be satisfactorily constructed, and that said construction will not injure any person or damage any property.

D. That it has carefully examined the Contract Documents and the Site, and from the Contractor's own investigations is satisfied as to the nature and materials likely to be encountered, the character of equipment and other facilities needed for the performance of the Work, the general and local conditions, and all other materials or items which may affect the Work.

E. That it is satisfied that the Work can be performed and completed as required in the Contract Documents, and warrants that it has not been influenced by any oral statement or promise of the Owner or the Design Professional.

F. That to the best of Contractor’s knowledge, there are no pending or threatened suits, proceedings, judgments, rulings, or orders by or before any court or any governmental agency or arbitrator that could reasonably be expected to affect materially and adversely:

   1. the financial condition or operations of the Contractor;

   2. the ability of the Contractor to perform its obligations hereunder; or

   3. the legality, validity, or enforceability of this Contract.

G. That Contractor is a duly organized and validly existing entity of the type described in the recital clauses of the Agreement and is in good standing under the laws of the jurisdiction of its formation; it has the legal right, power, and authority and is qualified to conduct its business and to execute and deliver this Contract and perform its obligations under this Contract; and all regulatory authorizations have been obtained and will be maintained, as necessary, for it to perform legally its obligations under this Contract.

H. That executing and performing this Contract are within Contractor’s powers; that executing and performing this Contract has been duly authorized by all necessary action on the Contractor’s part; and

that such actions do not and will not violate any provision of law or any rule, regulation, order, writ, judgment, decree, or other determination presently in effect applicable to Contractor or its governing documents.

I. That this Contract constitutes the Contractor's legal, valid, and binding obligation, enforceable against it in accordance with this Contract's terms, subject to applicable bankruptcy, insolvency, reorganization, and other laws affecting creditors' rights generally, and general equitable principles, to the discretion of the court before which proceedings to obtain the same may be pending.

J. That Contractor is in good standing with any union with craft labor on the Site for part or all the Work of this Contract or the work of the Project.

K. That Contractor is experienced in the methods of design, engineering, installation, management, and construction contemplated for the Work of this Contract and for contracts of this nature, scope magnitude and quality and that the Contractor understands the complexity involved in this type of Contract and the necessity to coordinate its Work with appropriate governmental agencies, the Owner, and the Other Contractors.

L. That Contractor is fully informed as to all existing conditions and limitations, including local workforce/labor working arrangements and the continuous, regular, and uninterrupted operations of the Facility.

M. That Contractor has had the opportunity to consult with or has consulted with legal counsel of its choice before entering into this Contract.

N. That any breach of any of the representations and warranties of this General Conditions Section 4.01, any failure of the Contractor to familiarize itself with the Contract Documents, the Facility, the Site or the Project or any lack of knowledge on the part of the Contractor of any existing or foreseeable condition or conditions at the Site reasonably inferred from the Contract Documents which create difficulties or hindrances in the execution of the Work shall constitute a conclusive and binding determination by the Contractor that resolving any adverse impact of such breach, failure or lack of knowledge does not constitute Extra Work and a waiver by the Contractor of all Claims for additional compensation or damages or time to achieve Substantial Completion as a result of the breach, failure or lack of knowledge.

Section 4.02 - Errors or Discrepancies

The Contractor shall examine the Contract Documents thoroughly before commencing the Work and report any errors or discrepancies to the Owner, in writing, within fifteen (15) calendar days of discovery. The Owner shall not be responsible for costs, damages or delays due to the Contractor's failure to comply with the requirements of this General Conditions Section 4.02.

Section 4.03 - Coordinated Composite Drawings

A. The Contractor shall prepare coordinated composite drawings clearly showing how the Work of the Contractor is to be performed in relation to the work of Other Contractors, prepare scaled drawings and sections in the same digital software program, version, and operating system as the original Contract Drawings or in an operating system approved by the Owner.

B. If, and only if, required by the Information for Bidders for the Contract, the Contractor shall run a conflicts and coordination check utilizing the Project Drawings within a three-dimensional software

program of the Contractor's choice to limit the number of physical conflicts that may occur during construction. Failure to run such a conflicts and coordination check or to resolve conflicts and coordination issues identified as a result of such a check prior to the initiation of the Work on Site shall constitute a:

1. conclusive and binding determination by the Contractor that resolution of the conflicts does not involve Extra Work; and

2. waiver by the Contractor of all Claims for additional compensation, damages, or time to achieve Substantial Completion as a result of the existence of physical conflicts.

Section 4.04 - Meetings

The Contractor shall attend all meetings required by the Contract Documents and all meetings when directed to attend by the Owner. The Contractor shall be represented at all meetings by the on-Site superintendent described in General Conditions Section 4.05 A who shall attend the meetings in person unless the Owner in writing prior to the meeting directs otherwise. If the Owner directs, the Contractor shall be represented either by the project management personnel of General Conditions 4.05 B or by an authorized officer of Contractor; in each case, the project management personnel or the authorized officer shall attend the meetings in person. The Owner, in its sole and exclusive discretion, shall determine the time, date, location, and purpose of the meeting. The purpose of a meeting includes, but is not limited to, Project progress, submittal status, Change Orders, site logistics, coordination, inspections, testing, safety reviews, or anything which the Owner determines is useful for administration or performance of the Contract or the Project.

Section 4.05 - Supervision by Contractor

A. The Contractor shall provide full-time competent supervision for the duration of the Contract. During the course of on-Site Work, the Contractor shall provide a full-time on-Site superintendent who shall have full authority to act for the Contractor at all times. The superintendent shall read, write, and speak English fluently, as well as communicate with the Contractor's workers and the workers of all Subcontractors.
B. The Contractor shall also provide competent project management personnel in addition and superior to the full-time on-Site superintendent who shall also have full authority to act for the Contractor at all times except such project management personnel cannot modify or rescind any action of the full-time on-Site superintendent directed to the Owner without the Owner's written consent.

C. If at any time the supervisory staff is not satisfactory to the Owner, the Contractor shall, if directed in writing by the Owner, immediately replace such supervisory staff with other staff satisfactory to the Owner at no additional cost to the Owner.

D. The Contractor shall remove from the Work any employee of the Contractor or of any Subcontractor when so directed in writing by the Owner.

Section 4.06 – Project Scheduling

A. The Contractor shall provide a project scheduler, experienced in critical path method (CPM) scheduling. The scheduler's experience and credentials shall be submitted in writing to the Owner for review and acceptance prior to proceeding with scheduling of the Work. The Owner may withdraw its acceptance of the project scheduler at any time thereafter for failure to perform in accordance with the Contract. The Contractor shall provide a replacement scheduler and submit the replacement's

experience and credentials in writing to the Owner for review and acceptance as soon as possible. The replacement scheduler shall be at no additional cost to the Owner.

B. Using the software required by the Owner, the Contractor shall prepare, maintain, and revise the Project CPM schedule to plan and monitor the progress of all Project operations, in accordance with the Contract Documents. See the General Requirements for further details.

C. Construction activities shall be interrelated on a single Project CPM schedule that represents the entire Project, including the entire Contract duration from Notice to Proceed to Substantial Completion and through Contract Completion and Acceptance. The Contractor shall utilize the critical path method of network calculation to generate the Project CPM schedule and shall utilize the time-scaled precedence diagram method to show the Project CPM Schedule. The Project CPM Schedule shall utilize calendar days for the time scale. The Contractor shall ensure all logic constraints are identified between the Work of the Contract, the work of Other Contractors and Owner's work prior to approval of the Project CPM schedule. See the General Requirements for further details.

D. The Owner may reject any proposed Project CPM schedule, any proposed updated Project CPM schedule or any proposed recovery Project CPM schedule if the Owner, in its sole and exclusive discretion, finds the proposed Project CPM schedule, proposed updated Project CPM schedule or proposed recovery Project CPM schedule defective for any reason, including but not limited to:

1. Defective logic;

2. Excessive use of constraints;

3. Activity durations that are inconsistent with actual or available workforce;

4. The appearance of an effort to manipulate the schedule so that responsibility for an adverse impact is associated with a natural person or entity other than the natural person or entity responsible for the adverse impact; or

5. Lacking executive summary and/or narrative.

E. If a proposed Project CPM schedule, proposed updated Project CPM schedule or proposed recovery Project CPM schedule is rejected by the Owner, the Owner will notify the Contractor in writing of the rejection and the reason or reasons for the rejection. Contractor shall submit a new proposed Project CPM schedule, proposed updated Project CPM schedule or proposed recovery Project CPM schedule with the defect or defects corrected at no cost to the Owner within two weeks of the Owner's written rejection.

F. Review comments made by the Owner on the proposed Project CPM schedule, any proposed updated Project CPM schedule or any proposed recovery Project CPM schedule shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor shall be responsible for scheduling, sequencing, and performing the Work to comply with the requirements of the Contract Documents.

G. The Contractor expressly understands and agrees that no additional compensation shall be paid for any alterations to Contractor's planned construction sequence to accommodate the Project CPM schedule requirements, any updated Project CPM schedule or any recovery Project CPM schedule pursuant to

the Contract. Failure to include any element of work required for the performance of the Work shall not excuse the Contractor from completing all the Work required within the applicable completion date of each phase in the Contract Documents regardless of the Owner's approval of the Project CPM schedule, any updated Project CPM schedule or any recovery Project CPM schedule.

H. The Owner may withhold payments, in whole or in part, if the Contractor fails to provide an acceptable project scheduler, replacement project scheduler, Project CPM schedule, updated Project CPM schedule, recovery Project CPM schedule or other schedule information or reports in accordance with requirements of the Contract.

Section 4.07 - Worker Identification and Site Access Control

A. All employees of the Contractor and every Subcontractor shall comply with all site access control, safety and security procedures prescribed by the Owner which may include, but are not limited to, the wearing of Owner issued identification badges, ingress and egress through controlled entry and exit points, and use of card readers or other electronic identity verification devices. Contractor cannot authorize any one to enter the Site, except Contractor's and Subcontractor's employees and persons delivering materials or equipment to Contractor or a Subcontractor, without the prior written consent of the Owner.

B. All employees of the Contractor and every Subcontractor, prior to entering the Site for the first time, shall obtain an identification badge if issued by the Owner and produce to the Owner a valid form of government-issued photo identification and furnish other background information, including but not limited to the following:

Full Name
Last four (4) digits of Social Security Number
Home Address (#/Street/Apt./City/Zip)
Contractor/Subcontractor Name
Job Classification
Union Local Affiliation, if any

The Owner recognizes that certain information requested above constitutes personal information and will take all reasonable steps to ensure the security and confidentiality of this information as required by law.

C. All employees of the Contractor and every Subcontractor shall visibly display on their person, while entering and on the Site, an identification badge if issued by the Owner. In the event said identification badge has not been issued by the Owner, all employees of the Contractor and every Subcontractor shall produce a valid form of government-issued photo identification promptly upon request of the Owner. Failure to display such identification or to produce such identification in the manner as prescribed by the Owner may result in the employee's non-admittance to or immediate removal from the Site. The Owner will send written confirmation to the Contractor confirming the action taken, if requested by the Contractor.

Section 4.08 - Related Work

A. The Contractor should examine the Contract Documents for Work of its Contract and any related work of other contracts, to ascertain the relationship of its Work to any related work of other contracts.

B. The Owner may contract with a Design Professional, Construction Manager, or other Consultants to provide services to the Owner. The services enumerated in consultant contracts are for the benefit of the Owner who may choose to utilize any or all of said services. The Contractor has no privity of contract with the Design Professional, Construction Manager, or any other Consultant which contracts with the Owner and should not assume that all of the services enumerated in said contracts will be provided.

C. The Contractor shall adhere to all of the requirements specified or communicated by the Design Professional in performing delegated design work required by the Contract Documents.

Section 4.09 – Coordination with Separate Contracts

A. The Owner may award other contracts for work which may proceed simultaneously with the execution of the Work. The Contractor shall coordinate the Contractor's operations with those of Other Contractors as directed by the Owner. Cooperation shall be required in the arrangements for access, the storage of material, and in the detailed execution of the Work.

B. The Contractor shall take those steps reasonably necessary to keep itself informed of the progress and workmanship of Other Contractors and any subcontractors of Other Contractors and shall notify the Owner in writing immediately of lack of progress or defective workmanship on the part of Other Contractors or any subcontractors of Other Contractors, where said delay or defective workmanship may interfere with the Contractor's operations.

C. Failure of a Contractor to keep so informed and failure to give written notice of lack of progress or defective workmanship by Other Contractors or any subcontractors of Other Contractors shall be construed as acceptance by the Contractor of said progress and workmanship as being satisfactory for proper coordination with the Work.

D. Where the Contractor shall perform Work in close proximity to work of Other Contractors or any subcontractors of Other Contractors, or where there is evidence that Work of the Contractor may interfere with work of Other Contractors or any subcontractors of Other Contractors, the Contractor shall assist in arranging space conditions to make satisfactory adjustment for the performance of the Work. If the Contractor performs Work in a manner that causes interference with the work of Other Contractors or any subcontractors of Other Contractors, the Contractor shall make changes necessary to correct the condition at no additional cost to the Owner.

E. The Contractor shall render any assistance which the Owner may require with respect to any claim or action in any way relating to the Work including, without limitation, review of claims, preparation of technical reports and participation in negotiations, without any additional compensation therefor.

Section 4.10 - Cooperation with Other Contractors

A. During the performance of the Work, Other Contractors may be engaged in performing work. The Contractor shall coordinate the Contractor's Work with the work of said Other Contractors in such a manner as the Owner may direct.

B. If the Owner determines that the Contractor is failing to coordinate the Work with the work of Other Contractors as the Owner has directed:

1. The Owner shall have the right to withhold any payments due under the Contract until the Contractor complies with the Owner's direction; and

2. The Contractor shall assume the defense and pay on behalf of the Owner any and all claims or judgments or damages and any costs to which the Owner may be subjected or which the Owner may suffer or incur by reason of the Contractor's failure to promptly comply with the Owner's directions, including, but not limited to attorney's fees, expert fees, and costs. Notwithstanding the foregoing, the Owner retains the right to select its own counsel for such defense, the cost of which is to be paid by the Contractor.

C. If the Contractor notifies the Owner, in writing, that an Other Contractor on the Site is failing to coordinate its work with the Work, the Owner shall investigate the charge. If the Owner finds it to be true, the Owner shall promptly issue such directions to the Other Contractor with respect thereto as the situation may require. The Owner shall not be liable for any damages suffered by the Contractor by reason of the Other Contractor's failure to promptly comply with the directions so issued by the Owner, or by reason of an Other Contractor's default in performance.

D. Should the Contractor sustain any damage through any act or omission of any Other Contractor having a contract with the Owner or through any act or omission of any subcontractor of said Other Contractor, the Contractor shall have no Claim against the Owner for said damage.

E. Should any Other Contractor having or which shall have a contract with the Owner sustain damage through any act or omission of the Contractor or through any act or omission of a Subcontractor, the Contractor shall reimburse said Other Contractor for all said damages and shall indemnify and hold the Owner harmless from all such claims by said Other Contractor, including, but not limited to attorney's fees, expert fees, and costs. Notwithstanding the foregoing, the Owner retains the right to select its own counsel for such defense, the cost of which is to be paid by the Contractor. The Owner's right to indemnification hereunder shall in no way be diminished, waived, or discharged, by its recourse to assessment of liquidated damages as provided in the Contract Documents, or by the exercise of any other remedy provided by the Contract or law.

F. The Owner cannot guarantee the responsibility, efficiency, unimpeded operations, or performance of any contractor. The Contractor acknowledges these conditions and shall bear the risk of all delays including, but not limited to, delays caused by the presence or operations of Other Contractors and subcontractors of Other Contractors and delays attendant upon any Project CPM schedule approved by the Owner and the Owner shall not incur any liability by reason of any delay.

ARTICLE 5 -- MATERIALS AND LABOR

Section 5.01 - Contractor's Obligations

A. The Contractor shall, comply with all the terms of the Contract Documents and complete all the Work in a good worker like manner, within the time specified in the Contract and to the satisfaction of the Owner.

B. The Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, permits, insurance, temporary structures and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent, and whether incorporated or to be incorporated in the Work or not incorporated in the Work.

C. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

D. Any labor, materials or means whose employment, or utilization during the course of the Contract may tend to or in any way cause or result in strike, work stoppages, delays, suspension of Work or similar troubles by workers employed by the Contractor, its Subcontractors or material suppliers, or by any of the trades working in or about the Site, or by Other Contractors, their subcontractors or material suppliers pursuant to other contracts shall not be allowed. Any violation by the Contractor of this requirement may in the sole judgment of the Owner be considered a default by the Contractor under the Contract and a basis for the Owner to take action against the Contractor as set forth in General Conditions Article 11 – Termination or Suspension or such other action as the Owner may deem proper.

E. The Contractor and each Subcontractor shall comply with all applicable local, state, and federal laws, rules and regulations and all applicable construction standards issued by the Joint Commission and other accrediting agencies and organizations.

F. The Contractor and each Subcontractor shall comply with all applicable Hazardous Material Laws. The Contractor shall provide the Owner the Safety Data Sheets for any Hazardous Materials or hazardous substances brought on the Site by the Contractor or a Subcontractor at least fifteen (15) calendar days prior to the delivery of such materials to the Site. Contractor shall identify to Owner at least fifteen (15) calendar days in advance the quantities of all "Chemicals of Interest" listed under the Chemical Facility Anti-Terrorism Standards of the Homeland Security Appropriations Act of 2007 that will be brought onto the Site.

G. Contractor shall provide the necessary information and training to its employees on each Hazardous Material and hazardous substance to which they may be exposed on the Site and shall cause each of its Subcontractors to provide the necessary information and training to the Subcontractor's employees on each Hazardous Material and hazardous substance to which they may be exposed on the Site. Upon request of the Owner, Contractor shall provide the Owner with proof, satisfactory to the Owner, that Contractor's employees and all Subcontractors' employees have received the necessary information and training.

H. Contractor shall not transport, store or use, and shall prohibit Subcontractors from transporting, storing or using, any construction materials or equipment (whether or not totally enclosed) containing Hazardous Materials including, but not limited to, asbestos, polychlorinated biphenyls, benzene, lead or urea formaldehyde in connection with this Contract; provided, however, Contractor and Subcontractors may transport, store and use the following substances: lead, natural gas, gasoline, diesel fuel, fuel oil(s), gravel(s), lube oil(s), grease(s), sealant(s), combustible gases, form oil(s), solvent(s), adhesives, paints, coatings, and all other materials that are used or consumed in or during construction or testing of the Work and its constituent systems and components in quantities reasonably necessary to perform the Work, if transported, stored and used in accordance with applicable laws including, but not limited to, those laws related to the implementation and utilization of spill containment, transport systems and storage vessels and facilities.

I. Any Hazardous Materials and hazardous substances brought to or stored on or at the Site shall require specific, prior written authorization from Owner and, as a condition to such authorization, Contractor shall provide Owner with the Material Safety Data Sheet covering any Hazardous Material or hazardous substance furnished under or otherwise associated with the Work (including the construction equipment). Contractor shall maintain on the Site, at all times, complete records, and inventories, including Safety Data Sheets, of Hazardous Materials and hazardous substances described in this

General Conditions Section 5.01 that are being used by it or its Subcontractors, or any persons for whose actions on the Site Contractor is responsible.

Section 5.02 - Means and Methods of Construction

A. Unless otherwise provided in the Contract Documents, the Contractor shall choose the Means and Methods of Construction subject to the Owner's right to reject, at any time, the Means and Methods of Construction proposed by the Contractor, which in the opinion of the Owner:

1. Will constitute or create a hazard to the Work or to persons or property;

2. Will not produce finished Work in accordance with the terms of the Contract;

3. Will be detrimental to the overall progress of the Project; or

4. Will have an adverse impact on the operations of the Client.

B. The Owner's failure to exercise its right to reject the Contractor's Means and Methods of Construction shall not relieve the Contractor of its obligation to complete the Work; the Owner's exercise of its right to reject the Contractor's Means and Methods of Construction shall not create a Contractor's or Subcontractor's cause of action for damages against the Owner.

Section 5.03 - Contractor's Title to Materials

A. No materials for the Work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by any other party. The Contractor warrants that the Contractor has full, good, and clear title to all materials used by the Contractor in the Work, or resold to the Owner pursuant to the Contract Documents free from all liens, claims or encumbrances.

B. For all materials and equipment to be stored at a location other than the Site prior to execution of an agreement with the Owner for materials stored off-site pursuant to General Conditions Section 8.01 G, the Contractor shall provide the Owner with written notice of the location, security, environmental protections and the materials or equipment to be stored at that location at least fifteen (15) calendar days before such storage begins. Such notice does not obligate the Owner to pay for such stored material or equipment. Payment for stored material or equipment can be made only when the requirements for such payment in General Conditions Article 8 - Payment and elsewhere in the Contract have been met.

C. All materials, equipment and articles which become the property of the Owner shall be new unless specifically stated otherwise.

Section 5.04 - Comparable Products ("Or Equal" Clause)

A. Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalogue number, or make, said identification is intended to establish a standard. Any material, article or equipment of other manufacturers and vendors which performs satisfactorily the duties imposed by the design intent may be considered equally acceptable provided that, in the opinion of the Design Professional, the material, article, or equipment so proposed is of equal quality, substance and function and the Contractor shall not Provide, Furnish or Install any said proposed material, article, or equipment without the prior

written approval of the Design Professional. The burden of proof and all costs related thereto concerning the "or equal" nature of the substitute item, whether approved or disapproved, shall be borne by the Contractor.

B. Where the Design Professional, pursuant to the provisions of this General Conditions Section 5.04, approves in writing a product proposed by the Contractor and said proposed product requires a revision of the Work covered by this Contract, or the work covered by other contracts, all changes in the work of all contracts, revision or redesign, and all new Drawings and details required therefore shall be provided by the Contractor at its cost and shall be subject to the approval of the Design Professional.

C. No substitution which may result in a delay to the Project will be permitted without the prior written approval of the Owner.

Section 5.05 - Quality, Quantity and Labeling

A. The Contractor shall Furnish materials and equipment of the quality and quantity specified in the Contract. Any excess materials purchased per the Contract are the property of the Owner.

B. When materials are specified to conform to any standard, the materials delivered to the Site shall bear manufacturer's labels stating that the materials meet said standards. Contractor’s quality control plan required by paragraph D of this General Conditions Section 5.05 shall include measures undertaken by the Contractor to prevent the use of materials with counterfeit labels or other counterfeit indications of meeting a standard.

C. The above requirements shall not restrict or affect the Owner's right to test materials as provided in the Contract.

D. The Contractor shall develop and implement quality control plans to assure itself and the Owner that all Work performed by the Contractor and its Subcontractors complies fully with all Contract requirements. The Contractor shall submit the plans to the Owner upon request as required by the Contract. See the Submittals Section of the General Requirements for further details. The Contractor's quality control plans shall be independent of any testing or inspection performed by or on behalf of the Owner.

Section 5.06 - Tax Exemption

A. The Owner is exempt from payment of federal, state, and local taxes; sales and compensating use taxes of the State of New York and of cities and counties on all materials and supplies incorporated into the completed Work. These taxes are not to be included in bids. This exception does not apply to tools, machinery, equipment or other property leased by or to the Contractor or a Subcontractor, or to supplies and materials which, even though they are consumed, are not incorporated in to the completed Work, and the Contractor and Subcontractors shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on said leased tools, machinery, equipment or other property and upon all said unincorporated supplies and materials.

B. The Contractor and Subcontractors shall obtain any and all necessary certificates or other documentation from the appropriate governmental agency or agencies, and use said certificates or other documentation as required by law, rule, or regulation.

ARTICLE 6 -- SUBCONTRACTS

Section 6.01 - Subcontracting

A. The Contractor may utilize the services of Subcontractors, subject to the limits prescribed in the Information for Bidders Section 7.0 – Approval of Subcontractors/Subcontract Limits. Exceeding stated limits, without prior written approval by the Owner, may be cause for Contract termination.

B. The Contractor shall submit to the Owner the name of each proposed Subcontractor as required by the Contract. The Owner reserves the right to disapprove any proposed Subcontractor and such disapproval shall not result in any additional cost to the Owner. If requested by the Owner, the Contractor shall provide copies of any and all Subcontracts and purchase order agreements related to the Work, which must be in written form. The Contractor shall require each Subcontractor to provide the Owner, upon the Owner's request, with a copy of each of the Subcontractor's subcontracts and purchase order agreements related to the Work.

C. The Contractor's use of Subcontractors shall not diminish the Contractor's obligation to complete the Work. The Contractor shall control and coordinate the Work of Subcontractors and be fully responsible for the acts and omissions of Subcontractors, and of persons either directly or indirectly employed by Subcontractors. The Contractor shall be responsible for all guarantees and warranties provided by Subcontractors.

D. The Contractor shall be responsible for requiring each Subcontractor, to extent of the Work to be performed by such Subcontractor, to be bound to the Contractor by all the terms, conditions, and requirements of the Contract Documents, and to assume towards the Contractor all the obligations and responsibilities which the Contractor, by the Contract Documents, assumes toward the Owner. The Contractor shall cause each Subcontractor to receive and review the provisions of the Contract Documents applicable to the Subcontractor, including but not limited to a copy of the Payment Bond for this Contract. Upon request of the Owner, the Contractor shall provide written proof satisfactory to the Owner that each Subcontractor has received and reviewed the provisions of the Contract Documents applicable to such Subcontractor, including but not limited to, a copy of the Payment Bond for this Contract.

E. The Contractor shall ensure that each Subcontractor's duties to procure insurance for, and to defend, indemnify and hold harmless the Owner and Client, are, to the fullest extent permitted by law, at least the same as the Contractor's duties to procure insurance for, and to defend, indemnify and hold harmless the Owner and Client.

F. To the fullest extent permitted by law and independent of any duty to indemnify and hold harmless, the Contractor shall require each Subcontractor, to the fullest extent permitted by law, to defend the Owner and Client against claims by third persons for wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the Subcontractor's operations or presence at, or in the vicinity of, the Site.

G. To the fullest extent permitted by law, the Contractor shall require each Subcontractor, to the fullest extent permitted by law, to indemnify and hold harmless the Owner and Client against claims by third persons for wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work, whether actually caused by or resulting from the performance of the

Work, or out of or in connection with the Subcontractor's operations or presence at, or in the vicinity of, the Site.

H. The Contractor shall require each Subcontractor, in addition to the Subcontractor's other obligations, to pay the costs of the Owner and Client, including but not limited to, attorneys' and consultants' fees, expenses and court costs, to commence and prosecute a court action against the Subcontractor to enforce one or more of the Subcontractor's obligations under General Conditions Section 6.01 E, F or G or against an insurance company to obtain coverage under an insurance policy which the Subcontractor represented would provide coverage to the Owner or Client.

I. Nothing contained in the Contract or any subcontract shall create any contractual relationship between any Subcontractor and the Owner except the requirements in General Conditions Sections 15.03 and 15.04 for each Subcontractor to procure insurance policies on which the Owner or the Owner and Client are insureds, the obligations of each Subcontractor pursuant to General Conditions Section 6.01 E, F and G to defend, indemnify and hold harmless, to the fullest extent permitted by law, the Owner and Client against claims by third persons for wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever and the obligation of each Subcontractor pursuant to General Conditions Section 6.01 H

In selecting a Subcontractor, the Contractor shall consider whether the proposed Subcontractor appears on any list of entities debarred or suspended from doing business with a government entity, including the current list of companies or individuals that have been declared ineligible to receive Federal contracts published by the System for Award Management. The Contractor shall not Subcontract with any entity on the List of Employers Ineligible To Bid On Or Be Awarded Any Public Contract, published by the NYS Department of Labor Bureau of Public Work. The Contractor shall not Subcontract with any entity on the debarment list published by the NYS Workers' Compensation Board pursuant to Section 141-b of the NYS Workers' Compensation Law. The Contractor shall not Subcontract with any entity on the list of Non-Responsible Entities maintained by the NYS Office of General Services pursuant to Executive Order No. 192.

In selecting a Subcontractor, the Contractor shall also consider whether the proposed Subcontractor has legal authority to do business in New York State and possesses the integrity, experience, qualifications, and organizational and financial capacity to perform Work on the Project.

Prior to award of a Contract, the Contractor shall require any Subcontractor, with a subcontract value of two million dollars ($2,000,000) or greater, to submit to the Owner a certified NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) for review. At any time during the term of the Contract, the Owner may request, and the Contractor or Subcontractor shall provide, a NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) for any other Subcontractor performing Work on the Project for review. Additionally, the Owner or Contractor may require a Subcontractor to update, recertify and resubmit a previously submitted NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) to the Owner upon request. Refer to General Conditions Article 19 – Executive Order No. 125.

J. Prior to or after award of the Contract, if requested by the Owner, the Contractor shall require a Subcontractor to submit a NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) and a Dormitory Authority DASNY Vendor Questionnaire. If requested by the Owner, the Contractor shall require a Subcontractor to update a NYS Vendor Responsibility Questionnaire For Profit

Construction (CCA-2) and a Dormitory Authority DASNY Vendor Questionnaire previously submitted to the Owner.

K. The Contractor shall submit a NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) and a Dormitory Authority DASNY Vendor Questionnaire to the Owner for each Subcontractor proposed for the Work with a subcontract value of two million dollars ($2,000,000) or greater. Refer to General Conditions Article 19 – Executive Order No. 125.

L. After execution of the Contract, the Owner will provide to the Contractor copies of the Owner's Code of Business Ethics Certification form. The Contractor is required to have each Subcontractor, at all tiers, complete the form prior to the Subcontractor beginning work. The completed forms are to be filed by the Contractor with the Owner. A failure to comply with this requirement may result in the Subcontractor(s) being removed from the Project Site.

M. Compliance with General Municipal Law:

1. New York General Municipal Law § 101 (5) requires each bidder on a public work contract, where the preparation of separate specifications is not required by New York General Municipal Law §101 (1), to submit with its bid a separate sealed list that names each subcontractor that the bidder will use to perform work on the contract, and the agreed-upon amount to be paid to each, for: (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus and (c) electric wiring and standard illuminating fixtures. After the low bid is announced, the sealed list of subcontractors submitted with such low bid is opened and the names of such subcontractors is announced, and thereafter any change of subcontractor or agreed-upon amount to be paid to each shall require the approval of Owner, upon a showing presented to the public owner of legitimate construction need for such change, which shall be open to public inspection. Legitimate construction need shall be determined by the Owner in Owner's sole discretion. Any attempt by Contractor to use or manipulate this process to obtain lower bid amounts by subcontractors than those listed on the sealed bid may result in a finding of non-responsibility of the Contractor.

2. On a project where the preparation of separate specifications is not required by New York General Municipal Law §101 (1), to the extent that Contractor seeks change of subcontractor or the agreed-upon amount to be paid to each for (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus, or (c) electric wiring and standard illuminating fixtures, the Contractor acknowledges and agrees that it shall seek the approval of Owner as set forth in the General Municipal Law.

ARTICLE 7 -- CHANGES IN THE WORK

Section 7.01 - Changes

A. Without invalidating the Contract, the Owner, in writing, may order changes in the Work by altering, adding to, or deducting from the Work of the Contract.

1. No change in the Work is effective unless the Owner executes and delivers a Change Order to the Contractor. No payment for a change in the Work is due the Contractor unless and until a Change Order is executed and delivered by the Owner to the Contractor and the Contractor has performed the change in the Work. No alteration to the standard language of the Owner's Change Order

form shall be accepted. If the Contractor requests an adjustment to the Substantial Completion date for a change in the Work and the Owner agrees, an increase or decrease to the duration, in calendar days, shall be included in the Change Order.

2. Notwithstanding subparagraph 1, the Owner, at its discretion, may execute and deliver to the Contractor a Notice to Proceed directing the Contractor to proceed immediately and diligently with the change in the Work described in the Notice to Proceed. The Owner, upon execution and delivery of the Notice to Proceed to the Contractor, is obligated to adjust the Contract for the change in the Work described in the Notice to Proceed; the extent of the adjustment(s) will be determined using the method of General Conditions Section 7.01 B specified in the Notice to Proceed, this General Conditions Article and negotiations with the Contractor; the adjustment(s) will be stated in the Change Order to be executed and delivered by the Owner to the Contractor. The Contractor, upon receipt of the Notice to Proceed, is obligated to proceed immediately and diligently with the change in the Work described in the Notice to Proceed while the adjustment(s) are determined. The Notice to Proceed shall be processed through the Project Management Program prior to execution and delivery by the Owner to the Contractor. No alteration to the standard language of the Owner's Notice to Proceed form shall be accepted. No payment for the change in the Work is due the Contractor until the Change Order is executed and delivered by the Owner to the Contractor and the Contractor has performed the change in the Work. The Owner determines the duration between execution and delivery of the Notice to Proceed and execution and delivery of the Change Order.

3. Contractor's failure to proceed immediately and diligently with any Notice to Proceed or Change Order executed and delivered by the Owner to the Contractor, unless the Owner in writing directs otherwise, shall be a material breach of the Contract.

4. If, after the Owner has executed and delivered a Notice to Proceed to the Contractor for a change in the Work, the Owner and the Contractor cannot agree on the adjustment(s) to the Contract for the change in the Work described in such Notice to Proceed, the Owner shall execute and deliver a Forced Change Order to the Contractor in an amount and with such other provisions that the Owner considers to be fair and reasonable for the change in the Work described in such Notice to Proceed and Forced Change Order. If the Contractor does not accept the Forced Change Order, the Contractor shall strictly comply with the requirements of General Conditions Section 7.01 D.

5. No Change Order is executed by the Owner unless and until the Change Order is, reviewed and accepted by the Owner, and properly executed by an authorized representative of the Owner with appropriate approval authority in accordance with the Owner's internal procedures.

B. The Contract amount may be increased or decreased only by a Change Order and the amount of the adjustment is determined by one or more of the following methods, as determined by the Owner:

1. By applying the applicable unit price or prices contained in the Contract Documents, or negotiated pursuant to the provisions of this General Conditions Article. Unit prices are limited to the quantities specified in the Contract Documents or prior Change Order. Unit prices for quantities greater than specified in the Contract Documents or prior Change Order may, in the Owner's sole and exclusive discretion, be subject to negotiations between the Owner and Contractor.

2. By estimating the fair and reasonable cost of the change in the Work or deleted Work.

3. By determining the actual cost of the change in the Work and considering the following:

a. Labor, including all wages and required wage supplements, paid to employees below the rank of superintendent directly employed at the Site for the change in the Work. Minimum wages are the prevailing rate of wages defined by the NYS Department of Labor. Actual wages in excess, paid by the Contractor, may be considered by the Owner.

b. Premiums or taxes paid by the Contractor for worker's compensation insurance, unemployment insurance, FICA tax and other payroll taxes as required by law, net of actual and anticipated refunds and rebates.

c. Materials associated with the change in the Work.

d. Equipment, excluding hand tools, which in the judgment of the Owner, would have been or will be employed in the Work. The Owner may employ the use of rental rates it deems most appropriate from the information in the "Equipment Watch Retail Rental and Equipment Watch Cost Recovery" databases. In no case will the equipment rental cost exceed the purchase price of the equipment. Self-owned equipment is defined to include equipment rented from Contractor-controlled or affiliated companies. It is the duty of the Contractor to utilize either rented or self-owned equipment that is of a nature and size appropriate for the Work to be performed. The Owner reserves the right to determine reasonable and appropriate equipment sizing, and at the Owner's discretion, it may adjust the costs allowed to reflect a smaller or less elaborate piece of equipment more suitable for performance of the change in the Work. The Owner, in its sole and exclusive discretion, will determine if equipment is rented from a company controlled by or affiliated with the Contractor.

e. To determine the daily and hourly rate of self-owned equipment, the monthly rate shall be divided by twenty-two (22) to establish a daily rate; or by one hundred and seventy-six (176) to establish the hourly rate. The operating cost listed in the "Equipment Watch Retail Rental and Equipment Watch Cost Recovery" databases would be added to this rate to establish the billable rate.

C. For each change in the Work, the Contractor shall submit to the Owner, within the time period provided by the Owner, the following information:

1. A detailed proposal of labor, material, and equipment costs for the change in the Work. The Contractor and Subcontractors shall use the Owner's Contractor and Subcontractor Change Order Proposal Forms, which are available directly from the Owner or from the Dormitory Authority's website.

2. The Contractor's and Subcontractor's proposal forms shall include the following signed statement, which shall be notarized if so requested by the Owner::

"I hereby certify that the value for the labor, material and equipment that comprise the proposal, represents the value of said work, material and equipment for the work performed or to be performed, pursuant to the Contract between the undersigned and the Dormitory Authority and that no overhead or profit is included in the proposal for a change to the Work performed by any Subcontractor or for any major equipment or material supplier that is a subsidiary or an affiliate of this firm."

3. Signed Labor Rate Worksheet to determine hourly rates for each classification of worker associated with the change in the Work. The Contractor shall use the Owner's Labor Rate Worksheets, which are available directly from the Owner or from the Dormitory Authority's website

http://www.dasny.org. Only hourly rates for each classification of worker approved by the Owner can be used to determine the adjustment of the Contract amount for a Change Order. Only an authorized officer of Owner or authorized employee of Owner's Project Controls Unit can approve Labor Rate Worksheets.

4. Narrative and fragnet schedule, which describes the impact on the Project CPM schedule in calendar days associated with the change in the Work if the Contractor requests a change in the date to achieve Substantial Completion. Owner, in its sole and exclusive discretion, may waive, in writing, this requirement for requests to change the date to achieve Substantial Completion made prior to the Owner's approval of the initial Project CPM schedule. Owner's waiver of this requirement can be made only by an authorized officer of Owner or authorized employee of Owner's Project Controls Unit. If the Contractor does not submit a narrative and fragnet schedule, the Contractor acknowledges that the Change Order does not require a change in the date to achieve Substantial Completion.

5. The Contractor agrees to provide, at the Owner's request, any additional documentation to further verify labor, material, equipment, and any other cost sought for a change in the Work.

6. The Contractor agrees to provide, at the Owner's request, written justification for a change in the Work.

D. Each Contractor's written change proposal shall be reviewed by the Owner consistent with the requirements of the Contract.

1. Owner and Contractor shall negotiate in good faith to agree on the adjustment(s) to the Contract for each change in the Work. The Owner is not required to respond to any change proposal submitted by the Contractor until the Contractor submits a change proposal that complies with the Contract Documents. Negotiations under this General Conditions Article shall not impact the Project schedule. The Contractor's proposal for a change in the Work is approved and accepted by the Owner only by the Owner's execution and delivery of a Change Order to the Contractor. See General Conditions Section 7.01 A. 5 for the requirements of execution and delivery.

2. If the Owner has executed and delivered a Notice to Proceed to the Contractor for a change in the Work and the Owner and the Contractor cannot agree on the adjustment(s) to the Contract for the change in the Work described in such Notice to Proceed, the Owner shall execute and deliver a Forced Change Order to the Contractor in an amount and with such other provisions that the Owner considers to be fair and reasonable for the change in the Work described in such Notice to Proceed and Forced Change Order. If the Contractor does not accept the Forced Change Order, the Contractor shall file a notice of Claim in strict accordance with General Conditions Section 10.03 and comply strictly with all requirements of General Conditions Sections 10.03, 10.05 and 10.06. The Contractor's failure to comply with any or all of General Conditions Sections 10.03, 10.05 and 10.06 shall be deemed to be:

   a. a conclusive and binding determination on the part of the Contractor to accept the Forced Change Order as final, binding and conclusive on the Contractor; and

   b. a waiver by the Contractor of all Claims for additional compensation or damages as a result of the Forced Change Order.

E. Any information representing the value of the Work performed, materials supplied and equipment utilized contained in the Contractor's and Subcontractor's proposals that constitutes False

Representation may subject the Contractor or Subcontractor to criminal charges, including NYS Penal Law Sections 175.35 (Offering a False Instrument for Filing) and 210.40 (False Statement) and/or Title 18 U.S.C. Sections 1001 (Fraudulent and False Statements) and/or termination of the Contract for cause and civil prosecution under Article XIII of the NYS State Finance Law – the New York False Claims Act.

F. The compensation specified in the Change Order executed by the Owner and delivered to the Contractor includes full compensation for the changes in the Work covered thereby, and the Contractor waives all rights to any other compensation, damages, or expenses for the changes in the Work described therein.

G. The Contractor shall furnish satisfactory bills, certified payrolls, vouchers, and other cost documentation covering all items of cost and when requested by the Owner shall give the Owner access to all accounts and records relating thereto, including records of Subcontractors and material suppliers.

H. At Substantial Completion, the Owner may address increased Project-specific bonding, liability insurance and builder's risk insurance costs which may have resulted from changes in the Work. The Contractor shall provide satisfactory proof of and paid invoices, including cancelled checks or bank statements showing payment, for such increased costs. The Owner will not pay overhead and profit on any increased costs for bonding, liability insurance or builder's risk insurance.

I. General Conditions Section 10.01 applies when the Owner determines that a decision, response, direction, action, omission, or condition does not require performance of Extra Work.

Section 7.02 - Overhead and Profit

A. See Example A for changes in the Work performed directly by the Contractor, whether a base cost is arrived at by estimated cost or actual cost method; add to base cost a sum equal to twenty percent. See Exceptions - Paragraphs "D" and "E".

Example A:

Contractor base cost	$1,000
20% overhead and profit	200
Total	$1,200

B. See Example B for changes in the Work performed by a Subcontractor under contract with the Contractor, where estimated or actual cost is Ten Thousand Dollars ($10,000.00) or less; add to the base cost a sum equal to twenty percent of cost, for the benefit of the Subcontractor. For the benefit of the Contractor; add an additional sum equal to ten percent of the Subcontractor's base cost.

Example B:

Subcontractor base cost	$1,000
20% Subcontractor overhead and profit	200
Subcontractor Total	$1,200
10% Contractor overhead and profit on base cost	100
Total	$1,300

C. See Example C for changes in the Work performed by a Subcontractor, under contract with the Contractor, which exceeds a base cost of Ten Thousand Dollars ($10,000) in estimated or actual cost;

add to the base cost a sum equal to twenty percent of cost for the benefit of the Subcontractor. For the benefit of the Contractor; add an additional sum equal to ten percent of the first Ten Thousand Dollars ($10,000) of the Subcontractor's base cost, plus five percent of the next Ninety Thousand Dollars ($90,000) of the Subcontractor's base cost, plus three percent of any sum in excess of One Hundred Thousand Dollars ($100,000) of the Subcontractor's base cost.

Example C:

Subcontractor base cost	$200,000
20% Subcontractor overhead and profit	40,000
Subcontractor Total	$240,000
10% Contractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Total	$248,500

D. See Example D for overhead and profit on major equipment such as: switchgear, transformers, air handling units, boilers, etc. For extra equipment purchases by the Contractor or Subcontractors which exceeds a base cost of Ten Thousand dollars ($10,000) in estimated or actual cost; add to the base cost for the benefit of the Contractor a sum equal to ten percent of the first Ten Thousand dollars ($10,000) of the vendor's base cost plus five percent of the next Ninety Thousand dollars ($90,000) of the vendor's base cost, plus three percent of any sum in excess of One Hundred Thousand dollars ($100,000) of the vendor's base cost. If the equipment is supplied by the Subcontractor, the Contractor is entitled to a maximum of ten (10) percent of the first Ten Thousand dollars ($10,000) of the base cost.

Example D:

Vendor base cost	$200,000
10% Contractor or Subcontractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Contractor or Subcontractor Total	$208,500
10% Contractor overhead and profit on first $10,000 base cost when equipment is supplied by the Subcontractor, no other mark-up allowed	1,000
Total	$209,500

E. See Example E for overhead and profit on a material only Change Order. For increased material purchases by the Contractor or Subcontractors; add to the base cost for the benefit of the Contractor a sum equal to ten percent of the first Ten Thousand dollars ($10,000) of the supplier's cost plus five percent of the next Ninety Thousand dollars ($90,000) of the supplier's cost, plus three percent of any sum in excess of One Hundred Thousand dollars ($100,000) of the supplier's cost. If the material is supplied by the Subcontractor, the Contractor is entitled to a maximum of ten (10) percent of the first Ten Thousand dollars ($10,000) of the base cost.

Example E:

Material cost (net difference between original contract and revised)	$200,000
10% Contractor or Subcontractor overhead and profit on first $10,000 base cost	1,000
5% on next $90,000 base cost	4,500
3% on base cost over $100,000	3,000
Contractor or Subcontractor Total	$208,500

10% Contractor overhead and profit on first $10,000 base cost when material is supplied by the Subcontractor, no other mark-up allowed	1,000
Total	$209,500

F. Other than the overhead and profit described in General Conditions Section 7.02A, no further overhead and profit will be allowed for changes to the Work performed by a Subcontractor under Subcontract with the Contactor or for major equipment or material supplier determined to be an affiliate of or controlled by the Contractor. An affiliate is considered any firm or entity in which the Contractor or any individual listed on the Contractor's NYS Vendor Responsibility Questionnaire either owns 5% or more of the shares of, or is one of the five largest shareholders, a director, officer, member, partner or proprietor of said Subcontractor, major equipment or material supplier; a controlled firm is any firm or entity which, in the opinion of the Owner, is controlled by the Contractor or any individual listed on the Contractor's NYS Vendor Responsibility Questionnaire.

1. The Owner, in its sole and exclusive discretion, will determine if a firm or entity is an affiliate of or controlled by the Contractor.

G. No overhead and profit shall be paid for changes in the Work performed by a Subcontractor not under Subcontract with the Contractor. No overhead and profit shall be paid on the premium portion of overtime pay. Where the changes in the Work involve both an increase and a reduction in similar or related Work, the overhead and profit allowance shall be applied only to the cost of the increase that exceeds the cost of the reduction.

H. The Owner, in its sole and exclusive discretion, shall require any Contractor or Subcontractor that is issued a Contract pursuant to pricing from a New York State Office (NYS) of General Services (OGS) Centralized Contract held by said Contractor or Subcontractor to provide an itemized change proposal as per the rates for non-trade service labor, equipment, and materials established within aforementioned NYS OGS Centralized Contract. Rates are considered inclusive of overhead and profit and no additional markup will be approved. All other provisions of Article 7 – Changes to the Work shall apply.

Section 7.03 - Deduct Change Order

The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a decrease in the Contract amount shall be as determined by the Owner. The credit shall include the overhead and profit allocable to the deleted or changed Work unless the Owner, in its sole and exclusive discretion, determines otherwise.

ARTICLE 8 -- PAYMENT

Section 8.01 - Provision for Payment

A. The Contractor shall complete and submit to the Owner for review and written approval, the detailed Schedule of Values prior to the Contractor's first billing request. It is understood, and the Contractor acknowledges, that the Schedule of Values is an administrative tool to illustrate a format and minimum level of detail required for billing requests, and shall not be considered as delineating the Contractor's scope of Work. The Owner may require the Contractor to revise its Schedule of Values at no cost to the Owner and to provide a greater level of detail. Further, the Owner reserves the right to accept only those cost distributions which, in the Owner's opinion, are reasonable, equitably balanced and correspond to the estimated quantities in or for the Contract Documents. Owner's approval of the

Schedule of Values can be provided only by an authorized officer of Owner or authorized employee of Owner's Project Controls Unit.

The Contractor, at its own expense, shall take all actions necessary to fully comply with the requirements of the Statewide Utilization Management Plan ("SUMP") of the NYS Contract System. Contractor shall require all Subcontractors to comply with the requirements of SUMP and the NYS Contract System. These requirements include, but are not limited to, the Contractor's timely payment to all Subcontractors and timely input in to the NYS Contract System of information, including but not limited to, information regarding Subcontractor payments and compliance with Contract requirements, including but not limited to Contract requirements for participation of Minority and Women Owned Business Enterprises in the performance of the Contract.

B. The Owner shall not approve any billing request until:

1. the Contractor is in full compliance with SUMP and the NYS Contract System; and

2. the Owner provides approval of the Schedule of Values.

C. To request a partial or full payment for partial or full performance of the Contract, Contractor shall obtain from the Owner a Contractor's billing request. The Contractor shall complete the billing request by entering in each line item thereof the percentage of completion of that item as of the end of the preceding business month or billing cycle and deliver the completed billing request to the Owner. The Owner shall review the billing request and make any changes which the Owner, in its sole and exclusive discretion, determines to be necessary so that the percentage of completion for each line item in the billing request accurately reflects the Contractor's performance of the Contract as of the end of the preceding business month. The Owner then delivers the Owner's adjusted version of the billing request to the Contractor for execution by the Contractor of the certifications of the Contractor required for partial or full payment for partial or full performance of the Contract. The Contractor delivers the executed billing request to the Owner. Any partial payment request under the Contract shall be at least thirty (30) calendar days after the preceding partial payment request under the Contract, unless the Owner in writing signed by an authorized officer permits more frequent requests.

D. The Owner may make a partial payment to the Contractor for partial performance of the Contract on the basis of an Application for Payment for the Work performed during the preceding business month. The Owner shall retain five percent (5%) of the amount of each said Application for Payment. The Owner may make full payment to the Contractor for full performance of the Contract on the basis of an Application for Payment. Each Application for Payment shall be accompanied by all documentation required by law, including but not limited to, certified payrolls and all documentation required by the Owner, including but not limited to documentation to establish compliance with NYS Labor Law and NYS Lien Law. The Owner may require any documentation the Owner determines is necessary or useful to establish that the Contractor's performance of the Work complies with the requirements of the Contract and applicable law.

E. Any partial payment made shall not be construed as a waiver of the right of the Owner to require the fulfillment of all the terms of the Contract. No payment, either partial or full, by the Owner to the Contractor shall waive or excuse any failure by the Contractor to comply fully with the Contract Documents. No payment will be made for Work not performed.

F. In preparing the Contractor's billing request, material delivered to the Site and properly stored and secured at the Site and material approved to be stored off-site under such conditions as the Owner shall

prescribe in accordance with paragraph G of this General Conditions Section 8.01, may be taken into consideration. All costs related to the storage of materials are the sole responsibility of the Contractor.

G. The Owner will provide an agreement for materials stored off-site and specific forms that the Contractor shall complete, execute, and submit with any billing request for such material. Required information includes, but is not limited to: a general description of the material; a detailed list of the materials; a pre-approved storage area; segregation and identification of the material; insurance covering full value against all risks of loss or damage, with non-cancellation provision; immediate replacement agreement in event of loss or damage; agreement to pay the expense of all inspections of the material; ownership provisions; delivery guarantee; project completion statement; bill of sale, releases of liens, and inventory. The Owner, in its sole and exclusive discretion, may require the Contractor to certify in the agreement for materials stored off-site that the materials comply with one or more requirements of the Contract or to provide documentary proof acceptable to the Owner that the materials comply with one or more requirements of the Contract.

H. All monthly billing requests submitted by the Contractor shall only be in the form and manner approved by the Owner. The Contractor shall furnish such affidavits, vouchers, receipts, and other documentation as to delivery and payment for materials, payment of Subcontractors, and payment of prevailing rate of wage and supplements required by NYS Labor Law as the Owner requires to substantiate each and every billing request. Contractor shall furnish any other documentation required by Owner to establish compliance with one or more requirements of the Contract or any statute or regulation, including but not limited to the certification required by General Conditions Section 16.02 and proof of compliance with NYS Labor Law Section 220-h (See General Conditions Section 16.03 H).

I. All payments received by the Contractor under or in connection with the Contract are trust funds under Article 3-A of the NYS Lien Law and shall be applied by the Contractor in accordance with such law.

Section 8.02 - Substantial Completion and Reduction of Retainage

A. After the Owner has determined Substantial Completion of the Work, as evidenced by the executed Notice of Substantial Completion, the Owner shall pay to the Contractor the balance due the Contractor pursuant to the Contract less:

1. Two (2) times the value of any remaining items of Work to be completed or corrected as determined in accordance with paragraph B. of this General Conditions Section 8.02.

2. An amount necessary to satisfy any and all claims, liens, or judgments by the Owner or third parties against the Contractor.

B. After the Owner has determined Substantial Completion of the Work, as evidenced by the executed Notice of Substantial Completion, the Contractor shall submit to the Owner, for Owner's written approval, a detailed estimate of the value of the known remaining items of Work as set forth by the Owner and a schedule for achieving Physical Completion and Contract Completion and Acceptance of the Work. The Owner shall review that estimate and schedule and:

1. Direct the Contractor to revise and resubmit the estimate, the schedule or both; or

2. Approve the estimate and schedule.

The Owner, at its discretion, may value the items of Work to be completed or corrected assuming such items will be completed or corrected by an entity other than the Contractor and may include the cost of obtaining regulatory or other third-party approval of one or more items of Work.

C. As the remaining items of Work are completed and accepted by the Owner, the Owner shall pay the appropriate amount pursuant to a duly completed and submitted Application for Payment.

D. The list of remaining Work items may be expanded to include additional items of corrective or completion Work until Contract Completion and Acceptance by the Owner. Appropriate payments may be withheld to cover the value of these items pursuant to this General Conditions Section 8.02.

E. The Contractor may request from the Owner a reduction of retainage when a phase of the Work is accepted by the Owner but Owner is not obligated to grant such request.

F. The Application for Payment for the first payment of reduction of retainage shall be accompanied by a release, by the Contractor to the Owner, in the form set forth at Exhibit "A" to the General Conditions for Construction. As set forth in such release, any Claims not specifically excepted and reserved by the Contractor per the release form will be released and forever discharged. Owner's acceptance of a release containing Claims specified by and reserved to the Contractor does not waive any rights of the Owner arising under the Contract or any other source with respect to such Claims. By executing this Contract, Contractor acknowledges and agrees that it has reviewed the release in the form set forth at Exhibit "[X]" to the Contract Documents. Submission of the duly completed release set forth at Exhibit "[X]" to the Contract Documents along with the Application for Payment for the first payment of reduction of retainage is a condition precedent to the release of any retainage by the Owner. The requirement of a release may be waived only in writing and only by the Owner's Office of Counsel. No payment, final or otherwise, shall operate to release the Contractor or the Contractor's sureties from any obligations under this Contract or the Performance or Payment bonds.

Section 8.03 - Release and Consent of Surety

Notwithstanding any other provision of the Contract Documents to the contrary, reduction of retainage and/or the final Application for Payment shall not become due until the Contractor submits to the Owner a General Release from the Contractor and, if the Owner requests, a Consent of Surety to said payment in form and content acceptable to the Owner. No payment, final or otherwise, shall operate to release the Contractor or the Contractor's sureties from any obligations under this Contract or the Performance or Payment bonds.

Section 8.04 - Liens

A. Upon the Owner's receipt of a notice of public improvement lien, all, or a portion, of the amounts due in the current and subsequent payments due the Contractor shall be withheld until a sum which shall be one and one-half (1 1/2) times the amount stated to be due in the notice of public improvement lien shall have been withheld from payments due the Contractor. This sum shall be withheld until the lien is discharged. The Contractor shall promptly discharge any notice of public improvement lien by filing a bond pursuant to NYS Lien Law Section 21, subdivision 5. If any Subcontractor should file a notice of lien against the property upon which the Project is located, such lien is void and Contractor, at its expense shall obtain and file an order of the Supreme Court of the State of New York cancelling such lien. If Contractor shall fail to obtain such order or if Contractor shall file a notice of lien against the property upon which the Project is located, the Owner may obtain an order of the Supreme Court of the

State of New York cancelling such lien and deduct the attorney's fees and other costs incurred in obtaining and filing such order from any amount due the Contractor.

B. Upon receipt of any other lien, levy, notice to withhold, restraining notice, court or administrative order or any other instrument allowed by law and directing the Owner to withhold payments due Contractor, the Owner will withhold the sum which Owner determines is necessary to withhold to comply with the applicable law. This sum shall be withheld until the instrument is, in the Owner's sole and exclusive discretion, appropriately satisfied or discharged.

Section 8.05 - Withholding of Payments

A. The Owner may withhold from the Contractor any part of any payment as may, in the judgment of the Owner, be necessary:

1. To ensure payment of just claims of any natural person or entity supplying labor, materials, or equipment for the Work.

2. To protect the Owner from loss due to defective Work not remedied.

3. To protect the Owner, Client, or any Consultant from loss due to failure to defend, loss due to injury to persons or damage to the Work or property of Other Contractors, Subcontractors or others caused by the act or neglect of the Contractor or Subcontractors.

4. To ensure payment of fines and penalties, that may be imposed on the Contractor pursuant to the provisions of the Contract.

5. To ensure payment of fines, penalties, or damages that may be imposed on the Contractor pursuant to General Conditions Article 20 - Opportunity Programs.

6. To protect and make whole the Owner from a Contractor's non-compliance to the requirements set forth in General Conditions Article 14 – Protection of Persons and Property and Article 15 – Insurance and Bonds.

7. To protect the Owner and Client from damage caused or claimed to have been caused directly or indirectly by the failure of the Contractor to perform the Work of the Contract in strict accordance with the Contract Documents.

B. The Owner shall have the right to apply any such amounts so withheld in such a manner as the Owner may deem proper to satisfy said claims, fines, and penalties, or to secure said protection. Said application of the money shall be deemed payments for the account of the Contractor.

Section 8.06 - Late Payment

Timeliness of payment and any interest to be paid to the Contractor for late payment is governed by Section 2880 of the NYS Public Authorities Law. Timely payment by the Contractor to the Subcontractor is governed by Section 139-f of the NYS State Finance Law which requires payment by the Contractor to the Subcontractor within seven (7) calendar days of receipt of payment from the Owner.

Section 8.07 – False Representations/Information

A. False Representations, information, or data submitted on or with Applications for Payment may result in one or more of the following actions:

1. Termination of the Contract for cause;

2. Disapproval of future bids or contracts or subcontracts;

3. Withholding of final payment on the Contract; and

4. Civil and/or criminal prosecution (See General Conditions Sections 7.01 E and 10.03 F).

B. The provisions of this General Conditions Section 8.07 are solely for the benefit of the Owner, and any action or non-action hereunder by the Owner shall not give rise to any liability on the part of the Owner.

ARTICLE 9 -- TIME OF COMPLETION

Section 9.01 - Substantial Completion

A. The Contractor shall commence performance of the Work at the time stated in the Notice to Proceed and the Contractor shall achieve Substantial Completion no later than the date for Substantial Completion specified in the Contract. Notwithstanding anything to the contrary, a schedule submitted by the Contractor showing Substantial Completion earlier than that specified in the Contract shall not entitle the Contractor to any additional cost in the event the earlier date is or is not realized unless agreed to by the Owner.

B. It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that Substantial Completion of the Work on or before the date for Substantial Completion specified in the Contract, is an essential condition of the Contract.

C. The Contractor agrees that the Work shall be prosecuted regularly, diligently, and cooperatively with Other Contractors at such rate of progress as shall ensure Substantial Completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time to achieve Substantial Completion allowed herein is reasonable.

D. It is further agreed that time is of the essence for each and every portion of the Work. In any instance in which additional time is allowed for Substantial Completion of the Work, the new date of Substantial Completion established by said extension shall be of the essence. The Contractor shall not be charged with liquidated damages or any excess cost of the Owner or Client if the Owner determines in its sole and exclusive discretion that the Contractor is without fault and that the delay in Substantial Completion of the Work is due:

1. To any preference, priority or allocation order duly issued by the Government of the United States or the State of New York.

2. To an unforeseeable cause beyond the control and without the fault of, or negligence of the Contractor, and approved by the Owner, including, but not limited to, acts of God or of public enemy, acts of the Owner, fires, epidemics, pandemics, quarantine, restrictions, strikes, freight embargoes and unusually severe weather.

3. To any delays of Subcontractors or suppliers occasioned by any of the causes specified in Subsections 1 and 2 of this paragraph provided the Contractor shall, within fifteen (15) calendar

days from the beginning of any such delay, notify the Owner in writing of the causes of the delay. Notice shall be delivered to the Owner as specified in General Conditions Section 10.03 C.

E. The date of Substantial Completion may be modified only by a Change Order.

F. If the Contractor shall neglect, fail, or refuse to achieve Substantial Completion by the date specified, or any proper extension thereof granted by the Owner, the Contractor agrees to pay to the Owner for loss of beneficial use of the Work of the Contract an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day thereafter that the Contractor does not achieve Substantial Completion.

G. If the Contractor shall abandon performance of the Work before achieving Substantial Completion, the Contractor agrees to pay to the Owner for loss of beneficial use of the Work of the Contract an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day after both the date of abandonment and the date specified for Substantial Completion that the Work has not achieved Substantial Completion. The obligation of the Contractor to pay liquidated damages as provided in this paragraph shall survive the termination of the Contract pursuant to General Conditions Section 11.01.

H. If the Owner terminates the Contract before the Contractor achieves Substantial Completion, the Contractor agrees to pay to the Owner for loss of beneficial use of the Work of the Contract an amount specified in the Contract, not as a penalty, but as liquidated damages, for each and every calendar day after both the date of termination of the Contract and the date specified for Substantial Completion that the Work has not achieved Substantial Completion. The obligation of the Contractor to pay liquidated damages as provided in this paragraph shall survive the termination of the Contract pursuant to General Conditions Section 11.01.

I. Said amount of liquidated damages is agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the Owner would sustain for loss of beneficial use of the Work of the Contract in the event of delay in Substantial Completion, abandonment of the Work by the Contractor or termination of the Contract pursuant to General Conditions Section 11.01, and said amount is agreed to be the amount of damages sustained by the Owner and said amount may be retained from time to time by the Owner.

J. The foregoing liquidated damages are intended to compensate the Owner only for the loss of beneficial use of the Work of the Contract. In addition, the Contractor shall be liable to the Owner and the Client, to the fullest extent permitted by law, for whatever actual damages (other than actual loss of beneficial use) the Owner or Client may incur as a result of any actions or inactions of the Contractor or its Subcontractors including, without limitation, interest expense and carrying costs, liabilities to Other Contractors working on the Project or other third parties, job extension costs, and other losses incurred by the Owner or Client. The provisions of this paragraph are for the exclusive use of the Owner and Client, and shall not accrue to Other Contractors or other third parties.

K. The Owner will issue the Notice of Substantial Completion after the Owner, in its sole and exclusive discretion, has determined that Substantial Completion of the Work has occurred.

Section 9.02 – Physical Completion and Contract Completion and Acceptance

A. After the Owner has issued the Notice of Substantial Completion, the Contractor shall comply with General Conditions Section 8.02 B. Compliance with General Conditions Section 8.02 B is a condition precedent to the payment described in General Conditions Section 8.02 A. Once the Owner approves

the detailed estimate of the value of the known remaining items of Work and the schedule for achieving Physical Completion and Contract Completion and Acceptance, the Contractor shall achieve Physical Completion and Contract Completion and Acceptance no later than the dates for each in the approved schedule. The Owner and Contractor agree that achieving Physical Completion and Contract Completion and Acceptance no later than the dates for each in the approved schedule is an essential condition of the Contract and that time is of the essence.

B. The Contractor agrees that after achieving Substantial Completion, Contractor shall continue to prosecute the remaining items of Work regularly, diligently, and cooperatively with Other Contractors. Contractor further agrees that once the schedule for achieving Physical Completion and Contract Completion and Acceptance is approved, the Contractor shall prosecute the remaining items of Work regularly, diligently, and cooperatively with Other Contractors at such a rate of progress as shall ensure the achieving of Physical Completion and Contract Completion and Acceptance by the dates for each in the approved schedule.

C. The list of remaining Work items may be expanded to include additional items of corrective or completion Work until Contract Completion and Acceptance by the Owner. Appropriate payments may be withheld to cover the value of these items pursuant to General Conditions Section 8.02.

D. The Owner will issue the Notice of Physical Completion after the Owner, in its sole and exclusive discretion, has determined that Physical Completion of the Work has occurred.

E. The Owner will issue the Notice of Contract Completion and Acceptance after the Owner, in its sole and exclusive discretion, has determined that Contract Completion and Acceptance of the Work has occurred. Contract Completion and Acceptance follows or may be concurrent with Physical Completion.

ARTICLE 10 -- CLAIMS AND DISPUTES

Section 10.01 - Claim for Extra Work

A. If the Contractor claims that:

1. a decision of, or direction or response to the Contractor by, the Owner, Consultant, or Owner Representative;

2. a condition; or

3. any action or omission of the Owner;

is contrary to the terms and provisions of the Contract and will require the Contractor to perform Extra Work, Contractor shall file a written notice of Claim in strict accordance with General Conditions Section 10.03. No Claim for Extra Work shall be allowed unless the Contractor files a written notice of Claim that complies strictly with the requirements of General Conditions Sections 10.01 and 10.03. The notice of Claim shall identify the decision, direction, response, action, omission, or condition from which the Claim arises. The Contractor shall also strictly comply with all other requirements of General Conditions Sections 10.01 and 10.03.

B. If the Owner determines the decision, response, direction, action, omission, or condition does not require the performance of Extra Work, the Owner shall issue a Disputed Work Directive. The Contractor, upon receipt of the Disputed Work Directive shall immediately and diligently proceed with the Work described in the Disputed Work Directive in accordance with all instructions of the Owner. Contractor's failure to proceed immediately and diligently with any Disputed Work Directive issued by the Owner, unless the Owner in writing directs otherwise, shall be a material breach of the Contract. Contractor's performance of the Work described in and pursuant to the Disputed Work Directive shall not be a waiver of the Contractor's Claim for Extra Work provided the Contractor strictly complies with all requirements of General Conditions Sections 10.01 and 10.03. The Owner may issue a Disputed Work Directive for a decision, response, direction, action, omission, or condition before the Contractor files a notice of Claim arising from such decision, response, direction, action, omission, or condition; if the Owner does so, the Contractor shall still file a notice of Claim in strict compliance with General Conditions Section 10.03 and shall strictly comply with all requirements of General Conditions Sections 10.01 and 10.03.

C. The Contractor's failure to comply strictly with any or all parts of General Conditions Sections 10.01 and 10.03 shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that the decision, response, direction, action, omission, or condition does not involve Extra Work; and

2. a waiver by the Contractor of all Claims for additional compensation or damages as a result of the decision, response, direction, action, omission, or condition.

Section 10.02 - Claim for Additional Cost

A. If the Contractor wishes to make a Claim for an increase in the cost to perform the Work, including but not limited to a Claim alleging breach of the Contract by Owner, the Contractor shall file a written notice of Claim strictly in accordance with General Conditions Section 10.03. The notice of Claim shall identify the condition or event from which the Claim arises. No Claim for an increase in the cost to perform the Work of the Contract shall be allowed unless the Contractor files a notice of Claim that complies strictly with the requirements of General Conditions Section 10.02 and 10.03. Contractor shall also strictly comply with all other requirements of General Conditions Sections 10.02 and 10.03. The Owner shall determine the validity of the Contractor's contention. Pending the decision of the Owner, the Contractor shall proceed with the diligent and prompt performance of the Work. Denial of additional costs shall not entitle the Contractor to additional time to achieve Substantial Completion. Nothing in this paragraph waives any of Owner's rights under the Contract.

B. The Contractor's failure to comply strictly with any or all parts of General Conditions Sections 10.02 and 10.03 shall be deemed to be:

1. a conclusive and binding determination on the part of the Contractor that the event or condition does not increase the cost to perform the Work of the Contract; and

2. a waiver by the Contractor of all Claims for additional compensation or damages as a result of the event or condition.

Section 10.03 - Notice of Claim and Substantiation

A. A written notice of Claim shall be delivered concurrently to the Owner's Representative and Project Controls Unit by the Contractor within fifteen (15) calendar days after occurrence of the event, decision,

direction, response, action, or omission giving rise to such Claim or within fifteen (15) calendar days after the Contractor first recognizes the condition giving rise to the Claim, whichever is earlier. The burden of proving the Owner's receipt of the notice of Claim shall be the Contractor's responsibility. Contractor's failure to comply with the requirements of this Section 10.03 shall constitute a waiver of its Claim.

B. Within ninety (90) calendar days of the initial notice of Claim, the Contractor shall substantiate the Claim in writing and document the nature of the Claim and provide supporting cost data and documentation, Contractor's original cost estimate, Project CPM schedule demonstrating alleged impact of and correlation to the Claim subject matter and a Contractor affidavit stating the following:

"I hereby certify that the value assigned the work, labor, material and equipment that comprise the Claim, represents the actual value of said work, labor, material and equipment pursuant to the Contract between the undersigned and the Dormitory Authority."

1. The Contractor shall provide, every thirty (30) calendar days thereafter for as long as such damages are incurred, written, verified statements of the details and the amounts of such damages, together with documentary evidence of such damages.

2. Contractor shall identify the final written, verified statement for each Claim submitted pursuant to this paragraph.

3. Each written, verified statement shall be delivered as set forth in paragraph C of this General Conditions Section 10.03.

C. The Contractor shall provide the Owner's Representative one (1) electronic copy of the documented Claim and mail two (2) paper copies of the documented Claim to:

Dormitory Authority
Project Controls Unit
515 Broadway
Albany, NY 12207-2964

D. The Owner, at any time after the Contractor files a notice of Claim, may request additional documentation to determine the validity of the Contractor's contention and the Contractor shall submit such additional documentation within the time period specified by the Owner in the Owner's request for additional documentation. The Owner, at any time after the Contractor files a notice of Claim, may request an updated and reconciled electronic copy of the documented Claim and the Contractor shall submit such a copy within ten calendar days.

E. The value of any Claim, if allowed, shall be determined by the methods described in General Conditions Article 7 – Changes in the Work. No Claim shall be allowed unless and until a Change Order allowing the Claim is executed and delivered by the Owner to the Contractor; payment of an allowed Claim may be made only through an Application for Payment.

F. Any information representing the actual value of the labor performed, equipment utilized and material Furnished contained in the Claim that constitutes False Representation may subject the Contractor or

Subcontractor to criminal charges, including NYS Penal Law Sections 175.35 (Offering a False Instrument for Filing) and 210.40 (False Statement) and/or Title 18 U.S.C. Sections 1001 (Fraudulent and False Statements) and/or termination of the Contract for cause and civil prosecution under Article XIII of the NYS State Finance Law – the New York False Claims Act.

Section 10.04 - No Damages for Delay

A. No Claims for increased costs, charges, expenses, or damages of any kind shall be made by the Contractor against the Owner for any delays or hindrances from any cause whatsoever; provided that the Owner, in the Owner's sole and exclusive discretion, may compensate the Contractor for any said delays or hindrances by extending the date for achieving Substantial Completion specified in the Contract. No payment for increased cost, charge, expense, or damage of any kind shall act as a waiver of the Owner's right, in its sole and exclusive discretion, to compensate the Contractor for any delays or hindrances from any cause whatsoever solely by extending the date for achieving Substantial Completion specified in the Contract.

B. If the Contractor claims that a delay or hindrance entitles the Contractor to additional time to achieve Substantial Completion, the Contractor shall submit a written request to the Owner for such additional time within fifteen (15) calendar days of the event or condition giving rise to the request. The written request shall identify the event or condition causing the alleged delay or hindrance giving rise to the request and show that the Contractor is not responsible for the delay or hindrance or for any concurrent delay. The Contractor shall submit with the request an updated Project CPM schedule that shows the impact of the event or condition on the Project CPM schedule. The request and updated Project CPM schedule shall be submitted to the Owner in accordance with General Conditions Section 10.03 C. The Owner may request additional documentation to decide the Contractor's request and the Contractor shall submit such additional documentation within the time period specified by Owner in the Owner's request for additional documentation. Failure of the Owner to respond in writing to a written request for additional time within thirty (30) calendar days shall be deemed a denial of the request unless the Owner extends the period to respond to the written request for additional time by written notice to the Contractor. While the Owner is considering the Contractor's request, the Contractor shall proceed with the diligent and prompt performance of the Work. Denial of additional time shall not entitle the Contractor to additional costs.

C. The Contractor's failure to comply strictly with any or all parts of General Conditions Sections 10.03 and 10.04 shall be deemed to be:

    1. a conclusive and binding determination on the part of the Contractor that the event or condition causing the alleged delay or hindrance does not require additional time to achieve Substantial Completion; and

    2. a waiver by the Contractor of all Claims for additional time to achieve Substantial Completion as a result of the event or condition causing alleged delay or hindrance.

Section 10.05 - Continuance of the Work

Unless the Owner, in writing, permits otherwise, the Contractor shall proceed diligently and promptly with the performance of the Work while the Owner considers a notice of Claim filed pursuant to:

A. General Conditions Sections 7.01D and 10.03;

B. General Conditions Sections 10.01 and 10.03; or

C. General Conditions Sections 10.02 and 10.03;

or while the Owner considers a request for additional time to achieve Substantial Completion filed pursuant to General Conditions Sections 10.03 and 10.04 or while the Owner considers any other Claim.

Section 10.06 - Resolution of Claim

A. Any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion shall be final, binding and conclusive on the Contractor unless within fifteen (15) calendar days after receiving notice of the Owner's resolution, the Contractor files a written notice with the Owner that the Contractor reserves the Contractor's rights under the Contract in connection with the matters covered by said resolution or determination. The written notice shall be filed in strict accordance with General Conditions Sections 10.03 C and 10.06. The Contractor's failure to comply strictly with these requirements shall be deemed to be a waiver by the Contractor of all Claims for additional compensation or damages included in the Claim and the request for additional time to achieve Substantial Completion.

B. After any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion, the Contractor shall proceed diligently and promptly with the performance of the Work whether the Contractor files a written notice with the Owner that the Contractor reserves the Contractor's rights under the Contract in connection with the matters covered by said resolution or determination or the Contractor does not file such a written notice. Nothing in this paragraph waives any of the Owner’s rights under the Contract.

C. Contractor shall file no action or proceeding in a court challenging any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion unless the Contractor shall have strictly complied with all the requirements relating to the giving of notice and of information with respect to such Claim or request for additional time to achieve Substantial Completion in this General Conditions Article 10. Nothing in this paragraph waives any of Owner’s rights under the Contract.

D. Contractor shall file no action or proceeding in court challenging any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion until Contractor has achieved Physical Completion of the Work. Contractor agrees that any court action or proceeding challenging any resolution or determination by the Owner of a Claim or a request for additional time to achieve Substantial Completion filed before Contractor has achieved Physical Completion of the Work is premature. Nothing in this paragraph waives any of Owner’s rights under the Contract. The Owner, in its sole and exclusive discretion, may modify this paragraph by a Contract Amendment.

E. At its sole and exclusive discretion, the Owner may resolve any Claim or a request for additional time to achieve Substantial Completion without waiving its rights under the Contract.

ARTICLE 11 – TERMINATION OR SUSPENSION

Section 11.01 – Termination for Cause

A. In the event that any provision of the Contract is violated by the Contractor or by any Subcontractor, the Owner may serve written notice upon the Contractor and upon the Contractor's surety, if any, of the Owner's intention to declare a Contractor Default (defined in the Performance Bond) and terminate the Contract. Such notice shall contain the reasons for the intention to declare a Contractor Default and

terminate the Contract. The Contractor will be allowed an opportunity to show why the Owner should not declare a Contractor Default and why the Contractor's Contract should not be terminated for cause. If the violation shall not cease or arrangements satisfactory to the Owner are not made, the Owner, in writing, may declare a Contractor Default and the Contract shall terminate upon the date specified by the Owner in the declaration of Contractor Default. The Owner shall send the Contractor and the Contractor's surety, if any, written notice of and a copy of the declaration of Contractor Default and termination of the Contract. In the event of a declaration of Contractor Default and termination of the Contract, the Owner has the remedies set forth in the Performance Bond, the Contract, and all remedies at law or in equity.

B. In the event of any such termination, the Owner may take over the Work and prosecute the Contract to completion and take possession of and may utilize such materials, appliances, and equipment on the Site and necessary or useful in completing the Work. The Contractor and Contractor's surety shall be liable to the Owner for all costs incurred by the Owner.

C. In the event the termination for cause is determined to be improper, the termination shall be deemed a termination pursuant to General Conditions Section 11.02 – Termination for Convenience of Owner.

Section 11.02 - Termination for Convenience of Owner

A. The Owner, at any time, may terminate the Contract in whole or in part. Any such termination shall be effected by delivering to the Contractor a written notice of termination specifying the extent to which performance of Work under the Contract is terminated and the date upon which the termination becomes effective. Upon receipt of the notice of termination, the Contractor shall act promptly to minimize the expenses resulting from the termination.

B. The Owner shall pay the Contractor for Work of the Contract performed by the Contractor and accepted by the Owner for the period extending from the end of the period covered by the last approved Application for Payment up to the effective date of the termination, an amount determined in accordance with General Conditions Article 7 – Changes in the Work. In no event shall the Contractor be entitled to compensation in excess of the total consideration of the Contract. In no event shall Contractor be entitled to overhead or profit on the Work not performed.

C. In the event of such termination the Owner may take over the Work and prosecute the Contract to completion and may take possession of and may utilize such materials, appliances, and equipment on the Site and necessary or useful in completing the Work.

Section 11.03 - Owner's Right to do Work

The Owner at any time may notify the Contractor that the Owner will have the Work of the Contract or any part thereof, performed by others, without terminating the Contract and without prejudice to any other right the Owner may have. The Owner may recover any and all costs related to such Work and deduct the value of such Work from the Contract amount. In the event the total costs related to such Work performed by others, or other costs associated with compliance with the Contract Documents, exceeds the available funds remaining in the Contract, the Owner shall have the right to recover said funds from the Contractor.

Section 11.04 - Suspension of Work

A. Should the Owner determine that conditions exist such that it becomes necessary to suspend performance of all or any part of the Work, the Owner, at its sole discretion, shall issue to the Contractor a Suspend Work Order. Upon receipt of the order, the Contractor shall immediately comply with its

terms and take reasonable steps to protect the Work covered by the order during the period of work suspension. The order shall contain the reason or reasons for suspension which may include, but is not limited to, latent field conditions, substantial program revisions, acquisition of rights of way or real property, financial crisis, labor disputes, civil unrest, expired insurance, court order, public health emergency or acts of God.

B. Upon receipt of a Suspend Work Order, the Contractor shall, as soon as practicable, cease performance of the Work as ordered and take immediate affirmative measures to protect such Work from loss or damage.

C. The Contractor specifically agrees that such suspension of the Work shall not increase the cost of the Work. However, to the extent that the suspension of the Work is through no fault of the Contractor, the Owner may consider requests for compensation provided that the Contractor complies with General Conditions Article 10 – Claims and Disputes.

D. The date of Substantial Completion of the Work may be extended by Change Order to compensate the Contractor for the time lost by the suspension.

E. The Owner may terminate the Suspend Work Order by a written direction to the Contractor or through the issuance of a Resume Work Order, or may invoke any other provision of General Conditions Article 11 – Termination or Suspension.

Section 11.05 – Stoppage of Work

A. Should the Contractor fail to comply with the terms of the Contract, including but not limited to the insurance requirements of the Contract, the Owner may at any time, in its sole discretion, issue a Stop Work Order requiring the Contractor to stop all or any part of the Work. Upon receipt of the order, the Contractor shall immediately comply with its terms and take reasonable steps to protect the Work covered by the order during the period of work stoppage. The Owner, at its option, shall either:

1. Cancel the Stop Work Order after the Contractor has successfully remedied the cause of the Stop Work Order; or

2. Invoke any other provision of General Conditions Article 11 – Termination or Suspension.

B. The Contractor shall not be entitled to an increase in time or costs as a result of the Stop Work Order. Owner may, in its sole discretion, consider requests for an increase in time or costs provided that the Contractor complies with General Conditions Article 10 – Claims and Disputes.

ARTICLE 12 -- BENEFICIAL OCCUPANCY

Section 12.01 - Occupancy Prior to Substantial Completion

A. If, before Substantial Completion, the Owner desires Beneficial Occupancy of any part of the Work, the Owner shall have the right to do so, and the Contractor shall in no way interfere with or object to Beneficial Occupancy. Payment for operational costs of Project systems for the part of the Work subject to Beneficial Occupancy from the time of Beneficial Occupancy to Substantial Completion shall be borne by the Owner, unless otherwise specified by the Contract.

B. Said Beneficial Occupancy (1) shall not constitute acceptance of space, systems, materials, or elements of the Work and (2) shall not affect the obligations of the Contractor for Work which is not in

accordance with the requirements of the Contract or other obligations of the Contractor under the Contract.

The Contractor shall continue the performance of the Work in a manner that shall not unreasonably interfere with said use, occupancy, and operation by the Owner.

ARTICLE 13 -- INSPECTION

Section 13.01 - Access to the Work

The Owner shall at all times have access to the Work and the Contractor shall provide proper facilities for access. If the Contractor schedules or performs any Work on a day or at a time which results in a Dormitory Authority employee assigned to the Project receiving overtime compensation or an additional charge to the Dormitory Authority from an Other Contractor for such Work, the Dormitory Authority, in its sole and exclusive discretion, may deduct such overtime compensation and such additional charge from moneys due the Contractor. If the Contractor intends to schedule any Work, including but not limited to any testing or inspection, outside the regular operating hours for the Project, the Contractor must provide the Owner and any Other Contractor involved in such Work at least fifteen (15) calendar days written notice of the scheduled date for such Work. The Owner, in its sole and exclusive discretion, may reduce the required number of days of notice for one or more occasions by written notice to the Contractor and to any involved Other Contractors.

Section 13.02 - Notice for Testing and Inspection

If the Contract Documents, the Owner's instructions, laws, rules, ordinances, or regulations require that any Work be inspected or tested, the Contractor shall give the Owner a minimum of five (5) calendar days, unless otherwise specified, written notice of readiness of the Work for inspection or testing and the date fixed for said inspection or testing.

Section 13.03 - Reexamination of Work

Reexamination of any part of the Work may be ordered by the Owner, and if so ordered the Work shall be uncovered by the Contractor. If said Work is found to be in accordance with the Contract, the Owner shall pay the cost of reexamination. If said Work is not found to be in accordance with the Contract, the Contractor shall pay the cost of reexamination and replacement.

Section 13.04 - Inspection of Work

All Work, all materials whether incorporated in the Work or not incorporated in the Work, all processes of manufacture, and all methods of construction shall be, at all times and places, subject to the inspection of the Owner, and the Owner shall be the final judge of the quality and suitability of the Work, materials, processes of manufacture, and methods of construction for the purposes for which said Work, materials, processes of manufacture, and methods of construction are used. Any Work not approved by the Owner shall be reconstructed, made good, replaced, or corrected immediately by the Contractor including all work of Other Contractors destroyed or damaged by said removal or replacement. Rejected material shall be removed immediately from the Site. Acceptance of material and workmanship by the Owner shall not relieve the Contractor from the Contractor's obligation to replace all Work that is not in full compliance with the Contract.

Section 13.05 - Defective or Damaged Work

If, in the opinion of the Owner, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the Work damaged or not performed in accordance with the Contract Documents, the Contract amount shall be reduced by an amount, which in the judgment of the Owner, shall be deemed equitable.

Section 13.06 – Testing of Work

All materials and equipment used in the Work shall be subject to testing in accordance with accepted standards to establish conformance with the Contract Documents and suitability for intended use or as directed by the Owner. Any Work covered or concealed without the approval or consent of the Owner, shall be uncovered for examination. No testing by the Owner or by a testing laboratory on behalf of the Owner relieves the Contractor of the responsibility to maintain quality control of materials, equipment, and installation to conform to the requirements of the Contract Documents. The Owner may order additional testing for any test results below specified minimums, above specified maximums or otherwise unacceptable. Additional cost for testing, professional services and any other expenses related to the additional testing shall be at the Contractor's expense. The Owner may deduct such costs from moneys due the Contractor.

Section 13.07 - Final Completion

No previous inspection shall relieve the Contractor of the obligation to perform the Work in accordance with the Contract. No payment, either partial or full, by the Owner to the Contractor shall excuse any failure by the Contractor to comply fully with the Contract Documents. The Contractor shall remedy all defects and deficiencies at the Contractor’s expense, paying the cost of any damage to other Work, the work of Other Contractors and the property of the Owner or Client. No Work is completed and accepted until the Owner issues the Notice of Contract Completion and Acceptance. Contract Completion and Acceptance is limited to the Work described in the Notice of Contract Completion and Acceptance.

Section 13.08 - Guarantee

The Contractor shall, in all respects, guarantee the Work to the Owner and be responsible for all material, equipment, and workmanship of the Work. The Contractor shall forthwith repair, replace or remedy in a manner approved by the Owner, at the Contractor’s expense, any material, equipment, workmanship, or other part of the Work found by the Owner to be defective or otherwise faulty and not in compliance with the Contract Documents, which defect or fault appears during the minimum period of one (1) year, or such longer period as may be prescribed by the Contract, from the date of Substantial Completion determined by the Owner. For items of Work performed after the date of Substantial Completion, the minimum period of one (1) year in the preceding sentence shall begin with the date of Physical Completion. The Contractor shall also pay for any damage to the Work, any damage to the work of Other Contractors and any damage to the property of the Owner or Client resulting from said defect or fault.

ARTICLE 14 -- PROTECTION OF PERSONS AND PROPERTY

Section 14.01 – Site Safety and Protection

A. The Contractor and each Subcontractor shall comply with all applicable rules, regulations, codes, and bulletins of the New York State Department of Labor and to the standards imposed under the Federal Occupational Safety and Health Act of 1970, as amended. The Contractor and each Subcontractor shall comply with all Client safety requirements. The Contractor and each Subcontractor shall comply with

all City of New York safety requirements for Projects within the City of New York constructed in accordance with the Building Code of the City of New York.

B. The Contractor and each Subcontractor, and only the Contractor and each Subcontractor, shall be responsible for the initiation, maintenance and supervision of safety precautions and programs in connection with the Work and the Contractor shall require each Subcontractor to initiate, maintain and supervise its own safety precautions and programs for any portion of the Work for which the Subcontractor is responsible and to generate safety reports for days when safety inspections occur. The Contractor shall prepare and submit to the Owner a written safety plan for the Site showing how all safety requirements of applicable law and the Contract will be implemented for the duration of the Contract. The Contractor shall designate a responsible person at the Site whose duties shall include maintaining site safety pursuant to OSHA and any other applicable requirements including NYS EO 202, conducting weekly tool box meetings with its workers, implementing the Site safety plan and providing the Owner with a copy of such meeting minutes.

C. The Owner shall provide the Contractor with copies of the Owner's safety orientation booklet. The Contractor shall provide a copy to each of its workers and to each worker of its Subcontractors prior to each worker starting Work. The Contractor shall maintain documentation that each worker received a copy of the Owner's safety orientation booklet prior to the worker starting Work.

D. The Contractor and each Subcontractor shall, at all times: (1) guard the Owner's property from damage or loss in connection with the Work; (2) guard and protect the Contractor's Work and adjacent property; (3) replace or make good any said loss or damage unless said loss or damage is caused directly by the Owner; and (4) guard the lives and health of all persons on and in the vicinity of the Site.

E. The Contractor and each Subcontractor shall protect all adjoining property and shall repair or replace any said property damaged or destroyed during the progress of the Work.

F. The Contractor is responsible for ensuring that each Subcontractor executes the Subcontractor's obligations in this General Conditions Section 14.01.

Section 14.02 - Protection of Work

A. The Contractor shall be responsible for the safety, efficiency and adequacy of the Contractor's Work, plant, appliances, and methods, and for any damage which may result from the failure or the improper construction, maintenance, or operation of such Work, plant, appliances, and methods.

B. The Contractor shall have full responsibility to protect and maintain all materials on and off site in proper condition and forthwith repair, replace and make good any damage thereto until Physical Completion. The Contractor shall maintain an inventory of all materials for the Project that are delivered to the Site or approved for off-site storage facilities pursuant to General Conditions Section 8.01 G. All tools, spare parts, extra materials, attic stock and similar items delivered by the Contractor after Physical Completion shall be in proper condition and Contractor shall forthwith repair, replace, and make good any damage thereto until the later of Contract Completion and Acceptance or the expiration of one year from delivery.

C. The Contractor shall immediately report any loss, theft, burglary, vandalism, or damage of materials or installed work to the Owner by phone and email as soon as it is discovered. If vandalism, theft, or burglary is suspected as the cause of the loss, the Contractor shall notify Site security personnel and the municipal police, protect the place of the loss until released from protection by the Owner, and insure that no potential evidence relating to the loss is removed from the place of the loss.

D. Any insurance claim alleging damage to the Work shall be submitted to the Owner pursuant to General Conditions Section 10.03.

E. A claim for damage to the Work shall include the following in addition to the requirements of General Conditions Section 10.03:

1. A copy of a police report (if applicable).

2. A complete inventory of damages or lost items including:

a. Description of each item.

b. Purchase date and proof of delivery of each item.

c. Supplier from whom purchased.

d. Serial number (if applicable).

e. Price of each item.

3. The name, address and telephone number of the person who controlled the lost or damaged items immediately before the loss or damage.

4. The name, address and telephone number of the person who discovered the loss or damage.

5. A written description of how the loss or damage occurred.

F. The Owner may deny any claim from the Contractor under this General Conditions Section 14.02 if all items required by this General Conditions Section 14.02 are not provided or are not satisfactory to the Owner.

Section 14.03 - Protection of Lives and Health

A. The Contractor and each Subcontractor shall be responsible for the safe performance of the Work and their Means and Methods of Construction and for any injury or loss that shall occur from a failure to meet such responsibility.

B. The Contractor shall, within twenty-four (24) hours, notify the Owner and each Subcontractor shall, within twenty-four (24) hours, notify the Contractor of any incident, accident, illness, or injury that occurred on the Project Site. The Contractor shall follow-up and provide the Owner with a copy of Form C-2, Employers Report of Injury/Illness within twenty-four (24) hours of any incident, accident, illness, or injury, a copy of the recorded OSHA Log and any and all reports and statements pertaining to such incident, accident, illness, or injury.

C. The Contractor and each Subcontractor shall maintain a record of all cases of death, illness or injury requiring medical attention, hospitalization, or causing loss of time from work, arising out of and in the course of performance of Work of the Contract.

D. The Contractor and each Subcontractor shall preserve and safeguard the area of any incident, accident, illness, or injury where the person required emergency medical treatment. The Contractor shall secure

the area and not allow any material object or property to be altered, changed, moved, or removed from the area and post a person at the area to protect it. Safeguarding and protecting the area shall only be abandoned by the Contractor upon release by the Owner. The Contractor shall provide the Owner, within twenty-four (24) hours, a list of witnesses which includes the full name, home address, occupation and telephone number of each person and all maintenance records, tool box meeting records and daily reports reflecting the work performed on the day of the incident. The Contractor shall provide, within twenty-four (24) hours of learning of the actual or potential existence of any other witnesses, the Owner with updated information which includes the full name, home address, occupation, and telephone number of each additional witness.

E. If, in the performance of the Work, a harmful hazard is created for which appliances or methods of elimination have been approved by regulatory authorities, the Contractor shall install, maintain, and operate said appliances or methods.

F. The Contractor and each Subcontractor shall provide, in accordance with the terms of the relevant insurance policies and, as soon as practicable, within five (5) calendar days, written notice to each of its liability insurers (primary, excess and umbrella) of any such incident, accident, illness, injury, or death on the Project Site on behalf of itself, the Owner, the Client, and the Construction Manager. This provision does not remove the obligation of each insured to provide notice to its liability insurers. The Contractor and each Subcontractor shall provide to the Owner, the Client and the Construction Manager, a copy of such notice at the time such notice is given to each insurer as well as confirmation of receipt of such notice by each insurer.

G. The Contractor is responsible for ensuring that each Subcontractor executes the Subcontractor's obligations in this General Conditions Section 14.03.

H. Drug Testing Policy:

1. The Contractor shall undertake or continue, and ensure each Subcontractor shall undertake or continue, a drug testing policy designed to maintain a safe working environment.

2. The Contractor shall submit to the Owner, within seventy-two (72) hours after the date of the execution of this Contract, its drug testing policy in connection with the Project. Owner reserves the right in its sole discretion to direct that the Contractor's drug testing policy, at a minimum, contains a requirement to drug test any employee involved in an incident on the Project involving any reported bodily injury or any property damage over $1000 in value. Owner may also require random drug testing when appropriate in accordance with law along, with certifications to Owner regarding the status of the testing.

3. The Contractor shall not allow any worker or employee on a work site who is under, appears to be under, or is suspected of being under the influence of drugs or alcohol. Such employee shall not be allowed on site until drug testing has occurred and Owner has approved.

I. Professional Conduct:

1. The Contractor acknowledges and agrees that professionally appropriate conduct is a material obligation of this Contract. All employees, officers and representative of Contractor shall conduct themselves professionally in all communications in connection with the Project, including but not limited to communications with Subcontractors and other contractors.

2. Use of abusive, threatening, vulgar or other offensive language, whether written or oral, is a breach of the obligation set forth in paragraph (1) of this section 14.03 (I).

3. Contractor will receive a warning in writing from Owner upon breach of the obligation set forth paragraph (1) of this section 14.03 (I). Contractor agrees that any subsequent breach of paragraph (1) of this section 14.03 (I) committed after receipt of the written warning is grounds for the Owner to terminate this Contract for cause, or for the Owner to avail itself of any other remedy at law.

4. The Contractor shall include the provisions set forth in paragraphs (1) and (2) of this section 14.03 (I) in every subcontract in such a manner that the requirements of these provisions will be binding upon each Subcontractor as to Work in connection with the Contract.

J. Sexual Harassment:

1. As a condition to the award of this Contract, Contractor affirms that it has implemented (i) a written policy addressing sexual harassment prevention in the workplace and that (ii) it provides or will provide annual sexual harassment training to all of its employees, both of which meet the requirements of New York law including Section 201-g of the New York State Labor Law. The policy shall equal or exceed the standards set forth by the New York Department of Labor pursuant to the model sexual harassment prevention policy in connection with New York Labor Law Section 201-g (1). The Contractor shall ensure that all its employees receive a copy of the sexual harassment prevention policy pursuant to New York law and shall provide a copy to owner upon request.

2. The Contractor shall submit to the Owner, within seventy-two (72) hours after the date of the execution of this Contract, its sexual harassment prevention policy. The Owner may direct Contractor to revise its sexual harassment prevention policy to the extent that the Owner determines that the policy fails to meet the standards set forth in paragraph (1) of this section. Owner's failure to direct Contractor to revise its policy does not constitute a determination or representation that the policy satisfies New York law nor that the policy meets the standards set forth in paragraph (1) of this section.

3. The Contractor shall include the provisions set forth in paragraph (1) of this section 14.03 (J) in every subcontract in such a manner that the requirements of these provisions will be binding upon each Subcontractor as to Work in connection with the Contract.

K. Failure of the Contractor to comply with provisions of this General Conditions Section 14.03 shall be deemed a material breach of Contract and the Owner may impose a payment penalty on the Contractor for any act of non-compliance. The payment penalty shall not exceed one twentieth (1/20) of the contract price or a maximum of One Thousand Dollars ($1,000) for each time the Contractor fails to perform or to provide the information, reports, forms, etc. required in this General Conditions Section 14.03. This payment penalty is not exclusive; the Owner may avail itself of any other contractual remedy available.

Section 14.04 - Risks Assumed by the Contractor

The Contractor agrees that each duty set forth in this General Conditions Section 14.04 is separate, distinct, and independent from the other duties in this General Conditions Section 14.04.

A. To the fullest extent permitted by law, the Contractor solely assumes the following distinct and several risks whether said risks arise from acts or omissions, whether supervisory or otherwise, of the Owner, of the Client, of any Subcontractor, of third persons or from any other cause, including unforeseen obstacles and difficulties which may be encountered in the performance of the Work, whether said risks are within or beyond the control of the Contractor and whether said risks involve any legal duty, primary or otherwise, imposed upon the Owner or Client, regardless of the presence or absence of culpable conduct on the part of the Contractor, excepting only risks which arise from faulty designs as shown by the Drawings and Specifications or from the percentage of negligence attributed to the Owner, the Client or the Construction Manager or the Owner's, Client's or Construction Manager's members, officers, representatives or employees that caused the loss, damage or injuries hereinafter set forth:

1. To the fullest extent permitted by law, the risk of loss or damage, including direct or indirect damage or loss, of whatever nature to the Work or to any plant, equipment, tools, materials or property furnished, used, installed or received by the Owner, the Construction Manager, the Contractor or any Subcontractor, materialman or worker performing services or furnishing materials for the Work regardless of the presence or absence of any culpable conduct on the part of the Contractor, excepting only risks which arise from the percentage of negligence attributed to the Owner, Client or Construction Manager or the Owner's, Client's or Construction Manager's members, officers, representatives or employees that caused the loss or damage. The Contractor shall bear said risk of loss or damage until Physical Completion or until completion or removal of said plant, equipment, tools, materials or property from the Site and the vicinity thereof, whichever event occurs last. In the event of said loss or damage, the Contractor immediately shall repair, replace, or make good any said loss or damage.

2. To the fullest extent permitted by law, the risk of claims, just or unjust, by third persons against the Contractor, the Owner, the Client, or the Construction Manager on account of wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work by the Contractor or any Subcontractor, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the operations of the Contractor or any Subcontractor or presence at or in the vicinity of the Site of the Contractor or any Subcontractor, regardless of the presence or absence of any culpable conduct on the part of the Contractor. The Contractor shall bear the risk for all deaths, injuries, damages or losses sustained or alleged to have been sustained prior to Physical Completion of the Work excepting only the percentage of negligence attributed to the Owner, Client or Construction Manager or the Owner's, Client's or Construction Manager's members, officers, representatives or employees that caused the deaths, losses, damages or injuries, regardless of the presence or absence of any culpable conduct on the part of the Contractor. The Contractor shall bear the risk for all deaths, injuries, damages, or losses sustained or alleged to have been sustained after Physical Completion resulting from the Contractor's negligence or alleged negligence.

3. To the fullest extent permitted by law, the Contractor assumes entire responsibility and liability for any and all damage or injury of any kind or nature whatsoever, including death resulting therefrom, to all persons, whether employees of the Contractor or otherwise, and to all property, arising out of or alleged to arise out of or as a result of or in connection with the performance of the Work by the Contractor or any Subcontractor, whether actually caused by or resulting from the performance of the Work, or out of or in connection with the Contractor's or any Subcontractor's operations or presence at or in the vicinity of the Site, regardless of the presence or absence of any culpable conduct on the part of the Contractor. If any person shall make said claim for any damage or injury, including death resulting therefrom, or any alleged breach of any statutory duty or obligation on

the part of the Owner, the Client, Construction Manager, or any of the servants and employees of the Owner, Client or Construction Manager, the Contractor shall indemnify and hold harmless the Owner, the Client, the Construction Manager, and any of such servants and employees, for any and all loss, damage or injury that the Owner, the Client Construction Manager, or any such servants and employees, may sustain as the result of any claim, provided however, the Contractor shall not be obligated to indemnify and hold harmless the Owner, the Client Construction Manager, and any such servants and employees for their own negligence, if any. In the event that any negligence is attributed to the Owner, Client, Construction Manager or any such servants or employees, then that particular entity or person shall be indemnified and held harmless for all of its liability minus the percentage of negligence attributed to that particular entity or person.

4. Notwithstanding any contrary provision of the Contract, and to the fullest extent permitted by law, the Contractor shall, within ten (10) calendar days of notice from the Owner, Client or Construction Manager, assume the obligation to defend and represent the Owner, the Client, the Construction Manager, and any of the servants and employees of the Owner, Client or Construction Manager, with counsel selected by the Owner, in all claims by third parties arising out of or alleged to arise out of or as a result of or in any way associated with the duties, obligations or requirements of the Contractor or any Subcontractor pursuant to the Contract, or the presence of the Contractor or any Subcontractor on the Site. This obligation to defend applies immediately and is separate and independent of and distinct from the enforceability of any obligation of Contractor or any Subcontractor to indemnify or hold harmless the Owner, the Client, the Construction Manager and the servants or employees of the Owner, Client, and Construction Manager. The Contractor's obligation to defend includes, but is not limited to, payment of any legal fees associated with defending the Owner, the Client, the Construction Manager and any such servants and employees, all costs of investigation, expert evaluation, and any other costs. If the Contractor fails to so defend and represent the Owner, the Client, the Construction Manager, or any such servants and employees with counsel selected by the Owner, the Owner may proceed to defend and represent itself, the Client, the Construction Manager and any such servant and employee with counsel selected by Owner. Contractor shall make payment of the selected counsel's fees and expenses and all other defense costs incurred by Owner immediately upon receipt of Owner's demand.

B. The Contractor's obligations under this General Conditions Article shall not be deemed waived, limited or discharged by the enumeration or procurement of any insurance for liability for damages. The Contractor shall notify its insurance carrier within twenty-four (24) hours after receiving a written notice of loss or damage or claim from the Owner, the Client, or the Construction Manager. The Contractor shall make a claim to its insurer specifically under the provisions of the contractual liability coverage and any other coverage afforded the Owner, the Client or Construction Manager including those of being a named insured or an additional insured where applicable.

C. Neither Contract Completion and Acceptance of the Work nor making any payment shall release the Contractor from the Contractor's obligations under this General Conditions Article. The enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular claims for which the Contractor is responsible shall not be deemed to limit the effect of the provisions of this General Conditions Article or to imply that the Contractor assumes or is responsible for only risks or claims of the type enumerated; and neither the enumeration in this General Conditions Article nor the enumeration elsewhere in the Contract of particular risks assumed by the Contractor or particular claims for which the Contractor is responsible shall be deemed to limit the risks which the Contractor would assume or the claims for which the Contractor would be responsible in the absence of said enumerations.

D. Notwithstanding any provision of the Contract to the contrary, and to the fullest extent permitted by law, if the Contractor does not fulfill one or more of Contractor's obligations under General Conditions Articles 14 and 15 to defend, indemnify, hold harmless, and procure insurance for the Owner, Client and Construction Manager, and the Owner, Client or Construction Manager commences a court action to enforce one or more of the Contractor's obligations to defend, indemnify, hold harmless and procure insurance for the Owner, Client and Construction Manager, the Contractor, in addition to its other obligations, shall pay the costs of the Owner, Client and Construction Manager to bring and prosecute the court action, including but not limited to attorney and consultant fees, expenses and court fees. If the Owner, Client, or Construction Manager commences a court action against an insurance company to obtain coverage under an insurance policy which the Contractor represented would provide coverage to the Owner, Client or Construction Manager, the Contractor, in addition to its other obligations, shall pay the costs of the Owner, Client, and Construction Manager to bring and prosecute the court action, including but not limited to attorney and consultant fees, expenses, and court fees.

ARTICLE 15--INSURANCE AND BONDS

Section 15.01 - General Provisions

A. The Contractor and Subcontractors shall not violate, or permit to be violated, any term or condition of their insurance policies, and shall at all times satisfy the safety requirements of the Owner and of the insurance companies issuing such policies.

B. The Contractor and Subcontractors shall maintain in force all insurance required to be procured by them under this Contract until issuance of the Notice of Physical Completion by the Owner except where this Contract requires an insurance policy to be maintained for a period beyond issuance of the Notice of Physical Completion in which case the Contractor and Subcontractors shall maintain such insurance policy in force for the specified period beyond issuance of the Notice of Physical Completion.

C. All insurance required to be procured and maintained by the Contractor and Subcontractors under this Contract shall be procured from insurance companies licensed to do business in the State of New York by the NYS Department of Financial Services and rated at least A- by A.M. Best and Company, or meet such other requirements as are acceptable to the Owner in its sole and exclusive discretion.

D. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that the policy shall not be canceled, materially changed, or not renewed without at least thirty (30) calendar days written notice to the Owner except for non-payment in which case notice to the Owner shall be provided as required by law.

E. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that at least thirty (30) calendar days prior to the expiration of the policy, evidence from the carrier of renewal or replacement of the policy by the carrier, with terms and limits no less favorable than the expiring policy, or written notice from the carrier that the policy will not be renewed or replaced by the carrier, shall be delivered to the Owner.

F. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall be written on an occurrence basis except where this Contract explicitly allows otherwise.

G. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that the Owner and the Client shall not be responsible for any claim expenses and loss payments within the deductible or the self-insured retention

and that the Contractor or Subcontractor shall be solely responsible for all claim expenses and loss payments within the deductible or self-insured retention. At any time this Contract requires the Contractor or any Subcontractor to maintain an insurance policy, the Owner may require the Contractor or any Subcontractor to provide proof, acceptable to the Owner in its sole discretion, that the Contractor or Subcontractor has assets or security sufficient to satisfy all deductible or self-insured obligations under such insurance policy for which the Contractor or Subcontractor may be liable under the claims pending or reasonably possible against the Contractor or Subcontractor at the time the Owner requires the proof. A failure of the Contractor or Subcontractor to provide such proof is a failure of the Contractor or Subcontractor to maintain the insurance required by the Contract or to provide the Owner with evidence of valid and in-force insurance coverage required by the Contract for purposes of General Conditions Section 15.05.

H. All insurance policies required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that there shall be no right of subrogation against the Owner, Client, or Construction Manager. If any of the Contractor's policies or any of the policies of any Subcontractor prohibit such a waiver of subrogation, the Contractor or Subcontractor shall secure the necessary permission to grant this waiver of subrogation. Any and all such permission shall be confirmed by a manuscript endorsement to the relevant insurance policy or policies and a certified copy of the endorsement shall be provided to the Owner and Construction Manager.

I. Each liability and protective liability insurance policy required to be procured and maintained by the Contractor and Subcontractors under this Contract shall include a provision or endorsement that the coverage afforded the Owner, Client and Construction Manager under such policy shall be primary and non-contributory and that such policy shall be primary to any other insurance policy maintained by the Owner, by the Client or by the Construction Manager. Any other insurance policy maintained by the Owner, by the Client or by the Construction Manager shall be in excess of and shall not contribute with the Contractor's or Subcontractor's insurance policy, regardless of the "other insurance" clause contained in the Owner's, Client's or Construction Manager's own policy of insurance or the Contractor's or Subcontractor's insurance policies.

J. Any other Contract Document, including but not limited to the Information for Bidders, but excluding Change Orders, may require any of the Contractor and Subcontractors to provide at its or their expense any other form or limit of insurance necessary to secure the interests of the Owner or Client.

K. Notwithstanding any other provision of the Contract, the Owner, in a Change Order or Contract Amendment, may require the Contractor and any or all Subcontractors to provide, at the expense of the Owner, any other form or limit of insurance in addition to the insurance requirements of the original Contract necessary to secure the interests of the Owner, Client, or Construction Manager.

L. Neither the procurement nor the maintenance of any type of insurance by the Owner, the Client, the Contractor or the Construction Manager shall in any way be construed or deemed to limit, discharge, waive or release the Contractor or any Subcontractor from any of the obligations or risks accepted by the Contractor and Subcontractors or to be a limitation on the nature or extent of said obligations and risks or to be a limitation of any obligation to defend, indemnify, hold harmless and procure insurance for the Owner, Client and Construction Manager.

M. All provisions of General Conditions Article 14 - Protection of Persons and Property and General Conditions Article 15 – Insurance and Bonds are to the fullest extent permitted by law. One purpose of this Contract is to allocate, to the fullest extent permitted by law, all risk of loss to the Contractor, each Subcontractor, and the insurers of each. Each insurance company from which Owner or Client

has directly purchased an insurance policy is a third-party beneficiary of the Contractor's and each Subcontractor's obligations to procure insurance.

N. Contractor is responsible for ensuring that each Subcontractor obtains and maintains in the required amount each type of insurance policy required by this Contract and that such insurance policy provides the Owner, Client and Construction Manager with the coverage required by this Contract.

O. Contractor agrees and acknowledges that, because the Contractor (and not the Owner or Client) is responsible for performance of the duties and obligations set forth in this Contract for completion of the Project, the Contractor, through the use of insurance, intends to allocate all losses to such insurance to protect itself and the Owner and Client.

Section 15.02 - Submission of Insurance

A. Owner will not execute the Contract unless the Contractor shall submit to the Owner or the Owner's designee proof of insurance in such forms as requested and deemed acceptable by the Owner, indicating the Project, and showing evidence of all insurance required under the Contract. Upon the Owner's request, the Contractor shall provide a copy of each insurance policy required by the Contract certified by the insurance carrier as a true and complete copy. The Owner may request such a certified copy of a policy at any time and may make such requests as often as the Owner, in its sole and exclusive discretion, deems necessary. Each request may be for a certified copy of one or more policies. In addition, the Contractor shall provide copies of certificates of insurance to the Construction Manager, if applicable. Certificates of insurance, notwithstanding anything to the contrary contained on the Certificate of Insurance, when submitted to the Owner, constitute a warranty by the Contractor and its insurance agent or broker, that the insurance coverage described is in effect for the policy term shown.

B. The Contractor shall submit to the Owner or Owner's designee insurance certificates (Accord 25, or equivalent as determined by the Owner), copies of declaration pages, schedules of forms and endorsements, copies of all named insured endorsements, all endorsements of the policy granting coverage to the Owner, Client, and Construction Manager, and such other documents requested by the Owner as proof of insurance for the Contractor. All insurance submittals must be approved by the Owner or the Owner's designee prior to the Contractor's commencement of Work.

C. Upon the Owner's request, the Contractor shall submit to the Owner or Owner's designee proof of insurance for one or more Subcontractors, in such forms as requested and deemed acceptable by the Owner, indicating the Project, and showing evidence of all insurance required under the Contract. Upon the Owner's request, the Contractor shall provide a copy of each insurance policy of the Subcontractor or Subcontractors required by the Contract and certified by the insurance carrier as a true and complete copy. The Owner may request such a certified copy of a policy at any time and may make such requests as often as the Owner, in its sole and exclusive discretion, deems necessary. Each request may be for a certified copy of one or more policies for one or more Subcontractors. In addition, the Contractor shall provide copies of certificates of insurance to the Construction Manager, if applicable. Certificates of insurance of the Subcontractors, notwithstanding anything to the contrary contained on the Certificate of Insurance, when submitted to the Owner by the Contractor, constitute a warranty by the Contractor, the Subcontractor and the Subcontractor's insurance agent or broker, that the insurance coverage described is in effect for the policy term shown.

D. Upon request of the Owner made any time after bids are opened, the Contractor shall submit insurance certificates (Accord 25 and 855, or equivalent as determined by the Owner), copies of declaration pages, schedules of forms and endorsements, copies of all named insured endorsements, all endorsements of the policy granting coverage to the Owner, Client, and Construction Manager, and such other

documents requested by the Owner as proof of insurance for a Subcontractor. Owner may request proof of insurance for one or more Subcontractors at the same or at different times and may request proof of insurance for a particular Subcontractor as often as Owner, in its sole and exclusive discretion, determines is necessary.

Section 15.03 - Insurance Provided by Contractor

A. Prior to award of the Contract, the Contractor shall procure, at its sole cost and expense, and shall maintain in force at all times required by this Contract all of the insurance required under this Contract. Each Subcontractor shall procure, at its sole cost and expense, prior to the Contractor submitting to the Owner the name of such Subcontractor and prior to such Subcontractor commencing performance of any of the Work, and each Subcontractor shall maintain in force at all times required by this Contract all of the insurance required under this Contract. The insurance that the Contractor and each Subcontractor shall procure and maintain under this Contract includes, but is not limited to, the following:

1. Workers' Compensation (including occupational disease) and Employer's Liability insurance. Full New York State Workers' Compensation and Employer's Liability coverage shall be provided and evidenced by one of the following certificates **(Acord certificates are not acceptable):**

   a. C-105.2 (September '15, or most current version) - Certificate of NYS Workers' Compensation Insurance Coverage. The insurance carrier shall provide a completed form as evidence of in-force coverage.

   b. U-26.3 – (or any replacement) NYS Insurance Fund Certificate of Workers' Compensation Coverage. The NYS Insurance Fund shall provide a completed form as evidence of in-force coverage.

   c. GSI-105.2(2/02 or most current version) - Certificate of Participation in Workers' Compensation Group Board-approved self-insurance. The NYS Workers' Compensation Board's Self Insurance Office or the Contractor's Group Self Insurance Administrator shall provide a completed form.

   d. SI-12 (5/09 or most current version) Affidavit Certifying That Compensation Has Been Secured. The NYS Workers' Compensation Board's Self Insurance Office or the Contractor's Self Insurance Administrator shall provide a completed form.

2. Disability Benefits insurance. Full New York State Disability Benefits coverage for the benefit of such employees as are required to be covered by the New York State Disability Benefits Law shall be provided and evidenced by one of the following certificates:

   a. DB-120.1 (September 15, or most current version) - Certificate Of Insurance Coverage Under the NYS Disability Benefits Law.

   b. DB-155 (9/16) – Compliance with Disability Benefits Law. The NYS Workers' Compensation Board's Self Insurance Office shall provide a completed form.

   c. CE 200 Certificate of Attestation of Exemption. (Note: this form will only be accepted as evidence of an exemption from providing Disability Benefits insurance as required by law. The Dormitory Authority of the State of New York will not accept this as an exemption from providing Worker's Compensation Insurance.) The Certificate may be obtained from the NYS

Workers Compensation Board's website at http://www.wcb.state.ny.us. The CE 200 cannot be used for multiple projects; therefore, a new form shall have to be completed prior to award of any subsequent contract.

3. Commercial General Liability (CGL) insurance. The CGL insurance policy shall cover the liability of the Contractor or Subcontractor for bodily injury, property damage, and personal/advertising injury arising from performance of the Work or operations or presence at or in the vicinity of the Site of the Contract. The limits under such policy shall not be less than the following: the limit for each occurrence shall be at least $2,000,000; the general aggregate limit shall be at least $4,000,000; the personal and advertising injury limit shall be at least $1,000,000; ; the Fire Damage Legal Liability shall be at least $1,000,000; and the Products Completed Operations limit shall be at least $4,000,000. The limits may be provided through a combination of primary and umbrella and/or excess liability policies. Coverage shall provide and encompass at least the following:

   a. If the Contractor or Subcontractor proposes the use of a policy other than the ISO form CG 00 01 12 07, the Contractor or Subcontractor shall provide the proposed policy to the Owner which, in its sole and exclusive discretion, will determine whether the proposed policy provides equivalent coverage. The Contractor or Subcontractor shall pay Owner any attorney fees and other costs incurred by Owner in determining whether the proposed policy provides equivalent coverage. Owner will select the attorney providing advice on the proposed policy.

   b. ISO Endorsement Forms CG 20 10 04 13 and CG 20 37 04 13, or their equivalents, specifically naming as additional insureds the Dormitory Authority, Client, any other entities as required by the Contract Documents, and if applicable, the Construction Manager and for form CG 20 37 04 13 or its equivalent, specifically listing the Project location. In the event said endorsements or equivalents are not able to be provided, the Owner may accept, at the Owner's sole discretion, CG 20 38 04 13 or its equivalent or other manuscript endorsements providing equivalent coverage.

   c. If the Contractor or Subcontractor proposes the use of an endorsement or endorsements other than the ISO Endorsement Forms CG 20 10 04 13 and CG 20 37 04 13, the Contractor or Subcontractor shall provide the proposed endorsement(s) to the Owner or the Owner's designee which, in its sole and exclusive discretion, will determine whether the proposed endorsements provide equivalent coverage. Contractor and Subcontractor shall pay Owner any attorney fees and other costs incurred by Owner in determining whether the proposed endorsements provide equivalent coverage. Owner will select the attorney providing advice on the proposed endorsements.

   d. Additional insured status for Owner, Client, Construction Manager and any other entities as required by the Contract Documents shall apply during the Products/Completed Operations phase as well as during the course of performance of the Work.

   e. The policy provisions required by General Conditions Section 15.01.

   f. Excavation, Collapse and Underground Hazards.

   g. Independent contractors/subcontractors.

   h. Blanket Written Contractual Liability covering all indemnity agreements, including all indemnity obligations contained in the Contract, and covering tort liability of another assumed in a contract.

i. Products and completed operations coverage for a term no less than three years commencing upon issuance by the Owner of the Notice of Physical Completion.

j. Premises liability.

k. Defense and/or indemnification obligations, including obligations assumed under this Contract.

l. Cross liability for additional insureds.

m. Contractor and Subcontractor means and methods.

n. Liability resulting from Section 240 or Section 241 of the NYS Labor Law.

o. ISO Endorsement CG 25 03 11 85 or its equivalent applying the policy's general aggregate limit separately to the Project.

p. The maximum deductible or self-insured retention shall be $50,000.

q. No endorsement or provision in the policy shall exclude coverage for Owner, Client, or Construction Manager for any liability when the injured party is an employee of Contractor or any Subcontractor.

r. No endorsement or provision in the policy shall require privity of contract between the Owner and Subcontractor or between the Client and the Contractor or Subcontractor or between the Construction Manager and the Contractor or Subcontractor in order for the Owner, the Client, or the Construction Manager to have coverage as an insured on such insurance policy.

s. If the Contractor or Subcontractor must provide a Railroad Protective Liability insurance policy, the CGL exclusion for work within fifty (50) feet of railroad property must be deleted.

t. No endorsement or provision in the policy shall have a height limitation or exclusion.

u. No endorsement or provision in the policy shall have a classification exclusion with respect to work performed for the Owner, Client, and Construction Manager.

v. Owner, Client, and Construction Manager shall be covered for any and all liability arising out of acts or omissions of Contractor and any Subcontractor.

4. Commercial Automobile Liability insurance. The Commercial Automobile Liability insurance policy shall cover liability arising out of the use of any motor vehicle in connection with the Contract, including owned, leased, hired and non-owned vehicles bearing or, under the circumstances under which they are being used, required by the laws of NYS to bear, license plates. The policy shall have a combined single limit for bodily injury and property damage of at least $1,000,000. The limit may be provided through a combination of primary and umbrella and/or excess liability policies. If the Contract involves the removal of hazardous waste or otherwise transporting Hazardous Materials, pollution liability coverage for covered autos shall be provided by endorsement CA 99 48 03 06 or CA 00 12 03 06 and the Motor Carrier Act Endorsement (MCS90) shall be attached to the policy.

5. Umbrella and/or Excess Liability insurance. When the limits of the CGL, Commercial Auto Liability or Employers' Liability policies procured are insufficient to meet the limits specified in the preceding paragraphs, Commercial Umbrella or Excess Liability policies shall be procured and maintained provided, however, that the total amount of insurance coverage is at least equal to the requirements specified in the preceding paragraphs. The Commercial Umbrella or Excess Liability policies shall follow the same form as the CGL, Commercial Automobile Liability and Employers Liability insurance policies required in the preceding paragraphs. The Umbrella and/or Excess Liability policies shall be primary to any other insurance maintained by the Owner or Client or Construction Manager or any other additional insured. Any other insurance maintained by the Owner, the Client, the Construction Manager, or any other additional insured shall be in excess of and shall not contribute with the Contractor's or Subcontractor's Umbrella or Excess Liability insurance policies, regardless of the "other insurance" clause contained in the Owner's or Client's or Construction Manager's or other additional insured's own policy of insurance or the Contractor's or Subcontractor's insurance policies.

6. The Contractor shall secure, pay for, and maintain property insurance necessary for protection against the loss of owned, borrowed or rented capital equipment and tools, including any tools owned by employees, and any tools or equipment, staging towers, and forms owned, borrowed, or rented by the Contractor. The requirement to secure and maintain such insurance is solely for the benefit of the Contractor. Failure of the Contractor to secure such insurance or to maintain adequate levels of coverage shall not render the Owner, Client and, if applicable, the Construction Manager and other entities specified as additional insureds on the sample certificate of insurance provided by the Owner in the bidding documents or their agents and employees responsible for any losses; and the Owner, Client and, if applicable, the Construction Manager and other entities specified as additional insureds on the sample certificate of insurance provided by the Owner in the bidding documents and their agents and employees shall have no such liability.

B. Notwithstanding any other provision of the Contract to the contrary and to the fullest extent permitted by law, Contractor shall be liable for all costs and fees, including counsel fees, incurred by or on behalf of the Owner, the Client or the Construction Manager in any action brought by or against the Owner, Client or Construction Manager concerning insurance coverage owed to Owner, Client or Construction Manager by any insurer for which Contractor or any Subcontractor represented that the Owner, Client and Construction Manager would be an insured or would benefit in any way if a claim was brought against Owner, Client and Construction Manager .

Section 15.04 - Other Insurance Provided by Contractor

The Contractor and each Subcontractor shall also procure and maintain as required by General Conditions Sections 15.01 B and 15.03 A the following insurance:

A. United States Longshore and Harbor Workers' Compensation Act and Jones Act: When, to perform the Work, the Contractor or any Subcontractor is engaged in activities on or near a shoreline or on or near the navigable waterways of the United States or when any part of the Work is connected to water related activities, the Workers' Compensation policy referenced above of the Contractor and any such Subcontractor shall be endorsed to provide Jones Act and United States Longshore and Harbor Workers' Act coverage.

B. Contractor's Pollution Liability insurance: When the Work includes abatement, removal, repair, replacement, enclosure, encapsulation or disposal of any pollutants, which include but are not limited to, petroleum, petroleum products, mold, asbestos, lead or any other Hazardous Material, the Contractor or any Subcontractor performing Work involving any of the pollutants, shall procure and maintain in

full force and effect pollution legal liability insurance with limits of at least $2,000,000 providing coverage for bodily injury and property damage, including loss of use of damaged property or of property that has not been physically injured and coverage that encompasses at least the following:

1. Endorsement specifically naming as additional insureds: Dormitory Authority, the Client, and if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents.

2. The policy provisions required by General Conditions Section 15.01.

3. A maximum deductible or self-insured retention of $50,000.

4. Coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants, including any loss, cost or expense incurred as a result of any cleanup of pollutants or in the investigation, settlement or defense of any claim, suit or proceedings against the Owner, Client or Construction Manager arising from the Work.

5. Coverage shall be provided until three years after the Owner issues the Certificate of Physical Completion.

C. Railroad Protective Liability insurance: If any Work of the Contract is to be performed on or within fifty (50) feet of a railroad property or railroad right of way or will require entrance upon railroad property or right of way or will require assignment of a railroad employee, the Contractor shall provide and maintain a Railroad Protective Liability policy with the policy limits required by the owner(s) of the railroad. For purposes of this paragraph, a subway is a railroad. The policy form shall be ISO-RIMA or an equivalent form approved by the owner(s) of the railroad. The railroad owner(s) shall be the named insured on the policy and the definition of "physical damage to property" shall mean direct and accidental loss of or damage to all property of any named insured and all property in any named insured's care, custody, or control. If the Contractor shall provide a Railroad Protective Liability insurance policy, the Contractor and any Subcontractor performing on or within fifty (50) feet of railroad property or railroad right of way or entering railroad property or right of way or requiring assignment of a railroad employee shall have their CGL insurance policy endorsed to delete the exclusion of coverage for Work within fifty (50) feet of railroad property.

D. Professional Liability insurance: Each of the Contractor and any Subcontractor performing any Work which involves delegation of design shall procure and maintain Error and Omissions Liability Insurance for the delegated design Work with a minimum insurance limit of not less than two (2) million dollars issued to and covering damage for liability imposed on the Contractor or Subcontractor by this Contract or law arising out of any negligent act, error, or omission in the rendering of or failure to render professional services required by this Contract. This insurance may be issued on a claims-made policy form and shall be maintained for no less than three (3) years after issuance by the Owner of the Notice of Physical Completion. The policy, at the sole expense of the Contractor or Subcontractor, shall have extended Discovery Clause coverage of at least three (3) years after issuance by the Owner of the Notice of Physical Completion if the policy is cancelled or not renewed. The maximum deductible or self-insured retention is $100,000.

E. Unmanned Aircraft System (UAS) Insurance: Any Contractor or Subcontractor proposing the use of any Unmanned Aircraft System for any purpose on a Project, including but not limited to investigation, surveying, photography, inspections or observation, shall comply with all of Owner's policies and procedures regarding such use and shall provide coverage, in the form of an Unmanned Aircraft System (UAS) endorsement to the Commercial General Liability Coverage required above or Aircraft Liability

Coverage with a minimum limit of $1,000,000. Such coverage shall name the Owner and any required third parties as additional insureds.

F. Marine Protection & Indemnity insurance and Hull & Machinery insurance: Each of the Contractor and any Subcontractor performing any Work on navigable water or connected to water-related activities or with marine operations, shall procure and maintain Marine Protection & Indemnity insurance and Hull & Machinery insurance. Hull & Machinery coverage shall be provided for the total value of the watercraft and equipment used in the Work on navigable water or connected to water-related activities or with marine operations. The Contractor shall obtain a Marine Protection & Indemnity Liability insurance policy for all navigable water, water-related or marine activities or operations under the Contract with a minimum limit of $2,000,000. The Owner, the Client and, if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents shall be additional insureds on the Marine Protection & Indemnity Liability insurance policy. The Marine Protection & Indemnity Liability insurance policy shall provide coverage that encompasses at least the following:

5. The policy provisions required by General Conditions Section 15.01.

2. A maximum deductible or self-insured retention of $50,000.

3. Coverage shall be provided until the Owner issues the Certificate of Physical Completion.

4. Endorsement specifically naming as additional insureds: Dormitory Authority, the Client, and if applicable, the Construction Manager and other entities specified on the sample certificate of insurance provided by the Owner in the bidding documents.

Section 15.05 - Stop Work Order - Insurance

A. All insurance certificates are valid for one (1) year from the date the certificate is signed/stamped, or until policy expiration, whichever is earlier. The Contractor shall be responsible to submit updated insurance certificates to the Owner or the Owner's designee thirty (30) calendar days prior to any insurance certificate expiration date.

B. Failure of the Contractor or any Subcontractor to maintain the insurance required by the Contract or to provide the Owner or the Owner's designee with evidence of valid and in-force insurance coverage required by the Contract shall result in a Stop Work Order pursuant to General Conditions Article 11 – Termination or Suspension and/or withholding of payment to the Contractor.

C. At any time that the coverage provisions and limits on the policies required herein do not meet the provisions and limits set forth above, the Contractor or Subcontractor shall immediately cease Work on the Project. The Contractor or Subcontractor shall not resume Work on the Project until authorized to do so by the Owner or the Owner's designee.

D. Any delay or time lost as a result of the Contractor or Subcontractor not having proper insurance required by this General Conditions Article or not providing the Owner or the Owner's designee with evidence of valid and in force insurance required by the Contract shall not give rise to a delay Claim or any other Claim against the Owner. Further, the Contractor may be liable to other contractors for costs incurred by reason of the Contractor's or Subcontractor's failure to provide insurance.

Section 15.06 – Builder's Risk

A. The Owner will provide Builder's Risk insurance for all projects, except for those projects listed in paragraph B of this General Conditions Section 15.06.

1. The Owner shall, except as otherwise specified, at all times beginning with the Notice to Proceed and until Substantial Completion, procure and maintain, at the Owner's sole cost and expense, "All Risk" Builder's Risk insurance. The Contractor and Subcontractors will be covered for the Work of the Contract, except losses up to and including the deductible shall be borne by the Contractor. The Owner shall, at the Owner's sole discretion, have the power to adjust and to settle with the insurer any loss or claim under the Builder's Risk insurance. Reimbursement for loss, if any, shall be made payable to the Owner. The deductible is stated in the Information for Bidders.

2. Coverage shall include sub limits for property in transit and for property in storage on and off the Site. Specific higher limits for transit or for storage may be available as circumstances may require upon written request by the Contractor or any Subcontractor to the Owner at least 30 calendar days before such higher limit would take effect if the request is granted. Owner in its sole and exclusive discretion may grant or deny the request for a higher limit for transit or storage. If the Owner denies the request, the Contractor or Subcontractor shall have no Claim against the Owner for any cost or damage. If the Owner grants the request, the Owner may condition the grant upon the Contractor or Subcontractor paying the additional cost for the higher limit for transit or storage.

3. No coverage shall be provided to the Contractor or any Subcontractor under any property insurance policy of the Owner or Client which only covers completed, occupied structures.

B. The Contractor shall procure and maintain, at its sole cost and expense, Builder's Risk insurance for all OMH, OPWDD, OASAS, NYCHA, and HTFC-GOSR projects, or when otherwise specified, as provided below.

1. The Contractor shall maintain until the date of Physical Completion, an All Risk Builder's Risk Completed Value Form insurance policy, with coverage for at least the value of the Work of the Contract except for excavation work, planting and seeding, and Work buried in the ground other than wiring and walking tunnels, but including debris removal costs and architect, engineering and other costs to evaluate damage and provide any design or other services necessary to correct or minimize damage in the event of damage to the Work covered by the policy or such higher amount of coverage as required by the Owner in this Contract. Debris removal costs shall include demolition as may be necessary by the operation of any law, ordinance, or regulation. The policy shall cover property of the Owner or Client when in the Contractor's care, custody, or control. The policy shall name as insureds the Owner, Client and Contractor and shall include such soft costs coverage for the Owner and Client as specified in this Contract. The extended coverage endorsement may include a loss deductible of $10,000 or less. The Contractor shall bear all losses up to and including the deductible provision.

2. Coverage shall also include sub limits for equipment, material, and other property in transit or in storage on or off the Site. Specific higher limits of coverage for property in transit or storage, at Contractor's expense, may be required by the Owner due to circumstances of the Project.

Each Builder's Risk insurance policy shall include the following endorsement:

"It is made a condition of this insurance that until the Owner issues the Notice of Physical Completion to the Contractor, occupancy of the premises shall not require consent of the insurer, nor shall such occupancy be the basis for a rate adjustment."

3. Builder's Risk insurance policy shall name the Dormitory Authority and the Contractor Loss Payees in order of precedence, as their interests may appear and shall run until the date of Physical Completion. Policies expiring on a fixed date before Physical Completion shall be renewed not less than thirty (30) calendar days before such expiration date. Such policy shall not be changed by endorsement without the knowledge and consent of the Owner and in particular, shall provide that no notice of cancellation by the insurer shall be effective until sixty (60) calendar days after such notice is received by the Owner. If the policy is issued by a mutual insurance company, the policy shall provide that the Owner and the Client shall not be liable for any premium or assessment under the policy; the Contractor shall be responsible for all premiums and assessments.

4. The Owner may withhold the Contractor's payment for Work which is required to be insured until original binder or policies for the Builder's Risk insurance are provided to the Owner pursuant to General Conditions Section 15.06.

Section 15.07 - Bonds Provided by Contractor

A. The Contractor shall provide the Performance Bond in an amount at least equal to 100% of the Contract sum as security for the faithful performance of the Contract. The Contractor shall also provide the Payment Bond in an amount at least equal to 100% of the Contract sum for the payment of all persons performing labor or providing materials in connection with the Work of the Contract. The Contractor shall execute the Performance Bond form and the Payment Bond form included in the Contract Documents.

B. If at any time the Owner, in its sole and exclusive discretion, shall become dissatisfied with any surety or sureties upon the Performance Bond or the Payment Bond, or if for any other reason said bonds shall cease to be adequate security to the Owner, the Contractor shall, within five (5) calendar days after written notice from the Owner to do so, substitute an acceptable bond or bonds in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The Contractor shall pay the premiums on said bond or bonds. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable bond or bonds to the Owner.

C. The surety company, on all bonds, shall be authorized to do business in the State of New York by the NYS Department of Financial Services and rated at least A- by A.M. Best and Company, or meet such other requirements as are acceptable to the Owner in its sole and exclusive discretion.

ARTICLE 16 -- GENERAL PROVISIONS of the CONTRACT

Section 16.01 - General Law Provisions

A. This Contract and its enforcement, and any controversy arising out of or relating to the making or performance of this Contract, shall be governed by and construed in accordance with the law of the State of New York, without regard to the New York principles of conflicts-of law and except where the United States supremacy clause requires otherwise.

B. Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted therein and the Contract shall read and shall be enforced as though so included therein.

C. The Contractor shall comply fully with all applicable laws, rules, and regulations, and as applicable, Building Code of New York State or Building Code of the City of New York.

D. The Contractor agrees that the Contract shall be deemed executory to the extent of moneys available from either: (1) the proceeds of bonds issued by the Dormitory Authority for the Contract, (2) moneys made available by the Client to the Owner for the Contract, (3) other moneys made available to the Owner from whatever source specifically for the Contract and no liability shall be incurred by the Owner beyond moneys available therefore.

E. The relationship created by the Contract between the Owner and the Contractor is one of an independent contractor and it is no way to be construed as creating an agency relationship between the Owner and the Contractor nor is it to be construed as, in any way or under any circumstances, creating or appointing the Contractor as an agent of the Owner for any purpose whatsoever.

F. Except as provided herein, this Contract and each and every provision hereof and thereof is for the exclusive benefit of the Parties hereto and not for the benefit of any third party. Nothing in the Contract shall create or shall give to third parties any claim or right of action against the Owner, the State of New York, the Client, or any institution at which the Work is being carried out beyond such as may legally exist irrespective of the Contract; however, it is understood that the Client is an intended third party beneficiary of the Contract for the purposes of recovering any damages caused by the Contractor.

G. The Contractor shall not assign the Contract in whole or in part without prior written consent of the Owner. Any attempt to assign the Contract in whole or in part without prior written consent of the Owner is null and void. As a condition to consent to the assignment, the Owner shall require each proposed assignee to establish, to the satisfaction of the Owner in its sole and exclusive discretion, that the assignee is responsible and, if applicable, has the experience to perform the Work. If the Owner consents to an assignment and if the Contractor assigns all or part of any moneys due or to become due under the Contract, the instrument of assignment shall contain a clause substantially to the effect that the Contractor and assignee agree that the assignee's right in and to any moneys due or to become due to the Contractor shall be subject to all prior claims for services rendered or materials supplied in connection with the performance of the Work. The Owner reserves the right to assign this Contract in whole or in part without the consent of the Contractor. Unless otherwise agreed by the Parties hereto in a separate writing, no permitted assignment described in this Section shall relieve the assigning Party from any of its obligations under this Contract. However, the assignee may be required by the assigning Party to agree to indemnify and hold harmless the assigning Party from some or all of its obligations under this Contract.

H. This Contract shall be binding upon and shall inure to the benefit of the Parties hereto and their respective successors and permitted assignees.

I. The Owner is exempt from the terms of fair-trade agreements for sales to the Contract.

J. Inasmuch as the Contractor can be compensated adequately by money damages for any breach of the Contract which might be committed by the Owner, the Contractor agrees that no default, act or omission of the Owner shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the Contract or to suspend or abandon performance of the Contract; and the Contractor hereby waives any and all rights and remedies to which the Contractor might otherwise be or become entitled to because of any wrongful act or omission of the Owner saving only the Contractor’s right to money damages.

K. No action or proceeding shall lie or shall be maintained by the Contractor, nor anyone claiming under or through the Contractor, against the Owner upon any Claim arising out of or based upon the Contract, relating to the giving of notices or information.

L. No action or proceeding shall lie in favor of or shall be maintained by the Contractor against the Owner unless such action shall be commenced within one year after the earliest following event:

1. The date the Owner executes the Notice of Physical Completion.

2. Receipt, by the Owner, of the Contractor's final Application for Payment, if no Notice of Physical Completion is issued.

3. The date of termination if the Owner terminates the Contract.

M. The Owner and Contractor agree to submit to the exclusive jurisdiction of the Commercial Division, New York Supreme Court, which shall hear any dispute, Claim or controversy arising in connection with or relating to this Contract, including, but not limited to the validity, breach, enforcement, or termination thereof.

N. No action or proceeding shall be brought against the Owner in any location other than Albany County unless the Owner specifically consents, in writing, to a change of venue.

O. If the Contractor obtains a judgment against the Owner in any action or proceeding, the Contractor agrees to accept no more than three percent (3%) interest, per annum, on the amount of the judgment.

P. Neither Contractor nor its Subcontractors shall place or maintain, or permit to be placed or maintained, any sign, bill, or poster on or about the Premises without the prior consent of Owner’s Representative.

Q. Each Party has reviewed and discussed this Contract with counsel and agrees that this Contract shall not be construed by applying any rule of construction providing for interpretation against the drafting Party.

Section 16.02 - Diesel Emissions Reduction

A. The Contractor shall certify that heavy duty vehicles, as defined in the NYS Environmental Conservation Law (ECL) Section 19-0323 and Title 6 of the New York Codes Rules and Regulations, Part 248 (6 NYCRR 248), will comply with the rules, regulations and provisions pursuant to ECL Section 19-0323, and 6 NYCRR 248, which requires the use of Best Available Retrofit Technology and Ultra Low Sulfur Diesel to the extent required by law unless specifically waived by the NYS Department of Environmental Conservation (DEC). Qualification for a waiver will be the responsibility of the Contractor.

B. Annually, as required by DEC, but no later than March 1st, the Contractor shall complete and submit directly to the Owner, via electronic mail, the Regulated Entity Vehicle Inventory Form and Regulated Entity and the Contractors Annual Report Form, found on the DEC website http://www.dec.state.ny.gov for vehicles used on the Project for the preceding calendar year.

C. The Contractor shall certify to the Owner, and submit with each Application for Payment, the Contractor and Subcontractor Certifications form, which states that the Contractor agrees to comply with the provisions of General Conditions Section 16.02.

Section 16.03 – State and Federal Labor Law Provisions

A. All applicable provisions of NYS Labor Law shall be carried out in the performance of the Work.

B. The Contractor specifically agrees, as required by NYS Labor Law, Sections 220 and 220-d as amended, that:

1. No worker, in the employ of the Contractor, any Subcontractor or any other person doing or contracting to do the whole or any part of the Work contemplated by the Contract shall be permitted or required to work more than eight (8) hours in any one (1) calendar day and more than five (5) days in any one week, except in the extraordinary emergencies set forth in NYS Labor Law.

2. The wages paid for a legal day's work shall be not less than the prevailing rate of wages as defined by NYS Labor Law. Each laborer, worker or mechanic employed by the Contractor, any Subcontractor or any other person doing or contracting to do the whole or any part of the Work contemplated by the Contract shall be paid not less than the prevailing rate of wages as defined by NYS Labor Law and shall be provided not less than the supplements as required by NYS Labor Law.

3. The minimum hourly rate of wage to be paid and supplements provided shall be not less than that required by the NYS Labor Law and as shall be designated by the Commissioner of Labor of the State of New York.

4. The Contractor and all Subcontractors shall post in a prominent and accessible place on the Site, a legible statement of all minimum wage rates and supplements to be paid or provided for the various classes of workers engaged in the performance of the Work and all deductions, if any, required by law to be made from unpaid wages actually earned by any worker so engaged.

5. The Contractor and all Subcontractors shall provide each worker a written notice of the prevailing wage rate for each of the worker's particular job classifications on each pay stub and, as required by the NYS Labor Law, written notice that includes the telephone number and address for the Department of Labor and a notice informing all workers of their right to contact the Department of Labor if a worker is not receiving the proper prevailing rate of wages and/or supplements for a worker's particular job classification.

6. The Contractor shall be responsible for obtaining prevailing wage rate updates directly from the NYS Department of Labor, either by accessing its website http://www.labor.state.ny.us or a written request to the Bureau of Public Works.

C. The minimum wage rates, if any, specified for apprentices shall apply only to persons working with the tools of the trade which such persons are learning under the direct supervision of journeyman mechanics as an individual registered in an apprenticeship program which is duly registered with the Commissioner of Labor of the State of New York in conformity with the NYS Labor Law. Except as otherwise required by law, the number of apprentices in each trade or occupation employed by the Contractor or any Subcontractor shall not exceed the number permitted by the applicable standards of the NYS Department of Labor, or, in the absence of such standards, the number permitted under the usual practice prevailing between the unions and the employers' association of the respective trades or occupations.

D. All workers of the Contractor and all Subcontractors shall be paid in accordance with the provisions of the NYS Labor Law. The Contractor and all Subcontractors shall submit to the Owner original copies of the Contractor and Subcontractor Certifications form and Certified Payroll forms in accordance with payment procedures and otherwise upon request. The Contractor and all Subcontractors shall prepare and keep original payrolls or transcripts thereof in compliance with NYS Labor Law Section 220, subdivision 3-a, and shall file transcripts of such payrolls with the Owner as required by NYS Labor

Law Section 220, subdivision 3-a. Filing the transcripts of such payrolls with the Owner as required by NYS Labor Law Section 220, subdivision 3-a is a condition precedent to payment of any sums due and owing Contractor or any Subcontractor for Work performed upon the Project.

E. The Contractor agrees that, in case of underpayment of wages to any worker engaged in the Work by the Contractor or any Subcontractor, the Owner shall withhold from the Contractor out of payments due an amount sufficient to pay such worker the difference between the wages required to be paid under the Contract and the wages actually paid such worker for the total number of hours worked, and that the Owner may disburse such amount so withheld by the Owner for and on account of the Contractor to the worker to whom such amount is due. The Contractor further agrees that the amount to be withheld pursuant to this paragraph may be in addition to the amounts and percentages to be retained by the Owner pursuant to other provisions of the Contract.

F. Pursuant to subdivision 3 of Section 220 and Section 220-d of the NYS Labor Law the Contract shall be forfeited and no sum paid for any Work done thereunder upon a Contractor's or Subcontractor's second conviction for willfully paying or providing less than:

1. The stipulated wage scale or supplement as established by the fiscal officer.

2. The stipulated minimum hourly wage scale and supplements as designated by the Commissioner of Labor of the State of New York.

G. If the project is Federally funded in part or whole and therefore subject to the requirements of the Davis Bacon Act, the U.S. Department of Labor's government-wide implementation of the Act, or to Federal program legislation, the Contractor shall pay the higher of either NYS Department of Labor prevailing wage rates or wages established for the locality of the project by the U.S. Department of Labor.

H. The Contractor specifically agrees that all workers engaged on the Site, whether employees of the Contractor, Subcontractor, or other person performing or contracting to do any part of the Work, shall be certified, prior to performing any Work, as having successfully completed at a minimum the OSHA 10-hour construction safety and health course as required by NYS Labor Law Section 220-h, unless additional certifications, courses or training are required by the project specific jurisdiction or as required to complete the Work of the Contract.

Section 16.04 – Nondiscrimination

A. To the extent required by Article 15 of the NYS Executive Law (also known as the Human Rights Law) and all other NYS and United States statutory and constitutional non-discrimination provisions, the Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, sex (including gender identity or expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristics, marital status or domestic violence status.

B. If the Contractor is directed to do so by the Owner, the Contractor shall request each employment agency, labor union or authorized representative of workers with which the Contractor has a collective bargaining agreement or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, sex (including gender identity or expression), national origin, sexual orientation, military status, age, disability, predisposing genetic characteristics or marital status, and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations under Articles 15 and 15A of the NYS Executive Law.

C. The Contractor shall state, in all solicitations or advertisements for employees, that in the performance of the Contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex (including gender identity or expression), sexual orientation, military status, age, disability, predisposing genetic characteristics or marital status.

D. The Contractor shall include the provisions of paragraphs A, B, and C of this General Conditions Section 16.04 in every Subcontract and purchase order in such a manner that such provisions will be binding upon each Subcontractor and vendor as to the operations for the Contract to be performed within the State of New York.

E. Pursuant to NYS Labor Law, Section 220-e, the Contractor specifically agrees:

1. That in the hiring of employees for the performance of Work under the Contract or any subcontract hereunder, or for the manufacture, sale or distribution of materials, equipment or supplies hereunder, but limited to operations performed within the territorial limits of the State of New York, no Contractor, Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall by reason of race, creed, color, national origin, sex (including gender identity or expression), sexual orientation, military status, age, disability, predisposing genetic characteristics or marital status discriminate against any citizen of the State of New York who is qualified and available to perform the Work to which the employment relates.

2. That no Contractor, Subcontractor, nor any person on behalf of such Contractor or Subcontractor shall, in any manner, discriminate against or intimidate any employee hired for the performance of Work under the Contract on account of race, creed, color, national origin, sex (including gender identity or expression), sexual orientation, military status, age, disability, predisposing genetic characteristics or marital status.

3. That there may be deducted from the amount payable to the Contractor, by the Owner under the Contract, a penalty of fifty dollars ($50.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the terms of the Contract.

4. That the Contract may be canceled or terminated by the Owner and all moneys due or to become due hereunder may be forfeited for a second or any subsequent violation of the terms or conditions of this Section 16.04 E of the Contract.

Section 16.05 - Domestic Steel

The Dormitory Authority is required to comply with all provisions of Title 4 of Article 9 of the NYS Public Authorities Law, including NYS Public Authorities Law Section 2603-a, and in accordance therewith, if the amount of the Contract exceeds $100,000, the Owner requires that all structural steel, reinforcing steel or other major steel items to be incorporated in to the Work of the Contract be produced or made in whole or substantial part in the United States, its territories, or possessions. The Owner, in its discretion, may grant waivers of this requirement in accordance with NYS Public Authorities Law Section 2603-a. Contractor must request a waiver in writing and obtain a written waiver of this requirement from Owner before using in performance of the Contract any steel not produced or made in whole or substantial part in the United States, its territories, or possessions.

Section 16.06 - Failure to Comply with Article 16

The Owner will not be responsible for any Claim arising from compliance with this General Conditions Article 16.

ARTICLE 17—RECORDS/AUDITS/INVESTIGATIONS/ETHICS

Section 17.01 – Preparation of Records/Owner's Right to Inspect Records and to Audit

The Contractor shall, concurrently with performance of the Contract, prepare substantiating records regarding performance of the Contract, including records of Subcontractors and material suppliers. General Conditions Section 17.03 describes the records and other data to be maintained by Contractor, Subcontractors, and material suppliers. The Contractor shall maintain and keep, for a period of at least six (6) years after the date of payment of the final Application for Payment, all records and other data relating to the Work, including records of Subcontractors and material suppliers. Upon seven (7) calendar days' written notice, the Contractor shall make its records (including records of Subcontractors and material suppliers) available during normal business hours to the Owner or its authorized representative(s). Owner and its authorized representative(s) shall be entitled to inspect, examine, review and copy the Contractor's records, including but not limited to all documents, electronic records and recordings, (including records of Subcontractors and material suppliers) at the Owner's reasonable expense, within adequate workspace at the Contractor's facilities. The Owner shall also have the right to have Owner or its authorized representative audit all records and other data of the Contractor, Subcontractors and material suppliers relating to the Work.

Section 17.02- False Statements/Information/Disclosure

Failure to comply with General Conditions Section 17.01, providing False Representations, false statements or inaccurate information submitted in accordance with Contract Documents, including but not limited to, an Application for Payment, a Claim or a Change Order, a filing or system entry related to MWBE participation requirements or False Representations, false statements, or inaccurate information submitted to the Owner, or a determination that the Contractor participated in the kick-back of wages may result in one or more of the following actions:

A. Termination of the Contract for cause, pursuant to General Conditions Section 11.01.

B. Rejection of future bids or disapproval of a contract or subcontract.

C. Withholding of payments.

D. Criminal prosecution.

E. Civil prosecution under Article XIII of the NYS State Finance Law – the New York False Claims Act.

F. Rejection of a Claim or Change Order.

G. Deduction of the Owner's cost of an audit from the Contract amount.

Section 17.03 - Owner's Right to Conduct Investigations

A. The Contractor agrees to cooperate fully and faithfully with any investigation, audit or inquiry conducted by the Owner.

B. The Contractor shall grant the Owner the right to examine all books, records, files, accounts, computer records, documents, and correspondence, including electronically-stored information, in the possession or control of the Contractor, its subsidiaries and affiliated companies and any other company directly or indirectly controlled by the Contractor, relating to the Contract. These shall include, but not be limited to: Subcontracts; bid files; payroll and personnel records; cancelled checks; correspondence; memoranda; daily reports of Work completed that day; schedules; reports; audits; vendor qualification records; original estimate files; Change Order/Contract Amendment estimate files; detailed worksheets; Subcontractor, consultant and supplier proposals for both successful and unsuccessful bids; back-charge logs; any records detailing cash, trade, or volume discounts earned; insurance proceeds, rebates or dividends received; payroll and personnel records; tax returns; and the supporting documentation for the aforesaid books and records.

C. At the Owner's request, said materials shall be provided in a computer readable format, where available. At the request of the Owner, the Contractor shall execute such documents, if any, as are necessary to give the Owner access to Contract-related books, documents, or records, which are, in whole or part, under control of the Contractor but not currently in the Contractor's physical possession. The Contractor shall not enter in to any agreement with a Subcontractor, consultant, or supplier, in connection with the Contract, that does not contain a right to audit clause in favor of the Owner. The Contractor shall assist the Owner in obtaining access to past and present Subcontractor, consultant, and supplier amendment/change order files (including detailed documentation covering negotiated settlements), accounts, computer records, documents, correspondence, and any other books and records in the possession of Subcontractors, consultants and suppliers pertaining to the Contract, and, if appropriate, enforce the right-to-audit provisions of such agreements.

D. The Contractor shall assist the Owner in obtaining access to, interviews with, and information from all former and current persons employed and/or retained by the Contractor, for purposes of the Contract.

E. The Contractor shall require each Subcontractor to include in all agreements that the Subcontractor may hereinafter enter into with any and all Subcontractors, consultants, and suppliers, in connection with the Contract, a right-to-audit clause in favor of the Owner conferring rights and powers of the type outlined in this General Conditions Section 17.03. The Contractor shall not enter in to any Subcontract with a Subcontractor in connection with the Contract that does not contain such a provision. The Contractor shall not make any payments to a Subcontractor, consultant, or supplier from whom the Contractor has failed to obtain and supply to the Owner complete, accurate, and truthful information in compliance with a request from the Owner to the Contractor.

F. Any violation of the provisions of this General Conditions Article 17 shall justify termination of this Contract and may result in the Owner's rejection of the Contractor's bids or proposals for future contracts and the deduction of the Owner's cost of an audit from the Contract amount.

Section 17.04 - Disclosure of Criminal Investigation

A. The Contractor shall immediately notify the Owner in the event that any owner, partner, director, officer or employee of the Contractor, or its affiliated companies as identified in the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2), are subpoenaed or questioned in connection with any business-related criminal investigation, whether or not the owner, partner, director, officer or employee is, or is believed to be, the subject or target of such investigation, or is notified or otherwise learns that any owner, partner, director, officer or employee of the Contractor or its affiliated

companies is under investigation for an alleged business-related violation of criminal law, or in the event that any premises or records of the Contractor are searched pursuant to a search warrant seeking evidence of a crime or crimes, unless otherwise precluded by law enforcement authorities.

B. The Contractor shall immediately notify the Owner in the event that any owner, partner, director, officer or employee of the Contractor or its affiliated companies as identified in the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2), the firm itself, or one of its affiliated companies is indicted or charged in an accusatory instrument for any business-related violation of local, state or federal criminal law, unless otherwise precluded by law enforcement authorities.

C. In the event that any owner, partner, director, officer, or employee of the Contractor is indicted or charged in an accusatory instrument for any business-related violation of local, state, or federal criminal law relating to this Contract or any other Dormitory Authority contract, the Owner may require the Contractor to remove said owner, partner, director, officer, or employee from any direct involvement in the affairs of the Contractor as it relates to this Contract and all other Dormitory Authority contracts until the criminal matter is resolved. In the event that any owner, partner, director, officer, or employee of the Contractor is convicted of a business-related violation of local, state, or federal criminal law, the Owner may require the Contractor to permanently remove said individual from any direct involvement in the affairs of this Contract and all other Dormitory Authority contracts.

D. In the event that the Contractor or any owner, partner, director, officer, or employee of the Contractor is convicted or enters into an agreement as a remedy to the alleged commission of a criminal act of a business-related violation of local, state, or federal criminal law or regulatory violation, the Owner may schedule a hearing with the Contractor to determine the Contractor's responsibility to continue work under this Contract and other Dormitory Authority contracts. Following this hearing, the Owner may, at its sole discretion, take one or more of the following actions:

1. Terminate this Contract.

2. Require the Contractor, at its own expense, to hire an independent private-sector inspector general to monitor its activities, institute procedures and conduct internal inquiries, in a manner prescribed by the Owner.

3. Increase retainage to an amount not to exceed ten percent (10%).

4. Take any other remedial action deemed appropriate.

Section 17.05 - Anti-Riot Provisions

A. The Contractor agrees that no part of the Contract funds shall be used to make payments, give assistance, or supply services, in any form, to any individual convicted in any federal, state, or local court of competent jurisdiction for inciting, promoting, or carrying on a riot, or engaging in any group activity resulting in material damage to property or injury to persons found to be in violation of federal, state or local laws designed to protect persons or property.

B. The Contractor and each Subcontractor shall notify their employees of all rules and regulations adopted pursuant to Article 129-A of the NYS Education Law. The Contractor shall post notices containing the text of the aforementioned rules and regulations at the Site.

Section 17.06 - Ethical Conduct

A. Officers and employees of the Owner are bound by Sections 73, 73-a and 74 of the NYS Public Officers Law. In addition, no officer, employee, architect, attorney, engineer, inspector, or consultant of or for the Owner authorized on behalf of the Owner to exercise any legislative, executive, administrative, supervisory, or other similar functions in connection with the Contract or the Work, shall become personally interested, directly or indirectly, in the Contract, material supply contract, subcontract, insurance contract, or any other contract pertaining to the Work.

B. Section 73(5) of the NYS Public Officers Law expressly prohibits the Contractor, or its agents, from directly or indirectly offering or giving any gift having more than nominal value to an employee of the Owner under circumstances in which it could be reasonably inferred the gift was intended to influence the employee in the performance of their official duties or was intended as a reward for the employee's official action.

    1. In addition to the prohibition of Section 73(5) of the NYS Public Officers Law, the Dormitory Authority has a "zero tolerance" policy with respect to the solicitation, acceptance, or receipt of gifts from disqualified sources. Therefore, the Contractor and its agents shall refrain from offering or giving anything of value to an employee of the Owner. Employees of the Owner may not solicit any gift, gratuity, stipend, or thing of value from the Contractor or its agents. Violations of these gift provisions may be grounds for immediate Contract termination and/or referral for civil action or criminal prosecution.

C. To promote a working relationship with the Owner based on ethical business practices, the Contractor is expected to:

    1. Furnish all goods, materials and services to the Owner as contractually required and specified.

    2. Submit complete and accurate reports to the Owner and its representatives as required.

    3. Not seek, solicit, demand or accept any information, verbal or written, from the Owner or its representatives that provides an unfair advantage over a competitor.

    4. Not engage in any activity or course of conduct that restricts open and fair competition on Owner-related projects and transactions.

    5. Not engage in any course of conduct with Owner employees or its representatives that constitutes a conflict of interest, in fact or in appearance.

    6. Not offer or give any unlawful gifts or gratuities, or engage in bribery or other criminal activity.

D. The Owner encourages the Contractor to advance and support ethical business conduct and practices among its directors, officers, and employees, preferably through the adoption of corporate ethics awareness training programs and written codes of conduct.

E. Although the Contractor may employ relatives of Owner employees, the Owner shall be made aware of such circumstances as soon as possible, preferably in writing, to ensure a conflict of interest situation does not arise. The Owner reserves the right to request that the Contractor modify the work assignment of a relative of an Owner employee where a conflict of interest, or the appearance thereof, is deemed to exist.

F. The Contractor may hire former employees of the Owner. However, as a general rule, former employees of the Owner may neither appear nor practice before the Owner, nor receive compensation for services rendered on a matter before the Owner, for a period of two years following their separation from service with the Owner. In addition, former employees of the Owner are subject to a "lifetime bar" from appearing before the Owner or receiving compensation for services regarding any transaction in which they personally participated or which was under their active consideration during their tenure with the Owner.

G. The Contractor agrees to notify the Owner's Office of Internal Affairs at 518-257-3193 of any activity by an employee of the Owner that is inconsistent with the contents of this General Conditions Section 17.06.

H. Any violation of this General Conditions Section 17.06 shall justify termination of this Contract and may result in Owner's rejection of the Contractor's bids or proposals for future agreements.

Section 17.07 – Continuing Integrity

A. The Contractor shall, at all times during the Contract term, remain responsive and responsible. The Contractor shall also monitor all Subcontractors for responsiveness and responsibility at all times during the Contract term. The Contractor agrees, if requested by the President of Owner or his or her designee, to present evidence of its continuing legal authority to do business in New York State, integrity, experience, ability, prior performance, and organizational and financial capacity. The Contractor shall immediately notify Owner of any material or adverse information pertaining to the Contractor or any Subcontractor, regardless of tier.

B. The President of Owner or his or her designee, in his or her sole discretion, reserves the right to suspend any or all activities under this Contract, at any time, when he or she discovers information that calls in to question the responsibility of Contractor. In the event of such suspension, Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, Contractor shall comply with the terms of the suspension order. Contract activity may resume at such time as the President of Owner or his or her designee issues a written notice authorizing a resumption of performance under the Contract.

C. Notwithstanding any other provision of this Contract, upon written notice to Contractor, and a reasonable opportunity to be heard with the appropriate Owner officials or staff, the Contract may be terminated by the President of Owner or his or her designee at Contractor's expense where Contractor is determined by the President of Owner or his or her designee to be non-responsible. In such event, the President of Owner or his or her designee may complete the contractual requirements in any manner he or she may deem advisable and pursue available legal or equitable remedies for the breach.

Section 17.08 – Iran Divestment

A. By entering into this Contract, Contractor certifies, under the penalties of perjury, that Contractor is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the NYS State Finance Law. Contractor further certifies that Contractor will not utilize on this Contract any subcontractor that is identified on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the NYS State Finance Law.

B. During this Contract, should Owner receive information that a person (as defined in NYS State Finance Law §165-a) is in violation of the above-referenced certifications, Owner will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its

engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then Owner shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, seeking compliance, recovering damages, or declaring the Contractor in default.

ARTICLE 18 -- 2005 PROCUREMENT LOBBYING LAW

Section 18.01 - Procurement Lobbying Law

Bidders shall affirm their understanding of and agree to comply with NYS State Finance Law § 139-j (3) and § 139-j (6) (b), certify their compliance with NYS State Finance Law § 139-k (5), disclose prior non-responsibility determinations under NYS State Finance Law § 139-j, and shall certify that the information they provide with respect to NYS State Finance Law § 139-j and § 139-k is complete, true, and accurate. Contractor hereby reaffirms its understanding of an agreement to comply with NYS State Finance Law § 139-j (3) and § 139-j (6) (b), re-certifies its compliance with NYS State Finance Law § 139-k (5) and recertifies that the information it provided with respect to NYS State Finance Law § 139-j and § 139-k is complete, true, and accurate.

Section 18.02 - Contractor's Certifications

For any contract $15,000 or more each Contractor shall submit, with its bid, on the form provided herewith, the *2005 Procurement Lobbying Law – Certification,* pursuant to NYS State Finance Law § 139-j and § 139-k. The information contained in the *2005 Procurement Lobbying Law – Certification,* pursuant to NYS State Finance Law § 139-j and § 139-k will serve as an informational resource to aid the Owner in making an award determination.

Section 18.03 - Termination Provisions

The Owner reserves the right to terminate this Contract in the event it is found that the certification filed by the Contractor in accordance with NYS State Finance Law § 139-j and § 139-k, as such may be amended or modified, was intentionally false or intentionally incomplete. Upon such finding, the Owner may exercise its right pursuant to General Conditions Section 11.01 – Termination for Cause.

ARTICLE 19 -- EXECUTIVE ORDER No. 125

Section 19.01 - Determination of Contractor Responsibility

In order to assist the Owner in determining the responsibility and reliability of the lowest bidder for the Contract and to effectuate the directives of Executive Order No. 125, dated May 22, 1989, (9 NYCRR §4.125) the Council of Contracting Agencies has adopted procedures to collect and exchange relevant information among contracting agencies.

Section 19.02 – NYS Vendor Responsibility Questionnaire

A. For any Contract valued at $10,000 or more, the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) for the Contractor or for any Subcontractor shall be submitted as requested by the Owner. Owner may request an updated NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) for the Contractor or for any Subcontractor as often as the Owner, in its sole and exclusive discretion, deems necessary to carry out the Owner's duties and responsibilities under this Contract.

B. The information contained in the NYS Vendor Responsibility Questionnaire For Profit Construction (CCA-2) will serve as an informational resource to aid the Owner in making an award determination and in making other determinations for this Contract.

ARTICLE 20 -- OPPORTUNITY PROGRAMS

Section 20.01 - General Provisions

A. The Dormitory Authority is required to implement the provisions of NYS Executive Law Article 15-A and Parts 140 through 145 of Title 5 of the NYCRR for all State contracts (as defined in such statute and regulations) with a value:

1. in excess of $25,000 for labor, services, equipment, materials, or any combination of the foregoing; or

2. in excess of $100,000 for real property renovations and construction.

B. The Contractor agrees, in addition to any other nondiscrimination provision of the Contract and at no additional cost to the Owner, to fully comply and cooperate with the Owner in the implementation of NYS Executive Law ARTICLE 15-A, PARTICIPATION BY MINORITY GROUP MEMBERS AND WOMEN WITH RESPECT TO STATE CONTRACTS, and the regulations promulgated thereunder. These requirements include: equal employment opportunities for minority group members and women (EEO), and contracting opportunities for NYS certified minority and women-owned business enterprises (MWBEs). The Contractor's demonstration of good faith efforts pursuant to 5 NYCRR § 142.8 shall be a part of these requirements. These provisions shall be deemed supplementary to, and not in lieu of the nondiscrimination provisions required by NYS Executive Law Article 15 (the Human Rights Law) and other applicable federal, state and local laws.

C. Failure to comply with all requirements in this General Conditions Article 20 may result in a finding of non-responsiveness, non-responsibility, breach of contract or any combination of the foregoing leading to the assessment of liquidated damages pursuant to General Conditions Section 20.06 and other remedies available to the Owner pursuant to the Contract and applicable law.

Section 20.02 – Equal Employment Opportunity (EEO)

A. The provisions of NYS Executive Law Article 15-A, and the rules and regulations promulgated thereunder pertaining to equal employment opportunities for minority group members and women shall apply to the Contract.

B. The Contractor shall:

1. Undertake or continue, and ensure each Subcontractor shall undertake or continue, existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age,

disability, or marital status. For these purposes, EEO shall apply in the areas of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation.

2. Submit an EEO policy statement to the Owner within seventy-two (72) hours after the date of the Letter of Intent to award the Contract.

3. Adopt a model EEO policy statement and require each Subcontractor to adopt a model EEO policy statement if the Contractor or Subcontractor does not have an existing EEO policy statement, and if the Owner requires the Contractor or Subcontractor to adopt a model EEO policy statement.

4. Have a Contractor's EEO policy statement that shall include the following language:

   a. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, or marital status, will undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force.

   b. The Contractor shall state in all solicitations or advertisements for employees that, in the performance of the Contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability, or marital status.

   c. The Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union, or representative will not discriminate on the basis of race, creed, color, national origin, sex age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein.

5. The Contractor shall include the provisions of paragraphs a. through c. of this General Conditions Section 20.02 B. 4. and Subdivision E of this General Conditions Section 20.02, which provides for relevant provisions of the Human Rights Law, in every Subcontract in such a manner that the requirements of these provisions will be binding upon each Subcontractor as to Work in connection with the Contract.

C. To ensure continuous compliance with General Conditions Section 20.02:

1. The Contractor shall submit a Workforce Utilization Report, and shall require each Subcontractor to submit a Workforce Utilization Report, in such form as shall be required by the Owner on a monthly basis during the term of the Contract.

2. Separate forms shall be completed by the Contractor and each Subcontractor.

3. Pursuant to Executive Order 162 (9 NYCRR 8.162) dated January 9, 2017, the Contractor and its Subcontractors are required to submit monthly *E.O. 162 Workforce Utilization Reports* for contracts with a total contract value of Twenty-Five Thousand 00/100 Dollars ($25,000.00) or more. All *E.O. 162 Workforce Utilization Reports* are to be submitted within 10 days of the end of each month by following the online reporting process set forth in section 20.02 (4). The *E.O. 162*

Workforce Utilization Reports will require the Contractor and its and Subcontractors, among other things, report the gross wages paid to each of their employees for the work performed by such employees in connection with the Contract.

4. For monthly reporting in connection with Executive Order 162, reports are to be submitted electronically as follows:

    a. Log-in (https://ny.newnycontracts.com) or visit the NYSCS Account Look Up (https://ny.newnycontracts.com/frontend/usersearchpublic.asp) and follow the on-screen directions to look up your firm's account and then access the secure System. Contact Customer Support via any of the System links if you have any questions while attempting to access your account.
    b. Go to View>> My Workforce Audits.
    c. View Workforce Audits by status, dates, contract, and contract type (Prime/Subcontractor).
    d. The System will notify contractors to log in to review and record the workforce details for the applicable audit.
    e. Complete all required reporting on a timely basis.

D. The Contractor shall comply with the provisions of the NYS Human Rights Law, and all other State and Federal statutory and constitutional non-discrimination provisions. The Contractor and each Subcontractor shall not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex, national origin, sexual orientation, military status, age, disability, predisposing genetic characteristic, marital status, or domestic violence victim status, and shall also follow the requirements of the NYS Human Rights Law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest.

Section 20.03 – Opportunities for Minority and Women-Owned Business Enterprises (MWBE)

A. The Owner has established goals for the participation in this Contract of NYS certified minority-owned business enterprises ("MBE") and NYS certified women-owned business enterprises ("WBE" and collectively with MBEs, "MWBE"). The goals (collectively, MWBE Contract Goals) are set forth in the Information for Bidders Section 8.0 – Opportunity Programs Requirements.

B. The Contractor represents and warrants that, as a condition for award of the Contract, the Contractor has submitted a Statewide Utilization Management Plan ("SUMP") via the NYS Contract System (NYSCS) which lists all proposed Subcontractors including an identification of the NYS certified MWBE subcontractors and suppliers the Contractor intends to use to perform the Work of the Contract and to achieve the MWBE Contract Goals established in the Contract Documents. In addition, or alternatively, Contractor may have submitted a request for a waiver. Prior to award of the Contract, the Owner approved Contractor's plan to achieve the MWBE Contract Goals established in the Contract Documents (MWBE Utilization Plan) to the extent the Owner did not approve Contractor's request for a waiver of part or all of the MWBE Contract Goals. Owner approval of the MWBE Utilization Plan approves a Subcontractor only for the purpose of the MWBE Utilization Plan.

C. Contractor agrees to adhere to the MWBE Utilization Plan in the performance of the Contract. Contractor shall not change the Utilization Plan without the prior written approval of the Owner. Contractor further agrees that failure to adhere to the MWBE Utilization Plan shall constitute a material breach of the Contract and upon such breach, the Owner shall be entitled to any remedy provided in the Contract or by law, including but not limited to a finding that the Contractor is non-responsible.

D. The Contractor understands that only sums paid to MWBEs for the performance of a commercially useful function, as that term is defined in 5 NYCRR § 140.1 may be applied towards the achievement of the applicable MWBE Contract Goal. The portion of a subcontract with an MWBE serving as a supplier that shall be deemed to represent the commercially useful function performed by the MWBE shall be 60% of the total value of the subcontract. The portion of a subcontract with an MWBE serving as a broker that shall be deemed to represent the commercially useful function performed by the MWBE shall be the monetary value for fees, or the markup percentage, charged by the MWBE. The Owner will audit the Contractor's efforts to achieve the MWBE Contract Goals through the NYSCS.

Section 20.04 - Good Faith Efforts

A. The Contractor shall document good faith efforts pursuant to 5 NYCRR § 142.5 to provide meaningful participation by MWBEs as Subcontractors (which includes material suppliers, other vendors, and others; see definition of Subcontractor in General Conditions Article 1 - Definitions) in the performance of the Contract, to comply with the requirements of the Contract and to enable the Owner to determine compliance with the provisions of this General Conditions Article 20. Guidelines for documentation of good faith efforts are at https://www.dasny.org/forms under MWSBE.

B. If the Contractor fails to adequately document good faith efforts, it may result in a finding of non-compliance.

Section 20.05 - Waivers

A. If the Contractor, after making good faith efforts satisfactory to the Owner, is unable to achieve the MWBE Contract Goals, the Contractor may submit a request for a waiver through the NYSCS, or a non-electronic method provided by the Owner. The request for a waiver must be supported by evidence of the good faith efforts by the Contractor to achieve the maximum feasible MWBE participation towards the applicable MWBE Contract Goals. If the documentation included with the waiver request is complete, the Owner shall evaluate the request and issue a written notice of acceptance or denial within twenty (20) business days of receipt.

B. If the Owner, upon review of the SUMP, the MWBE Utilization Plan, the NYSCS and any other relevant information, determines that the Contractor is failing or refusing to comply with the MWBE Contract Goals and no waiver has been issued in regard to such non-compliance, the Owner may issue a notice of deficiency to the Contractor. The Contractor shall respond to the notice to deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of MWBE Contract Goals.

Section 20.06 – Damages - MWBE Participation

A. If the Owner determines that the Contractor is not in compliance with the requirements of this General Conditions Article 20 and the Contractor refuses to comply with the requirements of this General Conditions Article 20, or if the Contractor is found to have willfully and intentionally failed to comply with the MWBE Contract Goals, then: (1) the Contractor shall be obligated to pay the Owner liquidated damages; or (2) the Contractor shall be obligated to pay the Owner other appropriate damages; or (3) the Owner shall receive one or more other appropriate remedies, unless the Owner elects to pursue its remedies under NYS Executive Law Section 316. If the Owner declines to pursue its remedies under NYS Executive Law Section 316, the Owner may elect to pursue one or more of liquidated damages, other appropriate damages, and one or more other appropriate remedies.

B. If the Owner decides to assess liquidated damages, the Contractor shall be obligated to pay to the Owner liquidated damages in an amount equal to the difference between all sums identified for payment to MWBEs if the Contractor had achieved the MWBE Contract Goals and all sums actually paid to MWBEs for performance of Work under the Contract. If such liquidated damages have not been withheld by the Owner, the Contractor shall pay such liquidated damages to the Owner within sixty (60) days after they are assessed. provided, however, that if the Contractor has filed a complaint with the Director of the Division of Minority and Women's Business Development pursuant to 5 NYCRR §142.2, liquidated damages shall be payable only in the event of a determination adverse to the Contractor following the complaint process. The liquidated damages are intended to compensate the Owner only for the Owner's damage if the Owner determines that the Contractor is not in compliance with the requirements of General Conditions Sections 20.03, 20.04 and 20.05 and the Contractor refuses to comply with the requirements of General Conditions Sections 20.03, 20.04 and 20.05, or if the Contractor is found to have willfully and intentionally failed to comply with the MWBE Contract Goals. In addition, the Contractor shall be liable to the Owner to the fullest extent permitted by law for:

   a. whatever other appropriate damages the Owner may incur; or

   b. any other appropriate remedy to which the Owner may be entitled as a result of the Contractor's refusal to comply with the requirements of this General Conditions Article 20 outside the requirements of General Conditions Sections 20.03, 20.04, 20.05 and the MWBE Contract Goals.

Other appropriate damages include, but are not limited to, the expenses for personnel, supplies and overhead incurred by the Owner to administer and enforce the requirements of this General Conditions Article 20 other than the requirements of General Conditions Sections 20.03, 20.04, 20.05 and the MWBE Contract Goals.

Section 20.07 – Reporting to Owner

The Contractor shall complete the reports and submit as indicated to establish and update EEO requirements during the life of the Contract. Reports not submitted at such time shall be cause for the Owner to delay payment to the Contractor. The listed reports are a requirement of the Contract and copies are included in the Contract Documents and template forms are also available on the Dormitory Authority's web site. *The* Contractor shall submit to the Owner all executed agreements and purchase orders for ALL MWBE/SDVOB subcontractors/suppliers who were approved on the Utilization Plan no later than 30 days after award of the Contract.

ARTICLE 21- SERVICE-DISABLED VETERAN OWNED BUSINESSES

Section 21.01 – General Provisions

Article 17-B of the NYS Executive Law provides for more meaningful participation in public procurement by certified Service-Disabled Veteran – Owned Businesses (SDVOB), thereby further integrating such businesses in to New York State's economy. The Dormitory Authority recognizes the need to promote the employment of service-disabled veterans and to ensure that certified SDVOBs have opportunities for maximum feasible participation in the performance of Dormitory Authority contracts.

Section 21.02 – Contract with Goals

A. If the Information for Bidders established an overall goal for SDVOB participation in this Contract and Contractor submitted an SDVOB Utilization Plan that was accepted by the Dormitory Authority, Contractor shall follow the accepted SDVOB Utilization Plan. Contractor, by award of the Contract,

certified that Contractor shall follow the submitted and accepted SDVOB Utilization Plan for the performance of SDVOBs on the Contract.

B. Contractor shall not change the accepted SDVOB Utilization Plan without the prior written consent of the Dormitory Authority. Any modifications or changes to the accepted SDVOB Utilization Plan after award of the Contract to the Contractor shall be reported to the Dormitory Authority on a revised SDVOB Utilization Plan. As part of a revised SDVOB Utilization Plan, the Contractor may request a partial or total waiver of the goal for SDVOB participation but such request must be made prior to submission of the Application for Payment for the final payment on the Contract. Contractor shall make and shall document good faith efforts to provide meaningful participation by SDVOBs as subcontractors or suppliers in the performance of the Contract. The revised SDVOB Utilization Plan is not effective unless and until it is accepted by the Dormitory Authority. If the revised SDVOB Utilization Plan is not accepted by the Dormitory Authority, the Dormitory Authority shall issue a notice of deficiency and the Contractor shall proceed as set forth in paragraph D of this General Conditions Section 21.02

C. Contractor shall report to the Dormitory Authority Monthly SDVOB Contractor Compliance during the Contract documenting the preceding month's progress towards implementing the accepted SDVOB Utilization Plan and achieving the SDVOB goals for the Contract. This information shall be submitted to the Dormitory Authority in the manner and at the times directed by the Dormitory Authority.

D. If the Dormitory Authority, upon review of the SDVOB Utilization Plan and the Monthly SDVOB Contractor Compliance reports determines that the Contractor is failing or refusing to comply with the Contract SDVOB goals and no waiver has been issued with respect to such non-compliance, the Dormitory Authority may issue a notice of deficiency to the Contractor. The Contractor shall respond to the notice of deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of the Contract SDVOB goals.

E. Contractor shall make and shall document its good faith efforts to utilize SDVOBs in the performance of the Contract. Evidence of required good faith efforts includes but is not limited to:

1. Copies of solicitations to SDVOBs and any responses thereto;

2. Explanation of the specific reason(s) each SDVOB responding to a Contractor's solicitation was not selected;

3. Dates of any pre-bid, pre-award or other meetings attended by Contractor, if any, scheduled by the Dormitory Authority with certified SDVOBs which the Dormitory Authority determined were capable of fulfilling the SDVOB goals in the Contract;

4. Information describing the specific steps undertaken to reasonably structure the scope of subcontracts and material orders for the purpose of subcontracting with, or obtaining materials from, SDVOBs;

5. Other information relevant to the waiver request.

F. Contractor's failure to use SDVOBs in accordance with the accepted SDVOB Utilization Plan or any accepted revised SDVOB Utilization Plan shall be a material breach of the Contract and upon such breach, the Dormitory Authority shall be entitled to any remedy provided in the Contract, by law or regulation or at law or in equity, including but not limited to a finding the Contractor is non-responsible. If the Dormitory Authority finds the Contractor willfully and intentionally fails to comply with the

Contract SDVOB goals, the Contractor shall pay damages to the Dormitory Authority as set forth in 9 NYCRR § 252.2(s).

Section 21.03 – Contract with No Goals

If the Information for Bidders does not establish an overall goal for SDVOB participation in this Contract, Contractors are still strongly encouraged and expected to consider SDVOBs in the fulfillment of the requirements of the Contract in recognition of the service and sacrifices made by service-disabled veterans and in recognition of their economic activity in doing business in New York State. The Contractor is encouraged to make good faith efforts to promote and assist in the participation of SDVOBs in performance of the Contract as Subcontractors.

Exhibit "A"

RELEASE FORM
REDUCTION OF RETAINAGE
DORMITORY AUTHORITY STATE OF NEW YORK

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DASNY | WE FINANCE, BUILD AND DELIVER.

DORMITORY AUTHORITY STATE OF NEW YORK

Construction General Requirements

CORPORATE HEADQUARTERS

515 Broadway
Albany, New York
12207-2964

T 518.257.3000
F 518.257.3100

NEW YORK OFFICE

One Penn Plaza, 52nd Fl.
New York, New York
10119-0098

T 212.273.5000
F 212.273.5121

BUFFALO OFFICE

539 Franklin Street
Buffalo, New York
14202-1109

T 716.884.9780
F 716.884.9787

www.dasny.org

SECTION 011200 – CONTRACT SUMMARY OF WORK
Section Description: Responsibilities of each contract for the work, coordination for temporary facilities and controls

SECTION 012100 – ALLOWANCES
Section Description: Provisions for cash allowances including lump-sum, unit cost, contingency allowances

SECTION 012300 – ALTERNATES
Section Description: Provisions for change-of-scope and cost-comparison type alternates

SECTION 012900 – PAYMENT PROCEDURES
Section Description: Administrative requirements for Contractor's Application for Payment

SECTION 013000 – SCHEDULE OF VALUES

SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION
Section Description: Administrative requirements for project meetings; preconstruction, construction kick-off, progress; RFIs and Web sites

SECTION 013200 – PROJECT SCHEDULING AND PROGRESS DOCUMENTATION
Section Description: Contractor's responsibility to coordinate and cooperate with Owner to maintain P6 Project Management (scheduling software); Contractor's reports

SECTION 013300 – SUBMITTAL PROCEDURE
Section Description: Procedures for action and informational submittals including product submittals and submittal schedule

SECTION 014000 – QUALITY AND CODE REQUIREMENTS
Section Description: Administrative and regulatory requirements for Work permit, code compliance certificate and certificate of occupancy; NYS or NYC Statement of Special Inspections and Tests

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS
Section Description: Temporary utilities and facilities for construction support, security, and facility protection

SECTION 015001 – SUPPLEMENTAL FACILITY REQUIREMENTS
Section Description: Administrative requirements for Contractor's Application for Payment

SECTION 016000 – PRODUCT REQUIREMENTS
Section Description: Administrative and procedural requirements for product, material, and equipment selection and handling, warranties and comparable products

SECTION 017329 – CUTTING AND PATCHING
Section Description: Procedural requirements for cutting and patching

SECTION 017700 – CONTRACT CLOSEOUT REQUIREMENTS
Section Description: Administrative contract closeout requirements including closeout conference, Notice of Substantial Completion, final application for payment and final cleaning

SECTION 017823 – OPERATION AND MAINTENANCE MANUALS
Section Description: Maintenance and record keeping requirements of operational and maintenance manuals for products and equipment

SECTION 017839 – AS BUILT DOCUMENTS
Section Description: Maintenance and record keeping requirements of as-built drawings, as-built specifications, as-built schedule and other product record documents

SECTION 019113 – GENERAL COMMISSIONING REQUIREMENTS
Section Description: Administrative requirements and procedures for commissioning all systems

SECTION 011200 - CONTRACT SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a summary of each Contract for the Project, including responsibilities for coordination and temporary facilities and controls.

B. Specific requirements for the work of each Contract are also indicated in individual Specification Sections and on Drawings for each Contract.

C. Related Sections:

1. Section 013100 - Project Management and Coordination.
2. Section 013200 - Construction Progress Documentation.
3. Section 015000 - Temporary Facilities and Controls.

1.3 CONTRACTOR'S PROJECT MANAGER

A. Contractor and each Sub-contractor shall identify a project manager who shall be responsible for coordination between and among each and all contractors and subcontractors for the Project and the Owner.

1.4 COORDINATION ACTIVITIES

A. Coordination activities of Contractor's project manager include, but are not limited to, the following:

1. Provide overall coordination of the Work
2. Coordinate use of access shared with other contractors or subcontractors to workspaces shared with other contractors. Contractor is hereby notified that other construction projects may be occurring at the site during the execution of this work.
3. Coordinate product selections for compatibility with either product selected under this Contract and under other contracts for the Project. Identify to Owner and Design Professional incompatibilities between products selected under this Contract and products selected under other contracts for the Project.
4. Provide overall coordination of temporary facilities and controls.

5. Coordinate, schedule, and approve interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services
6. Coordinate construction and operations of the Work with work performed by each other separate Contract for the Project and the Owner's construction forces.
7. Prepare Coordinated Composite Drawings, in collaboration with each other contractor for the Project, to coordinate the work of the contracts for the Project.
8. Coordinate sequencing and scheduling of the Work. Include the following:

    a. Initial Coordination Meeting: At earliest possible date, the Owner will arrange and conduct a meeting with all contractors for the Project for sequencing and coordinating the work of the Project.

9. Provide quality assurance and quality control services specified in Section 014000 – Quality and Code Requirements.
10. Coordinate sequence of activities to accommodate tests and inspections, and coordinate schedule of tests and inspections.
11. Provide information necessary to adjust, move, or relocate existing utility structures affected by construction.
12. Provide progress cleaning of all Contract work areas and coordinate progress cleaning of areas or pieces of equipment where more than one contractor has worked.
13. Coordinate cutting and patching.
14. Coordinate protection of the Work.
15. Coordinate firestopping.
16. Coordinate completion of punch list items.
17. Coordinate preparation of As-built drawings and specifications.
18. Print and submit all required project turnover documents.
19. Coordinate preparation of operation and maintenance manuals.

B. Responsibilities of project manager for construction contract includes coordination for temporary facilities and controls, include, but are not limited to, the following:

1. Provide common-use field office for use by all personnel engaged in construction activities.
2. Provide telephone service for common-use facilities.

1.5 GENERAL REQUIREMENTS OF CONTRACTS

A. Extent of Contract: Requirements indicated on drawings and in specification sections determine which Contract includes a specific element of the Work of the Contract.

1. The work described in this section for each contract shall be complete systems and assemblies, including products, components, accessories, and installation required by the respective contract documents.
2. Blocking, backing panels, sleeves, and metal fabrication supports for the work of each contract shall be the work of such Contract.
3. Painting for the work of each contract shall be the work of such contract.
4. Cutting and Patching: Each contract shall perform its own cutting and patching.
5. Firestopping for the work of each contract shall be provided by such contract.

B. Redundant with Section 13200Substitutions: Each contractor's project manager shall cooperate with all other contractor's project managers involved to coordinate approved substitutions with remainder of the work of the Project.

C. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Section 015000 - Temporary Facilities and Controls, Contractor is responsible for the following:

1. Installation, operation, maintenance, and removal of each temporary facility necessary for its own normal construction activity, and costs and use charges associated with each facility, except as otherwise provided for in this Section 011200.
2. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
3. Its own storage sheds.
4. Temporary enclosures for its own construction activities.
5. Staging and scaffolding for its own construction activities.
6. General hoisting facilities for its own construction activities.
7. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
8. Progress cleaning of work areas affected by its operations on a daily basis.
9. Secure lockup of its own tools, materials, and equipment.
10. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

1.6 [**WORK Includes:**

A. Work in the **Contract]** includes, but is not limited to, the following:

B. Temporary facilities and controls include, but are not limited to, the following:
1. Unpiped temporary toilet fixtures, wash facilities, and drinking water facilities, including disposable supplies.
2. General waste disposal facilities.
3. Barricades, warning signs, and lights.
4. Restoration of Owner's existing facilities used as temporary facilities.

C. Work of the **Contract also** includes, but is not limited to, the following:

1. Isolation Valve Replacements.

2. Control valve replacements

3. Replacement of the existing Building Management System, including graphics, wiring, controllers, wiring, and all ancillary items to complete the BMS upgrade

4. Select VFD installations

5. Connection to OMH's off site virtual server.

6. Steam meters

7. Electric work to support the upgraded BMS

8. Hydronic and pipe modifications to support the installation of valves, meters and ancillary items.

9. Pipe and duct insulation.

10. Support of commissioning and performing system testing and verification.

11. Misc activities to facilitate the work shown on the drawings and specifications.

12.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 011200

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL – There are no Allowances associated with this contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Nor Used)

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - There are no Alternates Associated with this Contract.

END OF SECTION 012300

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, Schedule of Values, Contractor Pencil Copy and Application for Payment, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections:

1. General Conditions, Article 8 - Payment, for requirements governing provisions for payment.
2. General Conditions, Article 20 – Opportunity Programs, for requirements governing minority participation.
3. Section 017700 – Contract Closeout Requirements, for administrative contract closeout requirements.

1.3 DEFINITIONS

A. Schedule of Values: A form in the Contract Documents, which establishes minimum level of payment detail to formulate an initial Application for Payment.

B. Contractor’s Pencil Copy: A form provided by the Owner, which estimates a billing request from the Contractor. When approved by the Owner, formulates the Application for Payment.

C. Application for Payment: A form provided by the Owner, which provides certification by the Contractor for payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with the Owner.

B. The Contractor shall allocate portions of the Contract Sum to labor, material and major equipment costs to various portions of the Work as indicated on the form.

1. Submit the Schedule of Values to the Owner, for approval at earliest possible date after award of the Contract.

2. The Owner shall not approve any billing request until the Schedule of Values is approved.

C. Format and Content: Use model form provided in Contract Documents as a guide to establish line items for the Schedule of Values.

1. Arrange the Schedule of Values with separate columns to indicate the following for each item listed:

a. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

1) Labor.
2) Materials.
3) Major Equipment.

2. Provide a breakdown of Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

a. Include separate line items under Contractor and principal subcontracts for project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
4. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
5. Schedule of Values Updating: The Owner may require the Contractor to revise its Schedule of Values. Further, the Owner reserves the right to accept only those cost distributions which, in the Owner's opinion, are reasonable, equitably balanced and correspond to estimated quantities in Contract Documents.

1.5 MONTHLY APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as approved by the Owner and paid for by the Owner.

1. Initial Application for Payment, the Owner shall not approve any billing request until the Schedule of Values and Construction Schedule is approved.
2. Payment for stored materials involve additional requirements.
3. Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Billing request may be submitted to the Owner once each month.

1. Submit Contractor’s Pencil Copy billing request seven days prior to due date for review by the Owner.

C. Payment Forms: All forms and documents required for payment shall be provided by the Owner. Template forms and documents may also be available on the Dormitory Authority's web site www.dasny.org.

D. Preliminary Procedure: The Contractor may request from the Owner a Contractor's Pencil Copy form. Where indicated on the form, the Contractor shall enter a billing request, either dollar amount or percentage complete for each item number requesting payment.

1. If applicable, the Contractor shall obtain from the Owner, an Agreement for Materials Stored Off-Site prior to billing.
2. Submit Contractor's Pencil Copy billing request to the Owner for approval.
3. The Contractor shall provide updated documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

E. Procedure: Upon the Owner's approval of the Contractor's Pencil Copy billing request, payment documents will be provided to the Contractor. The Contractor shall complete each document and submit two copies of all documents with original signature & notary where indicated on forms, the following:

1. Application for Payment.
2. Compliance Report.
3. Contractor and Subcontractor Certifications Form
4. Contractor's Certified Payroll Form.

F. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

G. Transmittal: Sign and notarize where indicated on each document, submit two original copies to Owner.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about payment.

H. Stored Materials: The Owner will provide an Agreement for Materials Stored Off-Site and specific forms that the Contractor must complete and submit to the Owner, including but not limited to;

1. Include in the Contractor's Pencil Copy billing request amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed.
2. Differentiate between items stored on-site and items stored off-site.
3. Provide certificate of insurance, evidence of transfer of title to the Owner, and consent of surety to payment, for stored materials.
4. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
5. Provide summary documentation for stored materials indicating the following:

    a. Materials previously stored and included in previous Applications for Payment.

b. Work completed for this Application utilizing previously stored materials.
c. Additional materials stored with this Application.
d. Total materials remaining stored, including materials with this Application.

I. Payment: Timely payment by the Owner to the Contractor is governed by Section 2880 of the Public Authorities Law.

J. Liens: Upon receipt of a lien, the Owner shall deduct a sum of one and one-half (1 ½) times the amount stated to be due in the notice of lien from the application for payment. Upon official receipt of discharge of lien, the Owner shall provide payment as stated above.

1.6 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Preliminary Procedure: After issuance of the executed Notice of Substantial Completion, submit a Contractor's Pencil Copy billing request showing 100 percent completion for portion of the Work claimed as complete at Substantial Completion.

1. Submit Contractor's Pencil Copy billing request to the Owner for approval.
2. The Contractor shall provide final documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

B. Reduction of Retainage: The Contractor may request a reduction of retainage upon Substantial Completion of the Work or when a phase of Work is accepted by the Owner.

1. The Contractor submits to the Owner a written request to have retainage reduced and provides a cost estimate and schedule to complete all remaining Work items indicated on the executed Notice of Substantial Completion.
2. The Owner shall deduct from the sum two times the value of remaining items of Work to be completed or corrected.
3. The Owner will provide the Contractor with General Release and Consent of Surety forms based on the amount of reduction. The Contractor shall complete each document and submit three copies of each document with original signature & notary where indicated on forms.
4. The Owner shall hold payment until receipt of completed General Release and Consent of Surety forms.

C. Procedures: Upon the Owner approval of Contractor's Pencil Copy billing request, payment documents will be provided to the Contractor. The Contractor shall complete each document and submit two copies of all documents with original signature & notary where indicated on forms, the following:

1. Application for Payment.
2. Compliance Report.
3. Contractor and Subcontractor Certifications Form
4. Contractor's Certified Payroll Form.

D. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

E. Transmittal: Sign and notarize where indicated on each document, submit two original copies to Owner.

F. Payment: Timely payment by the Owner to the Contractor is governed by Section 2880 of the Public Authorities Law.

G. Liens: Upon receipt of a lien, the Owner shall deduct a sum of one and one-half (1 ½) times the amount stated to be due in the notice of lien from the application for payment. Upon official receipt of discharge of lien, the Owner shall provide payment as stated above.

1.7 FINAL APPLICATION FOR PAYMENT (same as contract closeout documents)

A. Contract Compliance: The Contractor shall comply with the Requirements of General Conditions, Section 10.08 – Limitations on Actions.

B. Preliminary Procedure: All Work and Extra Work of the Contract and all requirements of Section 017700 – Contract Closeout Requirements must be complete and approved prior to commencement of final Application for Payment.

1. The Contractor shall request and submit to the Owner a final Contractor's Pencil Copy that will formulate the final Application for Payment.
2. The Contractor shall provide outstanding documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

C. Procedures: Upon the Owner approval of Contractor's Pencil Copy billing request, final Application for Payment and Contract closeout documents will be provided to the Contractor. The Contractor shall complete each document and submit two copies of all documents with original signature & notary, where indicated on the forms, the following:

1. Final Application for Payment including remaining Retainage.
2. Final Compliance Report.
3. Contractor and Subcontractor Certifications Form
4. Contractor's Certified Payroll Form.
5. Release Form -- Final Payment to Contractor.
6. Consent of Surety -- Final Payment to Contractor, with power of attorney.

D. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

E. Transmittal: Sign and notarize where indicated on each document, submit two original copies to the Owner.

F. Final Payment: Timely payment by the Owner to the Contractor is governed by Section 2880 of the Public Authorities Law.

G. Liens: Upon receipt of a lien, the Owner shall deduct a sum of one and one-half (1 ½) times the amount stated to be due in the notice of lien from the final application for payment. Upon official receipt of discharge of lien, the Owner shall provide final payment as stated above.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

DASNY
DORMITORY AUTHORITY STATE OF NEW YORK

SCHEDULE OF VALUES

Proj Management
Cost Analyst

Date:

Project No: 360880
Project: Upgrade BMS - Cook Chill Facility
Contractor: 0

Contract No: 0
CR No: 0
Trade: 0

CSI	DESCRIPTION	UM	QTY	Extended Labor Cost	Extended Material Cost	SCHEDULED VALUE
000000	Bonds	LS			$0.00	$0.00
000000	Insurance	LS	1	$0.00	$0.00	$0.00
000000	Mobilization	LS	1	$0.00	$0.00	$0.00
000000	Demobilization	LS	1	$0.00	$0.00	$0.00
010000	Supervision	MO	0	$0.00	$0.00	$0.00
013200	Scheduling	LS	1	$0.00	$0.00	$0.00
013100	Project Management and Coordination	LS	1	$0.00	$0.00	$0.00
015000	Temporary Facilites and Controls	LS	1	$0.00	$0.00	$0.00
017329	Cutting and Patching	LS	1	$0.00	$0.00	$0.00
017823	Operation and Maintenance Manuals	LS	1	$0.00	$0.00	$0.00
013300	Submittals	LS	1	$0.00	$0.00	$0.00
017839	As Built Documents	LS	1	$0.00	$0.00	$0.00
017700	Project Closeout	LS	1	$0.00	$0.00	$0.00
010000	Debris Removal	EA	1	$0.00	$0.00	$0.00
024119	Selective Demolition	LS	1	$0.00	$0.00	$0.00
078000	Refrigerated Box Sealant	LS	1	$0.00	$0.00	$0.00
078400	Firestopping	LS	1	$0.00	$0.00	$0.00
099123	Interior Painting	LS	1	$0.00	$0.00	$0.00
230519	Meters and Gauges	LS	1	$0.00	$0.00	$0.00
230523.12	Ball Valves	LS	1	$0.00	$0.00	$0.00
230523.13	Butterfly Valves	LS	1	$0.00	$0.00	$0.00
230523.15	Gate Valves	LS	1	$0.00	$0.00	$0.00
230529	Hangers and Supports	LS	1	$0.00	$0.00	$0.00
230553	Identification	LS	1	$0.00	$0.00	$0.00
230713	Duct insulation	LS	1	$0.00	$0.00	$0.00
230719	Pipe Insulation	LS	1	$0.00	$0.00	$0.00
230923	Direct Digital Controls - Controllers	LS	0	$0.00	$0.00	$0.00
230923	Direct Digital Controls - Wiring	LS	0	$0.00	$0.00	$0.00
230923	Direct Digital Controls - Devices	LS	0	$0.00	$0.00	$0.00
230923	Direct Digital Controls - Graphics	LS	0	$0.00	$0.00	$0.00
230923	Direct Digital Controls - Other	LS	0	$0.00	$0.00	$0.00
230923.11	Control Valves	LS	0	$0.00	$0.00	$0.00
230923.12	Control Dampers	LS	0	$0.00	$0.00	$0.00

230923.14	Flow instruments	LS	0	$0.00	$0.00	$0.00
230923.17	Level Instruments	LS	0	$0.00	$0.00	$0.00
230923.19	Moisture Instruments	LS	0	$0.00	$0.00	$0.00
230923.23	Pressure Instruments	LS	0	$0.00	$0.00	$0.00
230923.27	Temperature Instruments	LS	0	$0.00	$0.00	$0.00
230923.43	Weather Stations	LS	0	$0.00	$0.00	$0.00
232113	Hydronic Piping	LS	0	$0.00	$0.00	$0.00
232213	Steam Piping	LS	0	$0.00	$0.00	$0.00
232216	Steam Specialties	LS	0	$0.00	$0.00	$0.00
233113	Metal Ducts	LS	0	$0.00	$0.00	$0.00
233300	Duct Accessories	LS	0	$0.00	$0.00	$0.00
260519	Low-Voltage Electrical Power Conductors	LS	0	$0.00	$0.00	$0.00
262923	Variable Frequency Controllers	LS	1	$0.00	$0.00	$0.00
			Total:	$	$	$

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections and Contract Manager, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Coordination drawings.
4. Requests for Information (RFIs).
5. Contract Manager software site.
6. Project meetings.

B. Each contractor shall participate in coordination requirements. Refer to Section 011200 – Contract Summary of Work for certain areas of responsibility that are assigned to a specific contractor.

C. Related Sections:

1. Section 011200 - Contract Summary of Work, for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 013200 - Project Scheduling and Progress Documentation, for preparing and submitting Contractor's construction schedule.
3. Section 017700 – Contract Closeout Requirements, for coordinating closeout of the Contract.
4. Section 019113 - General Commissioning Requirements, for coordinating the Work with Owner's commissioning authority.

1.3 DEFINITIONS

A. RFI: Request from the Owner, Design Professional, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination for Single Contract Project: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. The Contractor shall utilize the bid milestone schedule included in the Contract Documents to prepare a CPM schedule in accordance with Section 013200 – Project Scheduling and Progress Documentation. The Contractor shall submit the proposed CPM schedule to the Owner within 45 days of the Notice to Proceed.
2. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
3. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
4. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Coordination of the Owner's P6 Project Management CPM schedule.
2. Coordination of the commissioning process and activities.
3. Preparation of the schedule of values.
4. Entering dates each required submission item listed on the Contractor’s Submission Schedule will be submitted, coordinated with the CPM Schedule.
5. Installation and removal of temporary facilities and controls.
6. Delivery and processing of submittals.
7. Progress meetings.
8. Preinstallation conferences.
9. Project closeout activities.
10. Startup and adjustment of systems.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 COORDINATED COMPOSITE DRAWINGS

A. Coordinated Composite Drawings, General: Prepare coordinated composite drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordinated composite drawings on standard printed data. Include the following information, as applicable:

    a. Use applicable Drawings as a basis for preparation of coordinated composite drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    b. Coordinate the addition of trade-specific information to the coordinated composite drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    d. Indicate required installation sequences.
    e. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to the Design Professional indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordinated Composite Drawing Organization: Organize drawings as follows:
    1. Contract Work: Show the following:
        a. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
        b. Runs of vertical and horizontal conduit 1-1/4 inch diameter and larger.
        c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
        d. Location of pull boxes and junction boxes dimensioned from column center lines.

    2. Review: The Design Professional will review coordinated composite drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility. If the Design Professional determines that the coordinated composite drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Design Professional will so inform the Contractor, who shall make changes as directed and resubmit.

C. Coordination Digital Data Files: Prepare coordination digital data files in accordance with the following requirements:

    1. File Preparation Format: The Contractor shall coordinate with the Design Professional and use the same digital data software program, version, and operating system as the original Drawings.

1.6 KEY PERSONNEL

A. Key Personnel Names: Within 15 days after receipt of the Notice to Proceed, submit a list of key personnel assignments with resume and job qualifications, including project manager,

project scheduler, commissioning agent, superintendent and other personnel in attendance at the Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers, and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to the Project.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, the Contractor shall prepare and submit an RFI in the form specified.

1. Coordinate and submit RFIs in a prompt manner so as to avoid delays in the Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Design Professional.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the date of Substantial Completion or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: The Owner’s Contract Manager-generated form with substantially the same content as indicated above.

D. Design Professional’s Action: The Design Professional will review each RFI, determine action required, and respond. Allow a reasonable amount of working days for the Design Professional’s response for each RFI. RFIs received by the Design Professional after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals.

b. Requests for approval of substitutions.
c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the date for Substantial Completion or the Contract Sum.
e. Requests for interpretation of the Design Professional's actions on submittals.
f. Incomplete RFIs or inaccurately prepared RFIs.

2. The Design Professional's action may include a request for additional information, in which case the Design Professional's time for response will date from time of receipt of additional information.
3. The Design Professional's action on RFIs that may result in a change to the date of Substantial Completion or the Contract Sum may be eligible for the Contractor to submit a Claim in accordance with procedures in General Conditions, Article 10 – Claims and Disputes.

a. If the Contractor believes the RFI response warrants change in the date of Substantial Completion or the Contract Sum, notify the Owner in writing within fifteen (15) days of receipt of the RFI response.

E. On receipt of the Design Professional's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify the Owner and Design Professional within five days if the Contractor disagrees with response.

F. RFI Log: Coordinate and cooperate with the Owner to prepare, update and maintain the use of the Contract Manager RFI log. The RFI log will include not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Design Professional.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Design Professional's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 CONTRACT MANAGER SOFTWARE SITE

A. Coordinate and cooperate with the Owner for managing project communication and documentation until Contract Closeout. The Contract Manager software site may include, but is not limited to, the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.

4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Submittals forms and logs.
8. Payment application forms.
9. Online document collaboration.
10. Reminder and tracking functions.
11. Archiving functions.

1.9 PROJECT MEETINGS

A. General: The Owner and/or Design Professional will schedule and conduct meetings at the Project site, unless otherwise indicated.

1. Attendees: The Owner and/or Design Professional will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
2. Agenda: The Owner and/or Design Professional will prepare the meeting agenda through the use of the Owner's Contract Manager software and distribute the agenda to all invited attendees.
3. Minutes: The Owner and/or Design Professional will record significant discussions and agreements achieved in Contract Manager and distribute the meeting minutes to everyone concerned.

B. Construction Kick-off Meeting: The Owner will schedule and conduct a construction kick-off meeting before starting construction, at a time convenient to the Owner and Design Professional, upon issuance of the Notice to Proceed.

1. The meeting shall review responsibilities and personnel assignments.
2. Attendees: The Owner, Owner's Commissioning Authority, Design Professional, and their consultants; the Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the meeting shall be familiar with the Project and authorized to make binding decisions on matters relating to the Work.
3. Agenda: The meeting agenda will include items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Sustainable design requirements.

m. Preparation of As-builts and turnover documents.
n. Use of the premises.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.
bb. Safety.

4. Minutes: The Owner and/or Design Professional will use Contract Manager to record and distribute meeting minutes.

C. Progress Meetings: The Owner will conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: The Owner’s Commissioning Authority, and Design Professional, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with the Project and authorized to make binding decisions on matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of the Project.

a. The Project Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to the Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next scheduled progress meeting period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.

7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: The Owner and/or Design Professional entity responsible for conducting the meeting will use Contract Manager to record and distribute the meeting minutes to each party present and to parties requiring information.

   a. Schedule Updating: Coordinate with the Owner to revise the Project Schedule after each progress meeting where revisions to the schedule have been made or recognized. The Owner will issue revised schedule concurrently with the report of each meeting.

D. Preinstallation Meetings: The Owner may conduct preinstallation meetings at the Project site before each construction activity that requires coordination with other construction and major assemblies of the Work requiring tight control and coordination.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow shall attend the meeting. The Owner to advise the Contractor, Design Professional and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

   a. Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written recommendations.
   n. Warranty requirements.
   o. Compatibility of materials.

p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. The Owner and/or Design Professional will use Contract Manager to record significant meeting discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: The Owner and/or Design Professional will distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the meeting cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the meeting at earliest feasible date.

E. Project Closeout Conference: The Owner may schedule and conduct a Project closeout conference, at a time convenient to the Owner and Design Professional, but no later than sixty (60) days prior to the scheduled inspection date for Substantial Completion.

1. The Owner will conduct the conference to review requirements and responsibilities related to the Project closeout.
2. Attendees: The Owner, Owner's Commissioning Authority, Design Professional, and their consultants; the Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with the Project and authorized to make binding decisions on matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay the Project closeout, including the following:

a. Submission of turnover documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Requirements for demonstration and training.
d. Preparation of Contractor's punch list.
e. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
f. Coordination of separate contracts.
g. Owner's partial occupancy requirements.
h. Installation of Owner's furniture, fixtures, and equipment.
i. Responsibility for removing temporary facilities and controls.

4. Minutes: The Owner and/or Design Professional conducting meeting will use Contract Manager to record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - PROJECT SCHEDULING AND PROGRESS DOCUMENTATION - SINGLE PRIME CONTRACT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections and Bid Milestone Schedule, apply to this Section.

1.2 SUMMARY

A. This is a single prime contract therefore the Contractor is responsible for the scheduling and documentation requirements as outlined in this section 013200.

B. Section includes administrative and procedural requirements to plan, schedule and document the progress of construction during the performance of the Work, including the following:

1. Critical Path Method (CPM) schedule and reports.
2. Material location reports.
3. Field condition reports.`
4. Special reports.

C. Related Sections:

1. Section 011200 – Contract Summary of Work, for preparing a combined CPM Schedule.
2. Section 013300 – Submittal Procedure, for submitting schedules and reports.
3. Section 014000 – Quality and Code Requirements, for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Project: Work at the Site carried out pursuant to one or more Contracts.

B. Activity: A discrete part of the Contract that can be identified for planning, scheduling, monitoring, and controlling the Project. Activities included in a CPM schedule consume time and resources.

1. Critical Activity: An activity on the critical path that has no total float.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

C. Bid Milestone Schedule: Interim milestones, included in the Contract Documents, which the Contractor utilizes to formulate the Baseline Schedule.

D. Baseline Schedule: Initial schedule, prepared by the Contractor, to complete the Work of the Contract in accordance with the Contract duration and starting point to which schedule updates are compared.

E. CPM: Critical Path Method is a scheduling method used to plan and schedule construction projects where activities are arranged based on activity relationships creating a time scaled network diagram.

F. PDM: Precedence Diagram Method follows the standard CPM calculations and allows for special logic relationships creating an interdependent relationship throughout the network.

G. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no total float.

H. Data Date: The date when the status of the CPM schedule is determined, showing the calendar start date for the update period.

I. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either the Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Substantial Completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Substantial Completion date.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in both electronic (PDF) file format and as electronic backup file in native software format.

B. CPM Schedule: Schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (baseline or updated) and date on label.

C. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain; activity ID number, activity description, original duration, remaining duration, actual duration, early and late start and finish dates and total float in calendar days.

1. Activity Report: List of all activities sorted by early or actual start date in each phase, area and level following the physical divisions of the Work.
2. Short Term Activity Report: Lists all activities occurring from the update data date in a two month forward and one month back window.

3. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by early or actual start date. Include activity ID number and float path(s).
4. Total Float Report: Provide a cumulative list of total float from each update period with comments associated to any and all variances.
5. Procurement Report: List all procurement activities sorted in order of the item being procured.
6. Narrative Report: The project scheduler shall describe the nature of the submission, interpretation of calculations, issues affecting progress and a milestone analysis comparing progress against the baseline and update schedules.

D. Material Location Reports: Submit at monthly intervals.

E. Field Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

G. Qualification Data: For project scheduler.

1.5 QUALITY ASSURANCE

A. Project Scheduler Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within timeframes requested by the Owner. The project scheduler shall have or be able to obtain certification as a Planning and Scheduling Professional (PSP) or have a minimum of five years of demonstrated experience scheduling large capital projects.

B. Prescheduling Conference: The Owner may conduct conference at the Project site to comply with requirements in Section 013100 - Project Management and Coordination. Review methods and procedures related to the Baseline Schedule and the CPM schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss coordination, including phasing, work stages, area separations, interim milestones and Beneficial Occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review time required for review of submittals and resubmittals.
7. Review requirements for tests and inspections by independent testing and inspecting agencies.
8. Review time required for completion and startup procedures.
9. Review and finalize list of construction activities to be included in schedule.
10. Review submittal requirements and procedures.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate preparation and processing of CPM schedules and reports with the performance of the Work and with CPM scheduling and reporting of separate Contractors.

1. Coordinate new Baseline Schedules and CPM schedule updates with separate Contractor's when additional Contracts are executed during the entire duration of the Project.

B. Coordinate CPM schedule with the Contractor's Submission Schedule, progress reports, and other required schedules and reports.

1. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CRITICAL PATH METHOD SCHEDULE, GENERAL

A. Bid Milestone Schedule: The Owner shall provide a Bid Milestone Schedule, which is attached to this section as a template for the Baseline Schedule. Nothing in the Bid Milestone Schedule, Baseline Schedule or CPM schedule shall preclude the Contractor from advancing the Work of the Contract.

1. Include milestones indicated in the Contract Documents in Baseline Schedule, including, but not limited to, the Notice to Proceed, interim milestones, Substantial Completion, and Contract close-out.
2. Substantial Completion date shall not be changed by submission of a schedule that shows an early completion date, unless approved by the Owner.
3. No time for weather will be apportioned for foreseeable occurrences in a specific regional area. The Contractor shall be responsible to determine reasonable averages and make allowances in the performance of the Work.

B. Activities: Treat each numbered activity as a consumable resource for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 15 days, unless specifically allowed by the Owner.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 - Submittal Procedures in schedule. Coordinate submittal review times in the CPM schedule with dates entered in the Contractor's Submission Schedule.
4. Startup and Testing Time: Include not less than 15 days for startup and testing.

5. Substantial Completion: Indicate completion on the date established for Substantial Completion, and allow time for the Owner's administrative procedures necessary to execute the Notice of Substantial Completion (NOSC).
6. Incomplete Work items and Contract Closeout: Include not more than 60 days for incomplete Work items and Contract Closeout Requirements.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents, or approved by the Owner prior to use and show how date constraints affect the sequence of the Work.

1. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.

D. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered RFIs.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

E. Recovery CPM Schedule: When periodic update indicates the Work is 15 or more calendar days behind the current approved CPM schedule, submit a separate recovery CPM schedule indicating means by which the Contractor intends to regain compliance with the CPM schedule. Indicate changes to working hours, working days, crew sizes, and equipment required achieving compliance, and dating by which recovery will be accomplished, subject to Owner's approval.

F. Computer Scheduling Software: Prepare CPM schedules using current version of a program that has been developed specifically to manage CPM schedules and interface with the Owner's electronic file of the Bid Milestone Schedule.

1. Utilize Primavera P6 or P3 Primavera Project Planner operating system.

2.2 CRITICAL PATH METHOD SCHEDULE (CPM SCHEDULE)

A. Baseline Schedule: Prepare schedule using a time-scaled PDM network diagram representing the Work of the Contract. Total float time shall be equal to or greater than zero in the Baseline Schedule.

1. Submit Baseline Schedule within 15 days of the date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work based on indicated activities.
2. Develop network diagram in sufficient time to submit Baseline Schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.

a. Failure to include any work item required for the performance of the Work shall not excuse the Contractor from completing the Work of the Contract within applicable completion dates, regardless of the Owner's approval of the schedule.

B. CPM Schedule: Prepare contemporaneous schedules using a time-scaled PDM network for sequencing the Work and showing the progress of the Work.

1. Establish procedures for monitoring and updating the CPM schedule and for reporting progress. Coordinate procedures with the progress meeting and payment request date.
2. Coordinate the Work occurring concurrently through the integration of other Contractors Baseline Schedules into the CPM schedule.
3. Conduct educational workshops to train and inform the Contractor's key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract durations.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work of the Contract. At minimum, each individual specification section, including General Requirement sections, as indicated in the Project Manual, shall be listed as an activity.

1. Activities ID: Provide a unique identifier to each activity. No activity ID shall be recycled or reused.
2. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by the Contractor's activities.
i. Testing and commissioning.
j. Incomplete Work items and Contract closeout.

3. Actual Activity Dates: Once an activity has been assigned an actual date of occurrence, the status of that activity shall not change. Any change to actual dates must be accompanied with supporting data and approved by the Owner. No actual start date shall occur ahead of the data date.
4. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with the Bid Milestone Schedule dates.
5. Processing: Process data to produce output data status on a computer-drawn, PDM network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract duration.

6. Calculations: The schedule network shall be calculated allowing activities to retain their original logic. Progress override shall not be used when calculating the network status.
7. Logic: Leads and lags will not be used when the creation of an activity will perform the same function. Lag durations contained in the schedule shall not have negative value. Lead and lag durations shall not exceed the durations of the activity they are assigned.

    a. There shall be only two open ended activities; (1) Notice to Proceed, with no predecessor logic, and (2) Final Payment, with no successor logic. All intermediate activity logic shall be connected.
    b. Out of sequence activities that have progressed before all preceding logic will be allowed only on a case by case basis, as approved by the Owner. The Contractor shall propose logic corrections to eliminate all out of sequence progress and correct out of sequence progress that continues for more than two update cycles by logic revisions, as approved by the Owner.

8. Float: The Owner shall reject the schedule and schedule updates for the use of float suppression techniques such as preferential sequencing, special lead lags logic constraints, zero total or zero free float constraints, extended activity times, or imposing constraint dates other than what is required by the Contract.

    a. The use of resource leveling used for the purpose of artificially adjusting activity durations to consume float and influence the critical path is prohibited.
    b. A schedule showing work completing in less time than the Contract duration and accepted by the Owner, will be considered to have float.
    c. Any float generated during the performance of the Work, due to efficiencies of the Owner or any Contractor is not for sole use of the party generating the float.
    d. Negative float will not be a basis for requesting time extensions and will not be construed as a means of acceleration or schedule extension.

9. Format: Follow the applicable individual specification sections of the Work as the bases for the content of the CPM schedule. Organize the CPM schedule to provide the necessary detail for each area, level, quadrant and section as needed in the performance of the Work.

D. Changes in the Work: For each proposed change and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall CPM schedule.

E. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed, including the reason each adjustment was necessary.
2. Changes in early and late finish dates.
3. Changes in activity durations in workdays.
4. Changes in the critical path.
5. Changes in total float or slack time.
6. Changes in the duration for Substantial Completion.

2.3 REPORTS

A. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise the Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CPM SCHEDULE

A. Project Scheduler: Engage a consultant or person skilled in construction planning and scheduling to provide planning, scheduling, evaluation, and reporting services using CPM scheduling.

1. In-House Option: The Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Project scheduler shall attend all meetings related to the Project progress, alleged delays, and time impact.

B. CPM Schedule and CPM Reports Updating: Prior to each scheduled progress meeting, update schedule to reflect actual construction progress and activities. Issue schedule and reports one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the CPM reports of each such meeting. As a minimum, schedule update submissions shall occur monthly and within 30 days of the schedule Data Date.

2. Include CPM reports with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final remaining duration for each activity.

C. Distribution: Submit one electronic copy, in format specified, to the Owner and distribute copies of approved schedule and reports to the Owner, Design Professional, separate contractors, testing and inspecting agencies, and other parties identified by the Owner with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules and reports to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and individual Specification Sections and Contractor's Submission Schedule, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections:

1. Section 013200 – Construction Progress Documentation, for submitting schedules and reports, includes Contractor's construction schedule.
2. Section 017700 – Contract Closeout Requirements, for documents required to closeout contract.
3. Section 017823 – Operation and Maintenance Manuals, for submitting operation and maintenance manuals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require the Design Professional's responsive action. Action submittals are those submittals indicated in individual specification sections as action submittals.

B. Informational Submittals: Written and graphic information and physical samples that do not require the Design Professional's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual specification sections as informational submittals.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

D. Required Submittal List Utility application: Interacts with and to be used with the Owner's Contract Manager system. The Design Professional uses the utility to itemize the list of submission items needed to be submitted by the Contractor in order to insure the design intent will be satisfied and inclusive of all Project turnover documents and/or Contract Closeout Requirements.

E. Contractor's Submission Schedule: The itemized list of project submission requirements printed as a report from Contract Manager. The Contractor enters the date each item needs to be submitted in order to meet the CPM schedule and returns this document to the Owner.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: The Contractor's Submission Schedule is attached to this section, prepared by the Design Professional. The Contractor is to coordinate and cooperate with the Owner and Design Professional to arrange in chronological order by dates required by the construction schedule. Coordinate time required for review, ordering, manufacturing, fabrication, and delivery to establish dates. Coordinate additional time required for making corrections or modifications to submittals noted by the Design Professional and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate the Contractor's Submission Schedule with list of subcontracts, the schedule of values, and coordinated CPM schedule.
2. Initial Submittal: Submit in accordance with start-up CPM schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently in accordance with the complete CPM schedule.

    a. Coordinate with the Owner and Design Professional revised Contractor's Submission Schedule to reflect changes in current status and timing for submittals.

B. Format for Submittals: Submit required submittals in electronic (PDF) file format.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Design Professional's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by the Design Professional for the Contractor's use in preparing submittals.

Coordination: Coordinate preparation and processing of submittals with the performance of the Work.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Commissioning Authority will review submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Design Professional review and approval.
3. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
4. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

5. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Submit Operation and Maintenance Manuals concurrent with action submittal.
    b. The Owner or Design Professional reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence on the Design Professional's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. The Design Professional will advise the Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Re-submittal Review: Allow 15 days for review of each re-submittal.
4. Sequential Review: Where sequential review of submittals by the Design Professional's consultants, the Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

C. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by the Design Professional.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Design Professional.
    d. Name of Construction Manager (if applicable).
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number including revision identifier.

        1) Submittal number shall be the submittal item number and Submittal Package number designated in the Contractor's Submission Schedule.

    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

D. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Provide means for insertion to permanently record the Contractor's review and approval markings and action taken by the Design Professional.
4. Include the following information on an inserted cover sheet:

    a. Project name.
    b. Date.
    c. Name and address of Design Professional.
    d. Name of Construction Manager (if applicable).
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Name of subcontractor.
    h. Name of supplier.
    i. Name of manufacturer.
    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Related physical samples submitted directly.
    n. Other necessary identification.

5. Include the following information as keywords in the electronic file metadata:

    a. Project name.
    b. Number and title of appropriate Specification Section.
    c. Manufacturer name.
    d. Product name.

E. Options: Identify options requiring selection by the Design Professional.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless the Design Professional observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. The Design Professional will return submittals, without review**,** received from sources other than the Contractor.

1. Transmittal Form: Use the Contractor’s office form.
2. Transmittal Form: Provide locations on form for the following information:

    a. Project name.
    b. Date.
    c. Destination (To:).

d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Indication of full or partial submittal.
j. Drawing number and detail references, as appropriate.
k. Transmittal numbered consecutively.
l. Submittal and transmittal distribution record.
m. Remarks.
n. Signature of transmitter.

3. On an attached separate sheet, prepared on the Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by the Design Professional on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

I. Re-submittals: Make re-submittals in same form and format.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from the Design Professional’s action stamp.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, and installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals that are marked with approval notation from the Design Professional’s action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as electronic (PDF) files, to the Design Professional. If applicable, the Design Professional will forward submittals to the Commissioning Authority for systems being commissioned. The Owner may request paper copies of certain submittals for onsite coordination.

a. The Design Professional, through the Owner, will return annotated file. Annotate and retain one copy of file as an electronic Project turnover document file.
b. The Commissioning Authority through the Design Professional will return annotated file.

2. Operation and Maintenance Manual Submittals: Submit concurrent with the Action Submittal, as related in individual Specification Sections.
3. Closeout Submittals: Comply with requirements specified in Section 017700 – Contract Closeout Requirements and as listed in the Contractor's Submission Schedule.
4. Permits, Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Permits, Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Submittal Package number and Submittal Item number.
b. Manufacturer's catalog cuts.
c. Manufacturer's product specifications.
d. Standard color charts.
e. Statement of compliance with specified referenced standards.
f. Testing by recognized testing agency.
g. Application of testing agency labels and seals.
h. Notation of coordination requirements.
i. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data concurrent with Samples.
6. Submit Product Data in electronic (PDF) file format.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Submittal Package number and Submittal Item number.
b. Identification of products.
c. Schedules.
d. Compliance with specified standards.
e. Notation of coordination requirements.
f. Notation of dimensions established by field measurement.
g. Relationship and attachment to adjoining construction clearly indicated.
h. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Submittal Package number and Submittal Item number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: For turnover purpose, submit six full sets of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. The Design Professional, through the Owner, will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or

containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit six sets of Samples. The Design Professional, through the Owner, will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a turnover sample.

1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least six sets of paired units that show approximate limits of variations.

E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Submit subcontract list in PDF electronic file, to the Owner.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

H. OSHA Certificates: Upon the Owner’s request, submit certificates of the OSHA 10-hour Construction Safety and Health Course – S1537-A, for all laborers, workers and mechanics working on site.

I. Installer Certificates: Upon the Owner’s request, submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

J. Manufacturer Certificates: Upon the Owner’s request, submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

K. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

L. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

M. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to the Design Professional.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of the Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DESIGN PROFESSIONAL’S ACTION

A. General: The Design Professional will not review submittals that do not bear the Contractor's approval stamp and will return them without action.

B. Action Submittals: The Design Professional will review each submittal, make marks to indicate corrections or modifications required, and return it through the Owner. The Design Professional will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: The Design Professional will review each submittal and will return it if it does not comply with requirements.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from the Design Professional.

E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

G. On projects that have commissioning, the Commissioning Authority will receive copies of the submittals through the Design Professional and will provide comments on the submittals via the Design Professional.

3.3 CONTRACTOR'S SUBMITTAL SCHEDULE

A. The Contractor's Submission Schedule: The Contractor's Submission Schedule, prepared by the Design Professional is attached following the end of this section. The Contractor shall provide the dates each item needs to be submitted to the Owner no later than 30 days after approval of CPM schedule. The schedule shall include the date of all shop drawings, samples, materials that shall be submitted and the date approval is required. The Contractor shall adhere to the submittal processing time as describe in paragraph 1.5 above when developing the submittal schedule. The Contractor is to coordinate and cooperate with the Owner and Design Professional to complete scheduling in accordance with the approved CPM schedule.

END OF SECTION 013300

SCHEDULE OF SUBMITTALS

Facility: Rockland Psychiatric Center
Project: Rockland PC, BMS Replacement, Building #144
Project Number: 3608809999

Number	Specification Section	Submittal Type	Submittal Description	Notes
1	230519	Meters and Gages for HVAC Piping	Product Data	
2	230519	Meters and Gages for HVAC Piping	Shop Drawings	Diagrams for power, signal, and control wiring
3	230519	Meters and Gages for HVAC Piping	Product Certificates	
4	230519	Meters and Gages for HVAC Piping	O&M	
5	230523.12	Ball Valves for HVAC Piping	Product Data	For each type of product
6	230523.13	Butterfly Valves for HVAC Piping	Product Data	For each type of product
7	230523.15	Gate Valves for HVAC Piping	Product Data	For each type of product
8	230529	Hangers and supports for HVAC Piping and Equipment	Product Data	For each type of product
9	230529	Hangers and supports for HVAC Piping and Equipment	Shop Drawings	Signed and sealed by a qualified professional engineer
10	230529	Hangers and supports for HVAC Piping and Equipment	Welding Certificates	
11	230553	Identification for HVAC Piping and equipment	Product Data	For each type of product
12	230553	Identification for HVAC Piping and equipment	Samples	Color, letter style, and graphic representation required for each identification material and device
13	230553	Identification for HVAC Piping and equipment	Equipment Label Schedule	
14	230553	Identification for HVAC Piping and equipment	Valve numbering scheme	
15	230553	Identification for HVAC Piping and equipment	Valve Schedules	For each piping system to include in maintenance manuals
16	230713	Duct Insulation	Product Data	For each type of product
17	230713	Duct Insulation	Shop Drawings	
18	230713	Duct Insulation	Qualification Data	
19	230713	Duct Insulation	Material Test Reports	
20	230719	HVAC Piping Insulation	Product Data	For each type of product
21	230719	HVAC Piping Insulation	Shop Drawings	
22	230719	HVAC Piping Insulation	Qualification Data	
23	230719	HVAC Piping Insulation	Material Test Reports	
24	230923	Direct Digital Control System for HVAC	Product Data	For each type of product
25	230923	Direct Digital Control System for HVAC	Software	
26	230923	Direct Digital Control System for HVAC	Shop Drawings	
27	230923	Direct Digital Control System for HVAC	Schematic Drawings	
28	230923	Direct Digital Control System for HVAC	Control Panel Drawings	
29	230923	Direct Digital Control System for HVAC	System Network Riser Diagram	
30	230923	Direct Digital Control System for HVAC	System Electrical Power Riser Diagram	
31	230923	Direct Digital Control System for HVAC	Monitoring and Control Signal Diagrams	
32	230923	Direct Digital Control System for HVAC	Color Graphics	
33	230923	Direct Digital Control System for HVAC	System Description	
34	230923	Direct Digital Control System for HVAC	Coordination Drawings	
35	230923	Direct Digital Control System for HVAC	Welding Certificates	
36	230923	Direct Digital Control System for HVAC	Product Certificates	
37	230923	Direct Digital Control System for HVAC	Product Test Reports	
38	230923	Direct Digital Control System for HVAC	O&M	
39	230923.11	Control Valves	Product Data	For each type of product
40	230923.11	Control Valves	Shop Drawings	
41	230923.11	Control Valves	Delegated-Design Submittal	
42	230923.11	Control Valves	Coordination Drawings	

Number	Specification Section	Submittal Type	Submittal Description	Notes
43	230923.11	Control Valves	O&M	
44	230923.12	Control Dampers	Product Data	For each type of product
45	230923.12	Control Dampers	Shop Drawings	
46	230923.12	Control Dampers	Delegated-Design Submittal	
47	230923.12	Control Dampers	Coordination Drawings	
48	230923.12	Control Dampers	O&M	
49	230923.14	Flow Instruments	Product Data	For each type of product
50	230923.14	Flow Instruments	Shop Drawings	
51	230923.14	Flow Instruments	Product Certificates	
52	230923.14	Flow Instruments	Product Test Reports	
53	230923.14	Flow Instruments	O&M	
54	230923.23	Pressure Instruments	Product Data	For each type of product
55	230923.23	Pressure Instruments	Shop Drawings	
56	230923.23	Pressure Instruments	Product Certificates	
57	230923.23	Pressure Instruments	Product Test Reports	
58	230923.23	Pressure Instruments	O&M	
59	230923.27	Temperature Instruments	Product Data	For each type of product
60	230923.27	Temperature Instruments	Shop Drawings	
61	230923.27	Temperature Instruments	Product Certificates	
62	230923.27	Temperature Instruments	Product Test Reports	
63	230923.27	Temperature Instruments	O&M	
64	230923.43	Weather Stations	Product Data	For each type of product
65	230923.43	Weather Stations	Shop Drawings	
66	230923.43	Weather Stations	Product Certificates	
67	230923.43	Weather Stations	Product Test Reports	
68	230923.43	Weather Stations	O&M	
69	232113	Hydronic Piping	Product Data	For each type of product
70	232113	Hydronic Piping	Coordination Drawings	
71	232113	Hydronic Piping	Qualification Data	
72	232113	Hydronic Piping	Welding Certificates	
73	232113	Hydronic Piping	Water Analysis	
74	232213	Steam and Condensate Heating Piping	Product Data	For each type of product
75	232213	Steam and Condensate Heating Piping	Coordination Drawings	
76	232213	Steam and Condensate Heating Piping	Qualification Data	
77	232213	Steam and Condensate Heating Piping	Welding Certificates	
78	232213	Steam and Condensate Heating Piping	Steam Analysis	
79	232216	Steam and Condensate Heating Piping Specialties	Product Data	For each type of product
80	232216	Steam and Condensate Heating Piping Specialties	O&M	
81	232216	Steam and Condensate Heating Piping Specialties	Steam Meter	
82	233113	Metal Ducts	Product Data	For each type of product
83	233113	Metal Ducts	Shop Drawings	
84	233113	Metal Ducts	Product Certificates	
85	233113	Metal Ducts	Product Test Reports	
86	233113	Metal Ducts	O&M	
87	233300	Air Duct Accessories	Product Data	For each type of product
88	233300	Air Duct Accessories	Shop Drawings	
89	233300	Air Duct Accessories	Product Certificates	
90	233300	Air Duct Accessories	Product Test Reports	
91	233300	Air Duct Accessories	O&M	
92	260519	Low-Voltage electrical Power Conductors and Cables	Product Data	For each type of product
93	260519	Low-Voltage electrical Power Conductors and Cables	Product Schedule	
94	260519	Low-Voltage electrical Power Conductors and Cables	Qualification Data	
95	260519	Low-Voltage electrical Power Conductors and Cables	Testing Agency Qualifications	
96	260523	Control-Voltage electrical Power Cables	Product Data	For each type of product
97	260523	Control-Voltage electrical Power Cables	Product Schedule	

Number	Specification Section	Submittal Type	Submittal Description	Notes
98	260523	Control-Voltage electrical Power Cables	Qualification Data	
99	260523	Control-Voltage electrical Power Cables	Testing Agency Qualifications	
100	260529	Hanger and Supports for Electrical Systems	Product Data	For each type of product
101	260529	Hanger and Supports for Electrical Systems	Shop Drawings	
102	260529	Hanger and Supports for Electrical Systems	Delegated-Design Submittal	
103	260529	Hanger and Supports for Electrical Systems	Coordination Drawings	
104	260529	Hanger and Supports for Electrical Systems	Welding Certificates	
105	260533	Raceways and Boxes for Electrical Systems	Product Data	For each type of product
106	260533	Raceways and Boxes for Electrical Systems	Shop Drawings	
107	260533	Raceways and Boxes for Electrical Systems	Coordination Drawings	
108	260544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling	Product Data	For each type of product
109	260553	Identification for Electrical Systems	Product Data	For each type of product
110	260553	Identification for Electrical Systems	Samples	
111	260553	Identification for Electrical Systems	Identification schedule	
112	262923	Variable-Frequency Motor Controllers	Product Data	For each type of product
113	262923	Variable-Frequency Motor Controllers	Shop Drawings	
114	262923	Variable-Frequency Motor Controllers	Coordination Drawings	
115	262923	Variable-Frequency Motor Controllers	Qualification Data	
116	262923	Variable-Frequency Motor Controllers	Product Certificates	
117	262923	Variable-Frequency Motor Controllers	Harmonic Analysis Report	
118	262923	Variable-Frequency Motor Controllers	Sample Warranty	
119	262923	Variable-Frequency Motor Controllers	O&M	

SECTION 014000 - QUALITY AND CODE REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit the Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for the Contractor to provide quality assurance and quality control services required by the Owner or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:
1. Section 013200 - Construction Progress Documentation, for developing a schedule of required tests and inspections.
2. Individual Specification Sections, for specific inspections and tests requirements.

1.3 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements.

C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Product Testing: Tests and inspections that are performed by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Installer/Applicator/Erector: The Contractor or another entity engaged by the Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality Control Plan: For quality assurance and quality control activities and responsibilities.

B. Contractor's Quality Control Manager Qualifications: For supervisory personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality control service.

1.6 CONTRACTOR'S QUALITY CONTROL PLAN

A. Quality Control Plan, General: Submit quality control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to the Owner. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality assurance and quality control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality assurance and quality control procedures similar in nature and extent to those required for Project.

1. Project quality control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: Include in quality control plan a comprehensive schedule of the Work requiring tests or inspections, including the following:

1. The Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and the Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "NYS Statement of Special Inspections and Tests."

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work the Owner has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.8 PERMITS, LICENSES, AND CERTIFICATES:

A. The Contractor shall obtain, maintain and pay for all applications, permits, filings, and licenses necessary for the execution of the Work and for the use of such Work when completed as required by any and all authorities having jurisdiction. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of authorities having jurisdiction bearing on performance of the Work.

B. The Contractor shall promptly assist the Owner in securing all approvals from authorities having jurisdiction. Without limitation, the Contractor shall assist the Owner in making application for Project approval, variances or other approvals, Letters of Completion, Temporary Certificates of Occupancy, and Certificates of Occupancy, including completion of all necessary applications and supporting documentation.

C. The Contractor shall comply with all regulations governing conduct, access to the premises, operation of equipment and systems and conduct while in or near the premises and shall perform the Work in such a manner as not to unreasonably interrupt or interfere with the conduct of business of the Institution.

D. For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, material certificates/affidavits, approvals, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

E. Dormitory Authority Permits: Prior to commencement of the Work, the Dormitory Authority shall provide the Contractor, at no costs, a Construction Permit for performance of the Work and post a copy at the Project site.

1. The Contractor shall secure and pay for all other work permits, applications, filings, and approvals that are associated with the Work of the Contract and pay all other permits, fees, licenses and inspections necessary for the proper execution and completion of the Contract as required by all other applicable authorities having jurisdiction.
2. **The Contractor shall, at no additional costs to the Owner, provide for inspection of all electrical Work of the Contract and provide a certificate of compliance from an independent electrical inspection agency acceptable to the Owner.**

F. Municipal Permits: The Contractor shall secure and pay for a building permit and all work permits, applications, filings, and approvals that are associated with the Work of the Contract and pay all other permits, fees, licenses and inspections necessary for the proper execution and completion of the Contract as required by applicable authorities having jurisdiction.

1. The Contractor shall secure required building permit or work permits and approvals prior to commencement of the Work, provide a copy to the Owner and post a copy of the permit at the Project site.
2. The Contractor shall be responsible to maintain updated permits and approvals.
3. Upon Substantial Completion of the Work of the Contract, the Contractor shall secure all required approvals from applicable authorities having jurisdiction. The Contractor shall provide a copy to the Owner.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

F. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329**,** and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality control services are indicated as the Owner's responsibility, the Owner will engage a qualified testing agency to perform these services.

1. The Owner will furnish the Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to the Owner are the Contractor's responsibility. Perform additional quality control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of the Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as the Contractor's responsibility, engage a qualified testing agency to perform these quality control services.

    a. Contractor shall not employ same entity engaged by the Owner, unless agreed to in writing by the Owner.

3. Notify testing agencies at least 24 hours in advance of time (excluding weekends and holidays) when Work that requires testing or inspecting will be performed.
4. Where quality control services are indicated as the Contractor's responsibility, submit a written report, in duplicate, of each quality control service.
5. Testing and inspecting requested by the Contractor and not required by the Contract Documents are the Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 - Submittal Procedures.

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting:

1. Regardless of whether original tests or inspections were the Contractor's responsibility, provide quality control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents, or costs attributable to the Contractor’s lack of coordination in properly scheduling the Work requiring testing and inspection will be charged to Contractor and the Contract Sum will be adjusted by Change Order.

F. Testing Agency Responsibilities: Cooperate with the Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify the Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a written report, in duplicate, of each test, inspection, and similar quality control service through Contractor.
5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of the Contractor.

G. Associated Services: The Contractor shall cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. The Contractor shall provide the following:

1. Access to the Work, including equipment required to access the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to the Owner, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to the Design Professional.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for the Owner’s reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality control service activities.

C. Repair and protection are the Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

END OF SECTION 014000

2020 NYS BUILDING CODE
STATEMENT OF SPECIAL INSPECTIONS

BCNYS §1704.3 requires that the project Registered Design Professional in responsible charge prepare a Statement of Special Inspections. Completion of this Statement of Special Inspections and submission to the Code Compliance Unit with the Construction Permit Application is a condition for issuance of the Construction Permit.

Campus/Facility: Rockland PC Campus		
Project Title: BMS Replacement for Cook Chill Production Center		
Project #: 360880	**DASNY Project Manager:** Katarzyna Drogowski	
Registered Design Professional (RDP): Michael McNamara		
Name of Person Completing Statement: Doug Page	**Phone:** 518-862-0882	**Date:** 08/06/2021
Comments: No Special Inspections are required.		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
A. Special Cases (Add requirements under Part S as necessary)			1705.1.1			Special Inspections and Tests shall be required for proposed work that is, in the opinion of the building official, unusual in its nature.
B. Steel Construction.			1705.2			
1. Structural Steel			1705.2.1			
a. Inspection tasks prior to welding;			1705.2.1			AISC 360 Table N5.4-1
i. Welding procedure specifications (WPSs) available	X		1705.2.1	☐		AISC 360 Table N5.4-1
ii. Manufacturer certifications for welding consumables available	X		1705.2.1	☐		AISC 360 Table N5.4-1
iii. Material identification (type/grade)		X	1705.2.1	☐		AISC 360 Table N5.4-1
iv. Welder identification system		X	1705.2.1	☐		AISC 360 Table N5.4-1 The fabricator or erector, as applicable, shall maintain a system by which a welder who has welded a joint or member can be identified. Stamps, if used, shall be the low-stress type.
v. Fit up of groove welds (including joint geometry)		X	1705.2.1	☐		AISC 360 Table N5.4-1

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
vi. Configuration and finish of access holes		X	1705.2.1	☐		AISC 360 Table N5.4-1
vii. Fit-up of fillet welds		X	1705.2.1	☐		AISC 360 Table N5.4-1
viii. Check Welding equipment		X	1705.2.1	☐		AISC 360 Table N5.4-1
b. Inspection Tasks During Welding			1705.2.1			AISC 360 Table N5.4-2
i. Use of qualified welders.		X	1705.2.1	☐		AISC 360 Table N5.4-2
ii. Control and Handling of welding consumables.		X	1705.2.1	☐		AISC 360 Table N5.4-2
iii. No welding over cracked tack welds.		X	1705.2.1	☐		AISC 360 Table N5.4-2
iv. Environmental Conditions		X	1705.2.1	☐		AISC 360 Table N5.4-2
v. Verify WPS followed		X	1705.2.1	☐		AISC 360 Table N5.4-2
vi. Verify Welding Techniques		X	1705.2.1	☐		AISC 360 Table N5.4-2
c. Inspection Tasks after Welding			1705.2.1			AISC 360 Table N5.4-3
i. Welds cleaned		X	1705.2.1	☐		AISC 360 Table N5.4-3
ii. Size, length, and location of welds	X		1705.2.1	☐		AISC 360 Table N5.4-3
iii. Welds meet visual acceptance criteria	X		1705.2.1	☐		AISC 360 Table N5.4-3
iv. Arc strikes	X		1705.2.1	☐		AISC 360 Table N5.4-3
v. K-area	X		1705.2.1	☐		AISC 360 Table N5.4-3; When welding of doubler plates, continuity plates or stiffeners has been performed in the k-area, visually inspect the web k-area for cracks within 3 in. (75mm) of the weld.
vi. Backing removed and weld tabs removed (if required)	X		1705.2.1	☐		AISC 360 Table N5.4-3
vii. Repair activities	X		1705.2.1	☐		AISC 360 Table N5.4-3
viii. Document acceptance or rejection of welded joint or member	X		1705.2.1	☐		AISC 360 Table N5.4-3
d. Inspection Tasks Prior to Bolting			1705.2.1			AISC 360 Table N5.6-1
i. Manufacturer's certification available for fastener materials	X		1705.2.1	☐		AISC 360 Table N5.6-1
ii. Fasteners marked in accordance with ASTM requirements		X	1705.2.1	☐		AISC 360 Table N5.6-1
iii. Proper fasteners selected		X	1705.2.1	☐		AISC 360 Table N5.6-1

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane)						
iv. Proper bolting procedure selected for joint detail		X	1705.2.1	☐		AISC 360 Table N5.6-1
v. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements.		X	1705.2.1	☐		AISC 360 Table N5.6-1
vi. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used.		X	1705.2.1	☐		AISC 360 Table N5.6-1
vii. Proper storage provided for bolts, nuts, washers and other fastener components.		X	1705.2.1	☐		AISC 360 Table N5.6-1
e. Inspection Tasks During Bolting			1705.2.1			AISC 360 Table N5.6-2
i. Fastener assemblies, of suitable condition, placed in all holes and washers (if required) are positioned as required.		X	1705.2.1	☐		AISC 360 Table N5.6-2
ii. Joint brought to the snug-tight condition prior to the pretensioning operation.		X	1705.2.1	☐		AISC 360 Table N5.6-2
iii. Fastener component not turned by the wrench prevented from rotating.		X	1705.2.1	☐		AISC 360 Table N5.6-2
iv. Fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges.		X	1705.2.1	☐		AISC 360 Table N5.6-2
f. Inspection Tasks After Bolting			1705.2.1			AISC 360 Table N5.6-3
i. Document acceptance or rejection of bolted connections.	X		1705.2.1	☐		AISC 360 Table N5.6-3
g. Inspection of Steel Elements of Composite Construction Prior to Concrete Placement			1705.2.1			AISC 360 Table N6.1
i. Placement and installation	X		1705.2.1	☐		AISC 360 Table N6.1

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
of steel deck.						
ii. Placement and installation of steel headed stud anchors.	X		1705.2.1	☐		AISC 360 Table N6.1
iii. Document acceptance or rejection of steel elements	X		1705.2.1	☐		AISC 360 Table N6.1
2. Cold-Formed Steel Deck			1705.2.2	☐		
a. Inspection or Execution Tasks prior to Deck Placement			1705.2.2			SDI QA/QC Table 1.1
i. Verify compliance of materials (deck and all deck accessories) with construction documents, including profiles, material properties, and base metal thickness.	X		1705.2.2	☐		SDI QA/QC Table 1.1
ii. Document acceptance or rejection of deck and deck accessories.	X		1705.2.2	☐		SDI QA/QC Table 1.1
b. Inspection or Execution Tasks after Deck Placement						SDI QA/QC Table 1.2
i. Verify compliance of deck and all deck accessories installation with construction documents.	X		1705.2.2	☐		SDI QA/QC Table 1.2
ii. Verify deck materials are represented by the mill certifications that comply with the construction documents.	X		1705.2.2	☐		SDI QA/QC Table 1.2
iii. Document acceptance or rejection of installation of deck and deck accessories.	X		1705.2.2	☐		SDI QA/QC Table 1.2
c. Inspection or Execution Tasks Prior to Welding			1705.2.2			SDI QA/QC Table 1.3
i. Welding Procedure Specifications (WPS) available.		X	1705.2.2	☐		SDI QA/QC Table 1.3
ii. Manufacturer certifications for welding consumables available		X	1705.2.2	☐		SDI QA/QC Table 1.3
iii. Material identification (type/grade).		X	1705.2.2	☐		SDI QA/QC Table 1.3
iv. Check welding equipment.		X	1705.2.2	☐		SDI QA/QC Table 1.3
d. Inspection or Execution Tasks during Welding			1705.2.2			SDI QA/QC Table 1.4
i. Use of qualified welders.		X	1705.2.2	☐		SDI QA/QC Table 1.4
ii. Control and handling of		X	1705.2.2	☐		SDI QA/QC Table 1.4

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
welding consumables.						
iii. Environmental conditions (wind speed, moisture, temperature).		X	1705.2.2	☐		SDI QA/QC Table 1.4
iv. Verify WPS followed.		X	1705.2.2	☐		SDI QA/QC Table 1.4
e. Inspection or Execution Tasks after Welding			1705.2.2			SDI QA/QC Table 1.5
i. Verify size and location of welds, including support, sidelap, and perimeter welds.	X		1705.2.2	☐		SDI QA/QC Table 1.5
ii. Welds meet visual acceptance criteria.	X		1705.2.2	☐		SDI QA/QC Table 1.5
iii. Verify repair activities.	X		1705.2.2	☐		SDI QA/QC Table 1.5
iv. Document acceptance or rejection of welds.	X		1705.2.2	☐		SDI QA/QC Table 1.5
f. Inspection or Execution Tasks prior to Mechanical Fastening			1705.2.2			SDI QA/QC Table 1.6
i. Manufacturer installation instructions available for mechanical fasteners.		X	1705.2.2	☐		SDI QA/QC Table 1.6
ii. Proper tools available for fastener installation.		X	1705.2.2	☐		SDI QA/QC Table 1.6
iii. Proper storage for mechanical fasteners.		X	1705.2.2	☐		SDI QA/QC Table 1.6
g. Inspection or Execution Tasks during Mechanical Fastening			1705.2.2			SDI QA/QC Table 1.7
i. Fasteners are positioned as required.		X	1705.2.2	☐		SDI QA/QC Table 1.7
ii. Fasteners are installed in accordance with manufacturer's instructions.		X	1705.2.2	☐		SDI QA/QC Table 1.7
h. Inspection or Execution Tasks after Mechanical Fastening			1705.2.2			SDI QA/QC Table 1.8
i. Check spacing, type, and installation of support fasteners.	X		1705.2.2	☐		SDI QA/QC Table 1.8
ii. Check spacing, type, and installation of sidelap fasteners.	X		1705.2.2	☐		SDI QA/QC Table 1.8
iii. Check spacing, type, and installation of perimeter fasteners.	X		1705.2.2	☐		SDI QA/QC Table 1.8
iv. Verify repair activities.	X		1705.2.2	☐		SDI QA/QC Table 1.8
v. Document acceptance or rejection of mechanical fasteners.	X		1705.2.2	☐		SDI QA/QC Table 1.8

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
3. Open-Web Steel Joists and Joist Girders			1705.2.3			
a. Installation of open-web steel joists and joist girders		X	Table 1705.2.3	☐		
i. End connections – welded or bolted.		X	Table 1705.2.3	☐		SJI Specifications listed in Section 2207.1.
ii. Bridging – Horizontal or diagonal.		X	Table 1705.2.3	☐		
a. Standard bridging.		X	Table 1705.2.3	☐		SJI Specifications listed in Section 2207.1.
b. Bridging that differs from the SJI specifications listed in Section 2207.1		X	Table 1705.2.3	☐		
4. Cold-Formed Steel Trusses spanning 60 feet or Greater		X	1705.2.4	☐		The Special Inspector shall verify that the temporary restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.
C. Concrete Construction			1705.3			
1. Inspect reinforcement, including prestressing tendons, and verify placement.		X	Table 1705.3	☐		ACI 318 Ch. 20, 25.2, 25.3, 26.6.1-26.6.3 IBC 1908.4
2 Reinforcing Bar Welding:		X	Table 1705.3 1705.3.1	☐		AWS D1.4, ACI 318: 26.6.4
a. Verify weldability of reinforcing bars other than ASTM A706:		X	Table 1705.3	☐		AWS D1.4 ACI 318: 26.6.4
b. Inspect single pass fillet welds, maximum 5/16"; and		X	Table 1705.3	☐		AWS D1.4 ACI 318: 26.6.4
c. Inspect all other welds	X		Table 1705.3	☐		AWS D1.4 ACI 318: 26.6.4
3. Inspect anchors cast in concrete.		X	Table 1705.3	☐		ACI 318: 17.8.2
4. Inspect anchors post-installed in hardened concrete members.		X	Table 1705.3	☐		
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X		Table 1705.3	☐		ACI 318: 17.8.2.4
b. Mechanical anchors and adhesive anchors not defined in item 4a.		X	Table 1705.3	☐		ACI 318: 17.8.2

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
5. Verify use of required design mix		X	Table 1705.3	☐		ACI 318: Ch. 19, 26.4.3, 26.4.4 IBC 1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of concrete.	X		Table 1705.3	☐		ASTM C172, ASTM C31; ACI 318: 26.4, 26.12; IBC 1908.10
7. Inspect concrete and shotcrete placement for proper application techniques.	X		Table 1705.3	☐		ACI 318: 26.5; IBC 1908.6, 1908.7, 1908.8
8. Verify maintenance of specified curing temperature and techniques.		X	Table 1705.3	☐		ACI 318: 26.5.3-26.5.5 IBC: 1908.9
9. Inspect Prestressed concrete for:			Table 1705.3			
a. Application of prestressing forces; and	X		Table 1705.3	☐		ACI 318: 26.10
b. Grouting of bonded prestressing tendons	X		Table 1705.3	☐		ACI 318: 26.10
10. Inspect erection of precast concrete members		X	Table 1705.3	☐		ACI 318: Ch. 26.8
11. Verify in-situ concrete strength, prior to stressing tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.		X	Table 1705.3	☐		ACI 318: 26.11.2
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.		X	Table 1705.3	☐		
D. Masonry Construction (Check LA, LB or LC below) ☐ LA = Level A Quality Assurance ☐ LB = Level B Quality Assurance ☐ LC = Level C Quality Assurance			1705.4			TMS 402/ACI530/ASCE5 TMS 602/ACI530.1/ASCE6
Level A Quality Assurance: Minimum Verification						
A1. Prior to construction,		X		☐		TMS 402/ACI530/ASCE5

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
verify certificates of compliance used in masonry construction.						Table 3.1.1
Level B Quality Assurance: Minimum Special Inspections						
B1. Verify Compliance with approved submittals.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2: As masonry construction begins, verify that the following are in compliance:						TMS 402/ACI530/ASCE5 Table 3.1.2
B2a: Proportions of site-prepared mortar.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2b: Construction of Mortar Joints.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2c: Grade and size of prestressing tendons and anchorage.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2d: Location of reinforcement, connectors, and prestressing tendons and anchorage.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2e: Prestressing technique.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B2f: Properties of thin bed mortar for AAC masonry.	X	X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2 Continuous inspection required for the first 5000sf of AAC Masonry, Periodic inspection is required after the first 5000sf of AAC masonry.
B3. Prior to grouting, verify that the following are in compliance:		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B3a: Grout space.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B3b: Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorage.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B3c: Placement of reinforcement, connectors, and prestressing tendons and anchorage.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B3d: Proportions of site-prepared grout for bonded tendons.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B3e: Construction of mortar joints.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4: Verify during		X				TMS 402/ACI530/ASCE5

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
construction:						Table 3.1.2
B4a: Size and location of structural elements.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4b: Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4c: Welding of reinforcement.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4d: Preparation, construction, and protection of masonry during cold weather (temperature below 40dF) or hot weather (temperature above 90dF)		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4e: Application and measurement of prestressing force.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4f: Placement of grout and prestressing grout for bonded tendons is in compliance.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B4g: Placement of AAC masonry units and construction of thin-bed mortar joints.	X	X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2 Continuous inspection required for the first 5000sf of AAC Masonry, Periodic inspection is required after the first 5000sf of AAC masonry.
B5: Observe preparation of grout specimens, mortar specimens, and/or prisms.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.2
Minimum Tests						
B6: Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Specification Article 1.5B1.b.3 for self-consolidating grout.				☐		TMS 402/ACI530/ASCE5 Table 3.1.2
B7: Verification of f”m and f”aac in accordance with Specification Article 1.4B prior to construction, except where specifically exempted by this Code.				☐		TMS 402/ACI530/ASCE5 Table 3.1.2
Level C Quality Assurance: Minimum Special Inspections						

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
C1. Verify compliance with the approved submittals.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2. Verify that the following are in compliance:						TMS 402/ACI530/ASCE5 Table 3.1.3
C2a. Proportions of site mixed mortar, grout and prestressing grout for bonded tendons.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2b. Grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2c. Placement of masonry units and construction of mortar joints.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2d. Placement of reinforcement, connectors, and prestressing tendons and anchorages.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2e. Grout spacing prior to grouting.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2f. Placement of grout and prestressing grout for bonded tendons.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2g. Size and location of structural elements.		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2h. Type, size, and location of anchors including other details of anchorage of masonry to structural members, frames, or other construction.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2i. Welding of reinforcement.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2j. Preparation, construction, and protection of masonry during cold weather (temperature below 40dF) or hot weather (temperature above 90dF).		X		☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2k. Application and measurement of prestressing force.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2l. Placement of AAC masonry units and construction of thin-bed mortar joints.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C2m. Properties of thin-bed mortar for AAC masonry.	X			☐		TMS 402/ACI530/ASCE5 Table 3.1.3
C3. Observe preparation of	X			☐		TMS 402/ACI530/ASCE5

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
grout specimens, mortar specimens, and/or prisms.						Table 3.1.3
Minimum Tests						
D1. Verification of f"m and f'AAC in accordance with Specification Article 1.4B prior to construction and for every 5,000sf during construction.				☐		TMS 402/ACI530/ASCE5 Table 3.1.3
D2. Verification of proportions of materials in premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout, as delivered to the project site.				☐		TMS 402/ACI530/ASCE5 Table 3.1.3
D3. Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site in accordance with Specification Article 1.5B.1.b.3 for self-consolidating grout.				☐		TMS 402/ACI530/ASCE5 Table 3.1.3
E. Wood Construction			1705.5			
1. High Load Diaphragms		X	1705.5.1	☐		
2. Metal Plate Connected Wood Trusses spanning 60 feet or Greater		X	1705.5.2	☐		
F. Soils			1705.6			
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.		X	Table 1705.6	☐		
2. Verify excavations are extended to a proper depth and have reached proper material.		X	Table 1705.6	☐		
3. Perform classification and testing of compacted fill materials.		X	Table 1705.6	☐		
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X		Table 1705.6	☐		
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.		X	Table 1705.6	☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
G. Driven Deep Foundations			1705.7			
1. Verify element materials, sizes and lengths, comply with the requirements.	X		Table 1705.7	☐		
2. Determine capacities of test elements and conduct additional load tests, as required.	X		Table 1705.7	☐		
3. Inspect driving operations and maintain complete and accurate records for each elements.	X		Table 1705.7	☐		
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	X		Table 1705.7	☐		
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	-	-	Table 1705.7	☐		
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	-	-	Table 1705.7	☐		
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.	-	-	Table 1705.7	☐		
H. Cast-in-place Deep Foundations			1705.8			
1. Inspect drilling operations and maintain complete and accurate records for each element.	X		Table 1705.8	☐		
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into	X		Table 1705.8	☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
bedrock (if applicable) and adequate end-bearing strata capacity. Record concrete or grout volumes.						
3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3.	-	-	Table 1705.8	☐		
I. Helical Pile Foundations	X		1705.9			
J. Fabricated Items			1704.2.5 1705.10			Where fabrication of structural, load-bearing, or lateral load resisting members or assemblies is being conducted on the premises of a fabricators shop
1. Structural Steel		X		☐		
2. Steel Joists		X		☐		
3. Precast Concrete		X		☐		
4. Wood Construction		X		☐		
K. Special Inspections for Wind Resistance			1705.11			RDP to identify the main windforce-resisting systems and wind-resisting components that are subject to special inspection per BCNYS Section 1704.3.3.
1. Structural Wood	X	X	1705.11.1	☐		Inspection frequency varies depending on element inspection type.
2. Cold Formed steel light framed Construction		X	1705.11.2	☐		
3. Wind-resisting Components		X	1705.11.3	☐		
L. Special Inspections for Seismic Resistance			1705.12			RDP to identify the designated seismic systems and seismic force-resisting systems that are subject to special inspection per BCNYS Section 1704.3.2.
1. Structural Steel		X	1705.12.1	☐		AISC 341 Section J
2. Structural Wood	X	X	1705.12.2	☐		Inspection frequency varies depending on element inspection type.
3. Cold Formed steel light framed Construction		X	1705.12.3	☐		
4. Designated seismic systems	X	X	1705.12.4	☐		ASCE 7 Section 13.2.2 Insepction frequency may vary based on project specific SDC.
5. Architectural Components		X	1705.12.5	☐		
6. Plumbing, Mechanical, and Electrical Components		X	1705.12.6	☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
7. Storage Racks		X	1705.12.7	☐		
8. Seismic Isolation Systems		X	1705.12.8	☐		
9. Cold Formedsteel special bolted moment frames		X	1705.12.9	☐		
M. Testing for Seismic Resistance			1705.13			
1. Structural Steel		X	1705.13.1	☐		
2. Nonstructural Components		X	1705.13.2	☐		
3. Designated Seismic Systems		X	1705.13.3	☐		
4. Seismic Isolation Systems		X	1705.13.4	☐		
N. Sprayed Fire-Resistant Materials			1705.14			
1. Physical and visual tests		X	1705.14.1	☐		
2. Structural Member Surface Conditions		X	1705.14.2	☐		
3. Application		X	1705.14.3	☐		
4. Thickness		X	1705.14.4	☐		
5. Density		X	1705.14.5	☐		
6. Bond Strength		X	1705.14.6	☐		
O. Mastic and Intumescent Fire-Resistant Coatings		X	1705.15	☐		
P. Exterior Insulation and Finish Systems (EIFS)			1705.16			
1. Exterior Insulation and Finish Systems (EIFS)		X	1705.16	☐		
2. Water Resistive Barrier Coating		X	1705.16.1	☐		
Q. Fire-Resistant Penetration and Joints			1705.17			
1. Penetration Firestops		X	1705.17.1	☐		
2. Fire-resistant joint systems		X	1705.17.2	☐		
R. Testing for Smoke Control			1705.18			
1. Testing Scope		X	1705.18.1	☐		
2. Qualifications		X	1705.18.2	☐		
S. Additional Special Inspections/Tests			The registered design professional of record shall identify if additional tests and inspection defined by BC Section 1705.1.1 are required and provide specific requirements below.			
1.	☐	☐		☐		
2.	☐	☐		☐		
3.	☐	☐		☐		
4.	☐	☐		☐		
5.	☐	☐		☐		

INSPECTIONS AND TESTS (Continuous & Periodic is as defined by the BCNYS)	CONTINUOUS	PERIODIC	BCNYS REFERENCE	CHECK IF REQUIRED	SPECIFICATION REFERENCE AND CLARIFYING NOTES (by RDP)[1]	COMMENTARY/NOTES and REFERENCE STANDARDS (by DASNY)[2]
6.	☐	☐		☐		
7.	☐	☐		☐		
8.	☐	☐		☐		
9.	☐	☐		☐		
10.	☐	☐		☐		

NOTES:

1. RDP to provide reference specification section detailing the requirements for inspections and/or tests and other clarifying notes, as necessary.
2. Commentary/Notes by DASNY are provided for information only and are not intended to provide complete details of the required tests and inspections. Refer to the Building Code of New York State for complete and detailed requirements.

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections:

1. Section 011200 – Contract Summary of Work, for work restrictions and limitations on utility interruptions.

2. Section 015001 – Supplemental Facility Requirements

1.3 Owener’s Provisions for Utilities

A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum. The owner will not provide or pay for utilities, except contractor is permitted to use 110v electric outlets.

B. The contractor shall provide its own power supply to progress the work. The Contactor may use existing 110V convenience outlets..

1.4 INFORMATIONAL SUBMITTALS

A. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage; including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water damaged Work.

B. Dust-Control and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust-control and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of the work.

2. HVAC system isolation schematic drawing.
3. Location of proposed air filtration system discharge.
4. Other dust-control measures.
5. Waste management plan.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations and requirements of authority having jurisdiction for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: The Owner will not pay for or provide any utilities. Contractor to provide generators or other means for electric power. Contractor to provide rest room facilities for its own staff. Contractor to provide all utilities needed to progress the work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mils minimum thickness, with flame-spread rating of 15 or less per ASTM E 84.

B. Dust Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units. Contractor shall provide for any utilities required.

B. Storage Trailer: Provide trailer sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2. Fully coordinate locations of trailer(s) with DASNY and RPC/Cook Chill Facility

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, the Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed in accordance with approved coordination drawings.
   a. Maintain negative air pressure within work area using HEPA-equipped air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
4. Connect temporary service to the Owner's existing power source, as directed by the Owner.

C. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements.

2. Provide superintendent with cellular telephone for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Substantial Completion inspection date is scheduled. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Traffic Controls: Comply with requirements of Cook Chill Facility.

C. Parking: Provide temporary parking areas for construction personnel. Coordinate locations with the Cook Chill Facility.

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

E. Temporary Elevator Use: Use of elevators is not permitted.

F. Existing Stair Usage: Use of the Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to the Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

C. Fire Safety During Construction: Comply with all requirements identified herein as well as the more stringent requirements of the applicable codes (New York State Building and Fire Codes).

1. No smoking: Smoking shall be prohibited throughout the project/construction site.
2. The Contractor shall designate a Fire Prevention Program Superintendent/ Fire Safety Manager who shall be responsible for all fire safety efforts until completion and acceptance of the Work described in the Contract Documents that include but are not limited to the following:

a. Prefire Plans. Develop in cooperation with the local Fire Chief and Fire Code Official. Any changes affecting the utilization of information contained in the plan shall result in notification to the local Fire Chief and Fire Code Official.
b. Training. Job site personnel shall be trained in fire safety practices and procedures and the proper use of fire protection equipment, including hand-held fire extinguishers, hose lines, fire alarm and sprinkler systems.
c. Fire Protection Devices. Fire protection and detection equipment shall be maintained and serviced.
d. Hot Work Operations. Welding, cutting, open torches, torch-applied roof system activities, and other hot work operations shall be conducted under a permit system. A fire watch and fire extinguishers shall be provided.
e. Impairment of Fire Protection Systems. Coordinate planned, emergency or accidental impairments of fire protection systems to include tagging of impaired systems and notification of Fire Department, Alarm Company, Building Owner/Operator, and Contractors.
f. Temporary Covering of Fire Protection Devices. Coverings placed on or over fire protection devices for protection from damage shall be immediately removed upon the completion of the Work in the room or area in which the devices are installed.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves right to take possession of the Project identification signs.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 – Contract Closeout Requirements.

END OF SECTION 015000

SECTION 015001 – SUPPLEMENTAL FACILITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Facility Burn Permit.
2. Facility Shutdown Request Form
3. Contractor Regulations Form
4. Contractor Storm Water Form.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
4. Section 015000 Temporary Facilities and Controls

1.3 Additional Notification to Contractor

A. All contractors should adhere to all the facilities policies, procedures and USDA regulations.

B. Prior to any work all contracted entities, workers, sub-contractors or supervisors performing any work the facility will provide an orientation. Orientation provided by RPC/Cook Chill Staff.

C. Prior to any work related to the attached forms being initiated the appropriate paperwork must be completed appropriately and submitted to the facility.

D. Supplemental forms noted in 1.2 A above are part of this specification.

END OF SECTION 015001

COOK CHILL PRODUCTION CENTER FACILITY POLICY & PROCEDURE	DATE ISSUED:	DATE REVISED:	PAGE: 1 OF 2	SECTION #: --
	MANUAL NAME: FIRE / SAFETY / EMERGENCY MANAGEMENT			SUBSECTION --
APPROVED BY: FACILITY DIRECTOR SIGNED:_____	SECTION: Open Flame, Welding, Cutting or Grinding			

A. PURPOSE:

The purpose of the welding, open flame, cutting or grinding policy is to maintain a safe working environment and to ensure management's knowledge of the activities and actions taking place within the facility.

B. SCOPE:

To allow management to make decisions in regard to scheduling the operations and production to meet program needs. Use of a "welding permit" will allow management to obtain reliable information and make best decisions regarding safety concerns and to provide opportunities to evaluate the process for improvement.

C. FUNDAMENTALS:

To provide comprehensive information in regards to planning of maintenance and repair tasks to reduce the impact of emergencies or fire alarms on the safety of the building occupants, program operations or the production of food.

D. GOALS:

Provide a safe and secure environment for staff, visitors, and others within the facility.

E. ORGANIZATION & RESPONSIBILITY

A Permit for Work with Welding, Cutting, Grinding or Open Flame is mandated for all staff, mechanics, contractors, service providers, etc. prior to the start of any associated tasks. A request for an open flame permit must be submitted by the servicing technician and approved by the technician's employer/supervisor, the Facility supervisor, and the Facility management.

F. PROCESS:

A permit application will be completed by the servicing technician and submitted to their company supervisor/employer for approving signature. The signed form will be submitted to the Facility supervisor for review, discussion, and tentative approval. Facility supervisor will submit the application to Facility management for final approval or denial. Approved application will be returned to the servicing technician and must be retained by the technician during performance of the work. Fire watch must be performed for a period of ½ hour after the hot work ends. Upon completion of the permitted work or task, and fire watch, the technician must sign and date the permit and return to Facility management.

PERMIT FOR WORK WITH OPEN FLAME, WELDING, CUTTING OR GRINDING	1. BUILDING	2. LOCATION/ROOM
3. Describe Job and Materials Being Used:	**4. Company Name:** Technician Name: Supervisor Name: Contact Info: Federal ID # :	
5. Valid Period (12 hours maximum) From (date/time):_____ To (date.time):_____	**6. 12 hr extensions.** Indicate start date, time and work supervisor's initials on each line for 12-hr permit extensions 1._____ 2._____ 3._____ 4._____	

7. Complete Job Checklist

Yes N/A

- ☐ ☐ Is fire system in service?
- ☐ ☐ Are surface piping/electrical systems protected?
- ☐ ☐ Are painted surfaces protected?
- ☐ ☐ Have combustibles within 35 ft been removed?
- ☐ ☐ Are wall/floor openings protected/covered?
- ☐ ☐ Are smoke detectors removed from service?
- ☐ ☐ Have flammable atmosphere been neutralized?

8. Complete Fire Watch Checklist

Yes N/A

- ☐ ☐ Nearest fire alarm box location or phone available.
- ☐ ☐ Job site in compliance with permit.
- ☐ ☐ fire watch (not building) fire extinguisher present (min. 10 lb ABC).
- ☐ ☐ Fire watch training completed.

9. Determine need for Critical Work Area Approval. If any box below is checked, approval of a Fire/Safety Officer is required:

☐ Is the area within 35 ft of a radiological material storage area, critical ventilation system, or a combustible storage cabinet?

☐ Is the area used for storage and/or transfer of flammable and/or combustible liquids or gases?

☐ Is the work being conducted on building roofs or exterior walls? In a confined space? Other?

Safety Officer Approval: _____ date: _____

10. Indicate Special Instructions or waivers:

11. Obtain Approvals

_____ Date:_____

Originator of Permit – Signature indicates preparations have been completed and comply with requirements.

_____ Date:_____

Supervisor (if different than originator) - Signature indicates job location meets above requirements

_____ Date:_____

Building Manager – Approval indicates permission is granted to do identified work at indicated location.

12. Fire watch completion for initial and 12-hr work extensions. Indicate completion of fire watch by work supervisor or any staff member involved in the work by initialing each 12-hr work period:

1._____ 2._____

3._____ 4._____

12. Work Completed: (may be completed by the originator of the permit, the work supervisor, or any staff member involved in the work)

☐ ½ hour fire watch is conducted. Time work ended/fire watch began: _____ am/pm, fire watch ended: _____ am/pm

☐ Work area is cleaned up and fire extinguishers removed.

Signature: _____ Completion Date: _____ ☐ Return permit to Building Mngr /Supvr

Cook Chill Production Center
Contractor Regulations

The Cook Chill Production Facility is a USDA inspected food processing plant. As such, we are under the stringent regulations and constant inspection of the USDA. It is vital that all rules and regulations pertaining to the facility be understood and adhered to. The following is a summary of the most prominent rules that would affect design, inspection, maintenance, operations, and construction employees.

1. All contractors, workers, visitors, etc., must adhere to the fire and safety rules of the facility. Primarily, in the event of a fire alarm, all persons in the building are to immediately exit the building using the nearest means of egress and congregate at the handicapped parking spaces located near the main entrance. All persons are to remain in this location until the all-clear is given by an authorized facility representative.
2. Do not block any exit or fire extinguisher cabinet.
3. All workers must sign in at the Cook/Chill front office when first entering the facility. Upon signing in, each employee will be issued an identification badge, which must be worn at all times.
4. All workers must sign out at the end of the workday. The identification badges must be returned to the main office at the end of workday.
5. All contractors and their employees must remain in the authorized work area. Cross-contamination is a major concern with food production.
6. When authorized and entering a food production area, appropriate dress is required. This means that all personnel must wear a clean, fresh overcoat (disposable-type or dark blue cloth) and a hair net. Beard nets are required for persons with beards.
7. When authorized to enter a food production area, all persons are required to wash their hands.
8. All outside doors are to be kept closed and locked at all times. This is for security and also a USDA requirement for sanitation of our building and production areas. Receipt of deliveries and/or tools and equipment must be done in a timely manner without propping or chocking open of doors.
9. The consumption of food, which includes coffee, candy and gum, is not permitted in food production areas. Eating and drinking is permitted in the cafeteria and the outside rear area where tables and chairs are provided. Food and beverage consumption is not allowed in construction areas.
10. No work will be scheduled or permitted in "clean room areas" where food product is or may be open to atmosphere. Work will be scheduled for nights/weekends, after food production is completed.
11. Smoking is only permitted in three designated areas:
    1. Outside, north side of building, at the main entrance.
    2. Outside of corridor 1-34, south side of building, in the assigned break area.
    3. Outside, west side of building, outside boiler room exit.
12. There will not be any utility and building system interruptions during production hours. This includes all gas, electric, water, compressed air, HVAC, fire alarm system, refrigeration, ice water, and steam. All shut-downs are to be scheduled with the facility.
13. All contractors should supply their own tools, ladders and supplies. At no time should contractors be using the facilities equipment.

I have read and understand the information above. These rules, and all facility and USDA rules and regulations, will be enforced by facility management to ensure the safety and health of our clients. I understand that if there are any questions, I should address them to a facility manager or construction project inspector for clarification.

NAME (please print):_____ Title:_____ Company:_____

Project # / task:_____, Trade:_____

Signature:_____ Date:_____

NEW YORK STATE OF OPPORTUNITY. | Office of Mental Health

Cook Chill Production Center
UTILITIES SHUTDOWN REQUEST **Date:** _____

Project name and #: _____
To: Cook Chill Production Management
From (requestor's name): _____ Company: _____
Phone# ____/____-_____ Fax #: _____/_____-_____

TYPE OF SHUT DOWN REQUESTED:

Steam _____	Condensate_____	Electric _____
Ice Water_____	Refrigeration _____	HVAC _____
Dom. Hot Water _____	Dom. Cold Water _____	Sprinkler _____
Fire Alarm _____	Compressed Air _____	Natural Gas _____
Fuel Oil _____	Other (explain) _____	

Shutdown start date: ___/____ Completion date ___/_____
Start time: _____am/pm Scheduled completion time: _____am/pm

Exact location of the area where the work is to be performed (room #/room name):

_____

Equipment name: _____

Will facility participation, in any form, be required, expected or requested? YES/NO
This includes production changes/security issues/off-hours access/etc.
Explain in detail, use back of form is needed.

_____

_____

How will this shutdown affect the facility operations or food production?

_____

Are temporary services or utilities required to maintain facility operations or production? YES/NO
Explain: _____

Facility Approvals:			
	Maint Supvr:	YES/NO	initial: _____
	PUE-III	YES/NO	initial: _____
	Ops Mgr	YES/NO	initial: _____
	Director/Admin	YES/NO	initial: _____

Facility Comments: _____

_____

_____

COOK CHILL PRODUCTION CENTER

Contractors Guide to Understanding

Stormwater

What is Stormwater Runoff?

- Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is Stormwater Runoff a Problem?

- Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream river, wetland, or coastal water. Anything that enters a storm sewer system may be discharged untreated into the waterbodies we use for swimming, fishing and drinking water.

The Impacts of Stormwater Discharges on Waterbodies

Polluted stormwater runoff can have many adverse effects on plants, fish, animals and people. Polluted stormwater can result in part from illegal discharges to stormwater and improper disposal of wastes.

- Litter and debris such as plastic bags, six-pack rings, bottles, and cigarette butts, when washed into waterbodies, can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment can also destroy aquatic habitats.

- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.

- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.

- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil and other automobile fluids can poison aquatic life. Animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

- Polluted stormwater can often affect drinking water sources. This in turn can affect human health and increase drinking water treatment costs.

Pollutants of Concern

Specific pollutants of concern for our facility are floatables, silt and sediment and oils. Floatables are any type of floating trash and debris that can be carried by stormwater and discharged to waterbodies. Silt and sediment sources include construction projects and areas of bare ground. Sources of oil include vehicles and the facility's oil handling activities.

STEPS TO TAKE TO REDUCE POLLUTANTS IN STORMWATER RUNOFF

Litter - Don't litter! Dispose of litter and waste material in designated containers and receptacles. Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
Keep trash and grease dumpsters and other waste containers closed and protected from stormwater contact.
Smokers – be sure to dispose of cigarette butts in designated receptacles.

Chemicals - Recycle or properly dispose of work products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other automotive fluids. Contact your supervisor if you are unsure of proper recycling or disposal practices.

Spills - Report any oil or chemical spills to your supervisor immediately, including oil spills from your car. They will contact the appropriate facility personnel or local hazardous waste response team to address the spill.

Vehicle Fleet - Properly maintain fleet vehicles to prevent oil, gas and other discharges from being washed into waterbodies.
Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Lawn Care- Don't over water the lawn; use a soaker hose if possible.
Use pesticides and fertilizers sparingly, and use them only in the recommended amounts.
Composite or mulch yard waste. Sweep lawn cuttings out of the street to prevent their entry into the storm sewer system.

Buildings & Grounds - Monitor and maintain erosion and sediment control features. Prevent soil erosion by minimizing disturbed areas and seed and mulch bare areas as soon as possible.

The Cook Chill Production Center maintains a Stormwater Management Plan (SWMP) in accordance with State requirements, under the direction of our Plant Superintendent. As a contractor working on our facility grounds, your awareness and active participation in the facility's SWMP is important and encouraged. The SWMP includes submittal of Annual Reports to the Department of Environmental Conservation. If you would like to review and comment on the SWMP, the draft and final Annual Reports or report on an observed existing or potential stormwater discharge or facility condition that may be of concern, contact your immediate personnel supervisor who will contact our Plant Superintendent. Also, for more information on proper stormwater management, visit:

www.epa.gov/npdes/stormwater

http://www.dec.ny.gov/chemical/8468.html

CONTRACTED ENTITY CERTIFICATION

_____

(CORPORATION NAME)

(COMPLIANCE WITH NEW YORK STATE MS4 GENERAL PERMIT GP-0-08-002)

Contracted Entity Certification Statement:

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the NYSOMH-Cook Chill PC's stormwater management program and agree to implement any corrective actions identified by the NYSOMH-Cook Chill PC or a representative. I also understand that the NYSOMH-Cook Chill PC must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from the Municipal Separate Storm Sewer Systems ("MS4s") and that it is unlawful for any person to directly or indirectly cause or contribute to a violation of water quality standards. Further, I understand that any noncompliance by NYSOMH-Cook Chill PC will not diminish, eliminate, or lessen my own liability."

Corporation Name: _____

Address: _____

Phone Number: _____

Name of Person signing the Certification: _____

Title: _____

Signature: _____

Date: _____

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Contractor’s Submittal Schedule, apply to this section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in the Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Sections:
   1. Section 013300 – Submittal Procedure, for product submittals.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work of the Contract and purchased new for the Project. The term "product" includes the terms "material," "equipment," and "system."

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Procurement Exemption Approval Product Specification: A specification in which a specific manufacturer's product is named including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes as a single source or sole source provider.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" from Article 5, Section 5.04 of the General Conditions.
2. Design Professional's Action: If necessary, the Design Professional will request additional information or documentation for evaluation within one week of receipt of a comparable product request. The Design Professional will notify the Contractor through the Owner of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 013300 - Submittal Procedure.
    b. Use product specified if the Design Professional does not issue a decision on use of a comparable product request within time allocated.

B. Procurement Exemption Approval Product Specification Submittal: Comply with requirements in Section 013300 - Submittal Procedure. Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If the Contractor is given option of selecting between two or more products for use on the Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, the Design Professional will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at the Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger the Project structure.
3. Store products that are subject to damage by the elements under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic protected from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to the Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for the Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Refer to individual specification sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 013300 – Submittal Procedure.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. The Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," the Design Professional will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Provide products that do not contain asbestos.

B. Product Selection Procedures:

1. Product: Where Specifications include a procurement exemption approval and name a single source, sole source, manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for the Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications include a procurement exemption approval and name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for the Contractor's convenience will not be considered.
3. Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

C. Visual Matching Specification: Where Specifications require "match sample", provide a product that complies with requirements and matches sample. The Owner's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's full range", select a product that complies with requirements. The Design Professional will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: The Design Professional will consider the Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, the Design Professional may return requests without action, except to record noncompliance with these requirements:

1. Action Submittal shall be provided in accordance with Submittal Procedures within 60 days after Notice to Proceed.
2. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
3. Detailed comparison of qualities of proposed product with those named in the Specifications, including attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
4. Evidence that proposed product provides specified warranty.
5. List of similar installations for completed projects with project names and addresses and names and addresses of design professionals and owners, if requested.
6. Samples, if requested.

B. Comparable Products Costs: Any costs savings to an approved Comparable Product identified and realized by the Contractor shall be shared equal between the Owner (50%) and Contractor (50%).

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Responsibility: Each Contractor is responsible for the cutting and patching to permit installation or performance of Work of their contract.

C. Related Sections include the following:

1. Individual Specification Sections.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of Work of the contract.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of Work of the contract.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: At each occurrence, describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be

relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Design Professional's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety.

C. Fire Rated Elements: Do not cut and patch fire rated elements (i.e. floors, walls, roofs, shafts, etc.) in a manner that results in reducing their capacity to perform as intended or that results in decreased fire rating.

D. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

E. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Design Professional's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

F. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including other trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials, unless specified otherwise in other Sections.

C. Fire Rated Elements: Provide firestopping products/systems specified in system design listings by approved testing agencies that conform to the construction type, penetrating item, annular space requirements and fire rating involved in each separate assembly. Refer to applicable Individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting or patching to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface

containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

6. Fire Rated Elements: Install firestopping systems to comply with applicable Individual Specification Sections and firestopping manufacturer's written installation instructions and published drawings for products and applications.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017700 – CONTRACT CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Notice of Substantial Completion (NOSC) Form, apply to this section.

1.2 SUMMARY

A. Section includes administrative requirements for preparation and submission of final Contract Closeout Documents, including, but not limited to, the following:

1. Contract Closeout Meeting
2. Notice of Substantial Completion (NOSC) Requirements
    a. List of Incomplete Work Items
    b. Contract Turnover Documents
        1) As-built Drawings
        2) As-built Specifications
        3) As-built Schedule
        4) Permits, Licenses and Certificates
        5) Commissioning Authority's Deficiency Log
    c. General Guarantee
    d. Operation and Maintenance Manuals
3. Contract Closeout
4. Final Cleaning

B. Related Sections:

1. General Conditions, Article 8 – Payment
2. General Conditions, Article 13 – Inspection and Acceptance
3. Section 014000 – Quality and Code Requirements
4. Section 017823 – Operation and Maintenance Manuals
5. Section 017839 – As-built Documents

1.3 CONTRACT CLOSEOUT Meeting

A. Contract Closeout Meeting: The Owner will schedule and conduct a Contract closeout meeting, at a time convenient to the Owner and Design Professional, but no later than sixty (60) days prior to the scheduled inspection date for Substantial Completion.

1. The Owner will conduct the meeting to review requirements and responsibilities related to Contract closeout.
2. Attendees: Representatives of the Owner, testing agency, commissioning authority, Design Professional**,** and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to make binding decisions on matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Contract closeout, including the following:

    a. Status of Contract Turnover Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Requirements for submitting final operation and maintenance manual.
    d. Requirements for Permits, Licenses and Certificates.
    e. Preparation of Contractor's list of incomplete Work items.
    f. Procedures for processing Application for Payment at Substantial Completion and final payment.
    g. Submittal procedure.
    h. Responsibility for removing temporary facilities and controls.

4. Minutes: The Owner or Design Professional will record and distribute meeting minutes.

1.4 NOTICE OF SUBSTANTIAL COMPLETION (NOSC)

A. Substantial Completion: After the Work of the Contract is determined by the Owner, to be at Substantial Completion, the Contractor shall submit a written request to the Owner for a date of inspection. The date of Substantial Completion establishes the start of the guarantee period.

B. Documentation: The Notice of Substantial Completion (NOSC) form shall be executed at the end of inspection documenting incomplete Work items and submission of documents in accordance with this section that includes but is not limited to:

    a. Preparation of a list of Work to be completed and corrected, the value of Work items on the list, and completion date of each Work item.
    b. Submittal of contract turnover documents.
    c. Submittal of operation and maintenance manuals, testing, adjustment and balance records.
    d. Delivery of tools, spare parts, extra materials, and similar items to location designated by the Owner. Label with manufacturer's name and model number where applicable.
    e. Make final changeover of permanent locks and deliver keys to the Owner. Advise the Owner of changeover.
    f. Termination and removal of temporary facilities from Project site, along with mockups, construction tools, and similar elements.
    g. Completion of final cleaning requirements.

C. SAMPLE FORM - NOTICE OF SUBSTANTIAL COMPLETION

DORMITORY AUTHORITY – STATE OF NEW YORK

NOTICE OF SUBSTANTIAL COMPLETION

INSTITUTION:		CONTRACTOR:	
PROJECT TITLE:		CONTRACT NO:	
PROJECT NO:	9999	CONTRACT VALUE:	

With exception of the list of incomplete Work and status of Contract Turnover Documents, the Dormitory Authority accepts the Work of the Contract Documents as Substantial Completion on (date) _____, in accordance with the General Conditions. This date also constitutes start of the guarantee period.

ITEM	LIST OF INCOMPLETE WORK	SCHEDULED COMPLETION DATE
1.		
2.		
3.		
4.		
5.		
6.		

NOTE: Attach additional pages if necessary.

STATUS of CONTRACT TURNOVER DOCUMENTS:	PROVIDED YES	DUE DATE	Not Applicable
As-built drawings & specifications transmitted to Design Professional	☐		☐
Certified As-built schedule transmitted to Owner	☐		☐
Sustainable documentation submitted to Owner	☐		☐
Permits, licenses and certificates submitted to Authority having jurisdiction	☐		☐
Hazard waste documentation approved by Owner	☐		☐
Operation and maintenance manual submitted to Owner in final form	☐		☐
Spare products stock stored on site per Owner's direction	☐		☐
Identify any other Contract specific turnover document	☐		☐
Identify any other Contract specific turnover document	☐		☐
Final cleaning	☐		☐

Acknowledged by the Contractor (signature& title)	Email Address	Date
Recommended by the Design Professional (signature & title)	Email Address	Date
Recommended by the Project Manager (signature)		Date
Approved by the Director/Chief (signature)		Date

Distribution by PM:
Contractor
Design Professional
Facility Representative

Distribution by PA:
Code Compliance Unit
Risk Management
Procurement Contract File (original)

NOTICE OF SUBSTANTIAL COMPLETION
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1.5 LIST OF INCOMPLETE ITEMS

A. Organization of List: Submit list of incomplete items in *EXCEL* spreadsheet electronic format. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
2. Include the following information at the top of each page:

a. Project name & number.
b. Date.
c. Name of Contractor & Contract number.
d. Page number.

B. Reinspection: Submit a written request for reinspection. On receipt of request, the Owner will either proceed with inspection or notify the Contractor of unfulfilled requirements. After inspection, the Owner will notify the Contractor of items, either on the Contractor's list or additional items identified, that must be completed or corrected.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis to proceed with commencement of Contract Closeout Documents.

1.6 CONTRACT TURNOVER DOCUMENTS

A. Procedure: Contract turnover documents shall be transmitted to the Owner or if stated to the Design Professional, fifteen (15) days prior to requesting inspection date for Substantial Completion.

B. As-built Drawings: Transmit one paper copy set of marked-up As-built Drawings to the Design Professional, with copy of transmittal to Owner. Print each Drawing, whether or not changes and additional information were recorded.

C. As-built Specifications: Transmit one paper copy set of marked-up as-built specifications, including addenda and contract modifications to the Design Professional, with copy of transmittal to Owner.

D. As-built Schedule: Submit one electronic (PDF) copy, certified by the Contractor, of the schedule that reflects the exact manner in which the project was actually constructed, to the Owner.

E. Permits, Licenses and Certificates Documents: Submit one copy of original permits, licenses, certifications, inspection reports, material certificates/affidavits, approvals, and related documents required by authorities having jurisdiction to obtain Letter of Completion, Certificate of Occupancy, or Code Compliance Certificate. Coordinate and respond to requirements from

the Owner, and all other authorities having jurisdiction for issuance of approval/documents required for the Owner use and occupancy.

1. Cooperate and help coordinate with agency testing materials as specified in Section 014000 – Quality and Code Requirements. Testing Agency is required to submit final report of special inspections.
2. The Contractor to provide one copy of original certification from agency or firm certifying the following and as required by Individual Specification Sections:
   a. Electrical – Certification Form from;
      1) Authority having jurisdiction
      2) Independent electrical inspection agency acceptable to the Owner

F. Miscellaneous Record Submittals: Refer to Individual Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one electronic (PDF) copy of each submittal.

G. Reports: Submit written report indicating items incorporated in Contract Documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

1.7 GUARANTEE

A. General Guarantee: Comply with General Conditions, Article 13 – Inspection and Acceptance. The date established on the Notice of Substantial Completion form constitutes commencement of the Guarantee period.

1.8 OPERATION AND MAINTENANCE MANUALS

A. Final Manuals Submittal: Submit an electronic copy of a compiled set of complete Operation and Maintenance Manuals in final form as indicated in Section 017823 – Operation and Maintenance Manuals, to the Owner fifteen (15) days prior to requesting date of inspection for Substantial Completion.

1.9 CONTRACT CLOSEOUT (same as final application for payment)

A. Contract Compliance: The Contractor shall comply with the requirements of General Conditions, Section 10.08 – Limitations on Actions.

B. Preliminary Procedure: All Work and Extra Work of the Contract and requirements of this section must be complete and approved prior to commencement of Contract closeout.

1. The Contractor shall request and submit to the Owner a final Contractor's Pencil Copy billing request that will formulate the final Application for Payment.
2. The Contractor shall provide outstanding documentation to the Owner in accordance with General Conditions, Article 20 – Opportunity Programs.

C. Procedures: Upon the Owner's approval of the Contractor's Pencil Copy billing request, Contract closeout documents will be provided to the Contractor. The Contractor shall complete each document and submit all documents with original signature & notary as indicated on forms, the following:

1. Final Application for Payment that includes remaining Retainage.
2. Final Compliance Report.
3. Contractor and Subcontractor Certifications Form.
4. Contractor's Certified Payroll Form.
5. Release Form -- Final Payment to Contractor.
6. Consent of Surety -- Final Payment to Contractor, with power of attorney.

D. Payroll Forms: The Contractor and all Sub-contractors to the Contractor shall submit original copies of the Contractor and Subcontractor Certifications Form and Contractor's Certified Payroll Form.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with allowable VOC levels.

PART 3 - EXECUTION

3.1 DEMOBILIZATION

A. Deliver tools, spare parts, extra materials, and similar items to location designated by the Owner. Label with manufacturer's name and model number where applicable.

B. Make final changeover of permanent locks and deliver keys to the Owner. Advise the Owner's personnel of changeover.

C. Terminate and remove temporary facilities from the Project site, along with mockups, construction tools, and similar elements.

3.2 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for contract turnover document purposes. Post changes and modifications to contract turnover documents as they occur; do not wait until the end of the Project.

B. Maintenance of Turnover Documents and Samples: Store turnover documents and Samples in the field office apart from the Contract Documents used for construction. Contract turnover documents shall not be used for construction purposes. Maintain turnover documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to contract turnover documents for the Owner’s reference during normal working hours during performance of Contract.

3.3 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations as applies to Work of the contract.
   a. Remove tools, construction equipment, machinery, and surplus material from Project site.
   b. Remove debris and surface dust from installed equipment and devices.
   c. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

      1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

   d. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   e. Leave Project clean and ready for occupancy.

END OF SECTION 017800

SECTION 017823 - OPERATION AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections and Contractor's Submission Schedule, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance manual for systems, subsystems, and equipment.
2. Product maintenance data.
3. Systems and equipment maintenance data.

B. Related Sections:

1. Section 013300 – Submittal Procedures
2. Section 017700 – Contract Closeout Requirements
3. Section 019113 – General Commissioning Requirements

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Required Manuals: see Section 017700 – Contract Closeout Requirements for additional requirements.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to the Design Professional.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

C.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION, AND MAINTENANCE MANUALS

A. Organization: Organize the manual into separate sections by CSI number based on the table of contents of the project manual, for each system and subsystem, and a separate section for each piece of equipment not part of a system. The manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents:

a. Operation data.
b. Product maintenance data.
c. Systems and equipment data

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Design Professional.
8. Name and contact information for Commissioning Agent.
9. Names and contact information for major consultants to the Design Professional that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one media volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents by CSI Section number and then by system, subsystem, and equipment. .

E. Manuals, Electronic Copy: Submit electronic (PDF) copy of the manual, to the Design Professional, concurrent with Action Submittal.

2.2 OPERATION DATA

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Section and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.
3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.
9. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE DATA

A. Content: Organize data into a separate section, within the O & M Manual, for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in section identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Guarantees: Include copies of warranties and guarantees lists of circumstances and conditions that would affect validity of warranties.

1. Include procedures to follow and required notifications for warranty claims.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE DATA

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures,

maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in a separate section within the O & M Manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties: Include copies of warranties and lists of circumstances and conditions that would affect validity of warranties.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation shall be provided for review, concurrent, with Action Submittal specified in Individual Specification Section.

1. Correct or modify the manual to comply with the Design Professional’s and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Design Professional’s and Commissioning Authority's comments and prior to commencing demonstration and training.

B. Product Maintenance Data: Assemble a complete set of maintenance data, in a separate section, within the O & M Manual, indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Data: Assemble a complete set of operation and maintenance data, in a separate section, within the O & M Manual, indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate section within the O & M Manual, for each system and subsystem, in the form of an instructional manual for use by operating personnel.

D. Manufacturers' Data: Where manual contain manufacturers' standard printed data; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in As-built Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

END OF SECTION 017823

SECTION 017839 – AS BUILT DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Documents, including but not limited to, the Drawings and Individual Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for As-built documents, including the following:

1. As-built Drawings
2. As-built Specifications
3. As-built Schedule
4. Record Product Data
5. Miscellaneous record submittals

B. Related Sections:

1. Section 013200 – Construction Progress Documentation
2. Section 013300 – Submittal Procedure; Required Submittal List
3. Section 017700 – Contract Closeout Requirements
4. Section 017823 – Operation and Maintenance Manuals

1.3 CLOSEOUT SUBMITTALS

A. Required Documents: Section 017700 – Contract Closeout Requirements, describes administrative requirements for submission, number and type of copies required for contract closeout requirements.

PART 2 - PRODUCTS

2.1 AS-BUILT DRAWINGS

A. As-built Drawings: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings onsite. Review As-built Drawings and shop drawings monthly with the Owner, for approval.

1. Preparation: Daily mark As-built Drawings to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained

record data, whether individual or entity is installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up As-built Drawings.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Revisions to routing of piping and conduits.
d. Revisions to electrical circuitry.
e. Actual equipment locations.
f. Duct size and routing.
g. Locations of concealed internal utilities.
h. Changes made by Change Order.
i. Changes made by Bulletin.
j. Changes made following the Owner's written orders.
k. Details not on the original Contract Drawings.
l. Field records for variable and concealed conditions.
m. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up as-built prints.
4. Mark as-built sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 AS-BUILT SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.

5. Note related Change Orders, record Product Data, and turnover Drawings where applicable.

2.3 AS-BUILT SCHEDULE

A. Final Schedule: Submit to the Owner a final schedule update. The As-built Schedule shall reflect the exact manner in which the project was actually constructed including actual start and finish dates, activities, sequences and logic.

1. The Contractor shall certify the final schedule update as being a true reflection of the way the project was actually constructed.

2.4 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to the Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, As-built Specifications, and As-built Drawings where applicable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by Individual Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Maintain Change Log: Maintain and submit written change log to the Owner, monthly for review indicating items incorporated in contract turnover documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

B. Recording: Maintain one copy of each submittal during the construction period for contract turnover document purposes. Post changes and modifications to contract turnover documents as they occur; do not wait until the end of the Project.

C. Maintenance of Turnover Documents and Samples: Store turnover documents and Samples in the field office apart from the Contract Documents used for construction. Contract turnover documents are not to be used for construction purposes. Maintain turnover documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to contract turnover documents for the Owner's reference during normal working hours during performance of Contract.

END OF SECTION 017839

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.1. SUMMARY

A. The systems installed under Divisions 22, 23 and 26, as well as pieces of equipment provided under other Divisions that connect to or interface with the systems of Division 22, 23 and 26 will be evaluated, started, and tested (commissioned) to ensure that each performs per the intent of the design and/or representations made relative to performance, efficiency, and suitability for application in this project.

B. Owner will employ an independent Commissioning Authority (CA). The CA is an independent and knowledgeable third party, hired to verify that the systems work as per the design intent and provide the requirements of the commissioning responsibilities as designated in this specification. The CA will inform the Owner of the results of the commissioning, and provide suggestions, as necessary, to correct deficiencies in observed performance or installation.

Commissioning Objectives

Commissioning is intended to achieve the following specific objectives:

1. The Owner will ultimately inherit a building that is designed to meet the needs of the user and is built and functions as designed.
2. Systems performance expectations are clearly established.
3. The users, project managers, operating personnel, contractors and designers will be protected from any dislocation created by the fragmented corrections and undocumented deficiencies.
4. Corrective actions will be made in a manner that will not compromise long-term utilization or operating expense.
5. The Owner’s operating personnel will have the integrated system training needed to confidently operate and maintain the systems.

C. The CA will be employed directly by the Owner or Owner’s Representative to perform commissioning duties. Sections 220800, 230800 and 260800 outline the specific commissioning responsibilities of each Contractor for that division, and also obligate the General Contractor/Construction Manager to coordinate and manage the commissioning responsibilities of those subcontractors.

1. This section of the specification describes the process for commissioning and defines the responsibilities of the construction team, including the Construction Manager.
2. The commissioning process shall be applied to all equipment, components, and systems as listed in this section, including specific interfaces to and from equipment and systems provided under separate contracts.
3. Building Commissioning work is a joint team effort to ensure that all systems function together properly to meet the design intent, and to document system performance parameters for fine-tuning of control sequences and operations procedures. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, training, and performance testing. This section does not supersede other requirements of the specifications. It may, though, expand on some of them.

4. Complementary to the Contractor’s responsibility to commission the building systems, it should be noted that an Owner's CA will be involved. This Owner's CA will provide equipment-systems installation inspection and performance verification. **These Owner's verifications will be a prerequisite to final equipment and systems acceptance by the Owner as per design documents.** It should be emphasized that this Owner's systems verification does not negate the Contractor’s obligations to fully commission the building systems or relieve them of any contractual obligations. The Contractor's personnel shall be made available to execute all aspects of the Commissioning Process until the Owner and the Engineer of Record accept the final results. Commissioning Program tasks and meetings may be repeated until the Owner and the Engineer of Record are satisfied and will not be fixed as one time, one chance events for the Contractor.
5. The Owner's CA will verify equipment-systems installation and performance after the Contractor provides written notice that the building equipment and systems have been completed, tested and are fully operational. Upon this notification, Owner's CA will verify the installation and performance of the equipment and system(s). If corrections are required after the initial verification, the Owner's CA will provide one (1) additional installation and performance verification. Subsequent installation and performance verifications will be at the Contractor’s expense. The Contractor is responsible for all systems and equipment until final acceptance by both the Engineer of Record and the Owner. All guarantees and warranties shall not begin until final acceptance by both the Engineer of Record and the Owner.

1.2. CONSTRUCTION TEAM RESPONSIBILITIES

A. Within four (4) weeks of the award of the contract, the Mechanical, Plumbing and Electrical Contractors shall submit the names of the Project Manager who will be the commissioning coordinator for this project, as well as the names, addresses, phone numbers and qualifications of subcontractors’ representatives and factory trained manufacturers’ representatives for all equipment and systems required to participate in the commissioning process as specified in this Section.

B. Each Contractor, and all his sub-trades and suppliers, shall cooperate with the CA in carrying out the commissioning process. In this context, each Contractor shall:

1. Provide equipment and systems start-up as specified.
2. Operate equipment and systems as required for initial systems operations and for final functional performance tests as they are performed by the CA, including the on-site participation of approved factory trained manufacturer’s representatives for equipment.
3. Attend commissioning meetings, and attend to action items arising from them, as required to allow the commissioning process to proceed on schedule.
4. Provide instruction and demonstrations for the Owner's designated operating staff, in conjunction with the CA, in order to meet all specified training requirements in this regard.
5. The Contractors shall make any and all necessary corrections to systems, equipment, O & M manuals, as built drawings, and procedures as necessary to meet the design intent, contract documents, or performance requirements if errors are discovered during the commissioning process.
6. The Contractors shall supply all necessary documentation, such as shop drawings, submittal data, maintenance manuals, etc., required for equipment and systems to the CA for preparation of the commissioning plan, checklists, and functional performance plans.

7. The Contractors shall provide the required names, addresses and qualifications of all specified Manufacturer's Representatives to participate in the commissioning process prior to the initial commissioning meeting.
8. Subsequent installation and performance verifications, made necessary due to required corrections after initial verification, shall be at the respective Contractor's expense.

C. Each Contractor shall provide to the CA three (3) copies of the following items as soon as they become available:

1. Construction schedule, including sub-schedules and milestones for all major mechanical and electrical equipment. (i.e. boilers, motor control center, air handlers, generators, VAV boxes, etc.)
2. Certified and approved start-up and testing reports for all subsystem equipment that comprise the System.
3. Control schematics and sequences of operation for the total system and all subsystems.
4. Records of required inspections for code compliance, and documentation of approved permits and licenses to operate components of the System.
5. Operating data which shall include all necessary instructions to the Owner's operating staff in order to operate the system to specified performance standards.
6. Maintenance data which shall include all necessary information required to maintain all equipment in continuous operation, such as the testing, balancing and adjusting report and the as-built drawings.
7. Written notices that building equipment and systems have been completed, tested, and are fully operational. At the discretion of the CA, this may be the completed pre-functional checklist by the contractor.
8. Checklist of all submitted contract deliverables, such as manuals, spare parts, training, documentation, etc.

1.3. COMMISSIONING TEAM MEMBERS

The members of the commissioning team consist of the CA and support staff, Project Managers (PM), and Maintenance & Operating staff, assigned members of the construction manager (CM), the design team (A/E) (particularly the mechanical / electrical engineer), Testing and Balancing Contractor (TAB), Primary trades and other installing subcontractors or suppliers of equipment (Subs).

1. Commissioning Authority
2. Operations Staff
3. Construction Manager
4. Architectural and Engineering Design Team
5. HVAC Contractor
6. Control's Contractor
7. Testing and balancing Contractor
8. Plumbing Contractor
9. Electrical Contractor
10. Selected Equipment Manufacturers

1.4. CONSTRUCTION MANAGER'S RESPONSIBILITY

A. Cooperate with the CA personnel, provide access to work, and provide adequate time in the work for commissioning tasks.

B. Include the cost for commissioning requirements of construction manager in the contract price.

C. Ensure cooperation between the subcontractors and the commissioning team

D. Attend commissioning specific pre-construction, planning and testing meetings. Provide input into the master scheduling process with regard to the timing and duration of the commissioning activities.

E. Work with the Owner and the CA to schedule each training session with the appropriate O&M personnel.

F. Provide written documentation that the systems are complete and ready for functional testing verification.

G. Correct all Contractor related deficiencies identified during any stage of the commissioning process.

H. Furnish copies of all shop drawings, manufacturers' literature, maintenance information, or other information as may be requested.

I. Provide qualified personnel for assistance to complete the commissioning tests, including seasonal testing.

J. Coordinate the trades as per the CA's testing and pre-testing responsibilities.

K. Provide training with the assistance of the CA as outlined in Divisions 22, 23 and 26.

L. Provide to the CA all proprietary test equipment required by manufacturers to test their equipment.

M. Provide casual labor and facilities:

1. To provide access to work to be tested.
2. For CA's exclusive use, for storage of instruments and drawings, and preparation of daily reports.

N. The CM shall provide a qualified individual to function as the MEP Coordinator to coordinate the Commissioning Program with the CA for those systems included in Divisions 22, 23 and 26.

O. The CM shall execute the Commissioning Program, through organization of all meetings, tests, demonstrations, training events, and performance verifications described in the Contract Documents and approved Commissioning Program. Organizational responsibilities include preparation of agendas, attendance lists, arrangements for facilities and timely notification to participants for each Commissioning event.

P. The CM, MEP Coordinator and all Subcontractors shall review the plans and specifications with respect to the completeness in all areas relating to the Commissioning Program. This includes ensuring that there are adequate items included in the design to ensure the ability to properly test, balance, and adjust the systems and to document the performance of each piece of equipment and each system. Any items that are required for Commissioning but not shown shall be brought to the attention of the CA and Engineer of Record (ER) prior to submittal of shop drawings. Likewise, any items that are required for Commissioning but not installed shall be provided at no additional cost to the project as per design intent.

Q. The CM shall schedule a Pre-Commissioning Coordination Meeting within 90 days of the award of the contract, at the site and at a time suitable to all parties. This Pre-Commissioning Meeting will be for the purpose of reviewing the complete Commissioning Program and establishing tentative schedules for Maintenance Orientation and inspections, O & M submittals, training sessions, system flushing and testing, job completion, system startup, and test, adjust and balance work.

R. The CM and Coordinator will review and all functional performance tests, results, and documentation required by the contract documents, for all equipment and systems, as performed by subcontractors, vendors, etc. Develop schedules for all testing, integrate testing into the master construction activity schedule, and fully coordinate all subcontractors testing as required.

S. The CM and Coordinator shall submit Systems Testing Documentation Forms, schedules, and other commissioning documentation using the shop drawing submittal process, for approval by the ER and CA six months prior to starting any testing required by Divisions 22, 23 and 26. The Owner, ER and CA reserve the right to require changes in the personnel assigned at any time to maintain quality assurance within the Commissioning Program at no additional cost to the project.

T. The CM shall coordinate directly with each subcontractor on the project specific to their responsibilities and contractual obligations. All contractors shall provide qualified personnel for participation in systems tests, including seasonal testing required after the initial testing.

U. The CM, MEP Coordinator and all Subcontractors shall provide technical expertise to oversee, direct, and implement the correction of deficiencies found during the commissioning process. Observe the start-up and initial testing of equipment by the Contactor and Subcontractors and then all final HVAC, building automation, electrical, etc. The Contractor's personnel shall be made available to execute all aspects of the Commissioning Program until the ER and Owner accepts the final results. Commissioning Program tasks and meetings may be repeated until the ER and CA are satisfied and will not be fixed as one-time, one-chance events for the Contractor.

V. Note any inconsistencies or deficiencies in system operations and enforce system compliance or recommend to the ER modifications to system design which will improve system performance.

W. The CM shall coordinate through the Owner, CA and ER testing participation. When performance tests, results, and forms of documentation required by the contract documents are completed by the MEP Coordinator, the Owner, ER, and CA shall be notified. After such time, the CA will conduct systems performance verification.

X. In the event that a performance verification test by the CA fails, the cause of failure shall be determined by the CM and rectified as soon as possible, and then re-tested.

Y. The CM shall assemble all record drawings and all records of Code authority inspections and approvals. The CM and MEP Coordinator shall review operation and maintenance information and as-built drawings and obtain all documentation from tests and assemble a final submittal to the ER, Owner, and CA for approval. The CM shall document warranty start and dates.

Z. The CM shall oversee and/or provide training for the systems specified in Divisions 22, 23 and 26.

1.5. COMMISSIONING AUTHORITY'S DUTIES

A. The CA is contracted directly with the Owner's representative.

B. The CA shall develop and submit a detailed commissioning plan that would include all system testing requirements including, pre-functional and functional testing sheets, responsibilities, O&M manual and training requirements and forms.

C. The CA shall execute the Commissioning Program, through organization of all meetings, tests, demonstrations, performance verification as described within.

D. The CA shall be responsible for developing Pre-functional and Functional test procedures for all equipment and systems. Test procedures shall be in accordance with the manufacturer's recommendations, and shall fully describe the system configurations and tests for each component and system. Each test procedures shall include: specific criteria to be tested for; measured test results verses design requirements; pre-functional test sheets; approved submittal; and Contractor required testing.

E. The CA shall develop and maintain the commissioning schedule that shall be updated during each commissioning meeting. The commissioning schedule shall be a copy of the General Contractor/Construction Manager schedule.

F. The CA shall review all shop drawings, coordination drawings and submittals for completeness, accuracy and operational accessibility. All deficiencies shall be documented and submitted to the engineer for review.

G. The CA shall coordinate directly with the CM during the commissioning meetings (and the subcontractors) to develop the commissioning requirements and schedules. All Contractors shall provide qualified personnel for participation in the system tests, including seasonal testing.

H. At their discretion, the CA shall witness all Contractor required testing including; piping hydrostatic and duct leakage tests. The Contractors shall be responsible for coordinating these tests with the CA.

I. At their discretion, the CA shall participate in any factory testing (i.e. Air-handling factory testing) as identified by the Owner. The CA shall coordinate any factory testing with the subcontractors and the CM.

J. The CA shall review the record drawings and "as-built" documentation for clarity and accuracy. Any discrepancies identified during this review shall be documented and shall be returned for resubmission.

K. The CA shall review, if appropriate, all operational and maintenance manuals for pre-approval prior to submission to the Engineer. Any discrepancies identified during this review shall be documentation and returned to the Contractors for resubmission.

L. The CA will perform regular construction installation inspections during the construction timetable and include any identified deficiencies in the regular commissioning meetings. These items shall be reviewed and discussed during the commissioning meeting.

M. The CA shall participate in the TAB process and perform random sampling of air and water testing to ensure completeness of services.

N. The CA shall work with the control's Contractor to perform a point-to-point verification of the building's automation system once the control's Contractor submits in writing that their point-to-point is complete.

O. The CA shall cooperate with Architect and Contractor; provide qualified personnel when scheduled.

P. The CA shall promptly notify Architect and Contractor of irregularities or deficiencies of work, which are observed during performance of services.

Q. The CA will test all systems as defined in the Commissioning Plan and the written functional test procedures.

R. The CA shall work directly with the Owner's Representative and Commissioning Team to provide resolution of deficiencies and provide recommendations to the team.

S. The CA is not authorized to:

1. Release, revoke, alter, or expand requirements of Contract Documents.
2. Approve or accept any portion of work.
3. Perform any duties of the Contractor.

1.6. SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned for this project:

The BMS system, components and associated upgrade work to be commissioned includes as applicable, central processing/monitoring hardware and software, communications/alarm function, user interface with the BMS system, control functions required for facility operation, local control panels, equipment actuators and controls, and individual monitored points. **Twenty percent (20%)** of the equipment that is associated with the upgrade will be selected for commissioning. The following commissioning checks and tests include:

1. Verification checks of BMS interface with equipment, subsystems & systems
    a) Documentation checks: verify specifications, submittals, TAB report, pre-commissioning report, as-built drawings, and training implementation.
    b) Controls Hardware Installation & Set-up – Network, controllers, conduit and wiring checks: verify nameplate data and installed characteristics; verify system is operational.
    c) Sensors and Controlled Devices - Sensors, actuators, valves and dampers; verify I/O points set-up; verify nameplate data and installed characteristics; verify sensor calibrations; verify actuator, valve and damper functionality.
    d) Controls Software Installation & Programming: verify software installation and installed capabilities such as the operator graphical interface, scheduling set-up, trending set-up, alarm set-up and standard reports.

2. Functional tests of the BMS system control functions
    a) Software functionality tests (i.e. verify device/system responses through the user interface).
    b) Testing Sequences of Operation: Systems will be tested in all modes of operation. Possible tests include: start/stop (on/off); schedule (scheduled start/stop, optimum start/stop [includes warm-up and cool-down], unoccupied setback [includes night purge]; lead/lag (includes runtime and equipment failure); staging; reset (including setpoint change, control by flow and speed control); safeties; economizer; life safety interface; power failure. NOTE: Testing will verify sequences as programmed, but will NOT optimize sequences.

3. Any fire dampers, combination fire/smoke dampers and smoke dampers will be commissioned, if applicable.

PART 2 - COMMISSIONING PROTOCOLS

2.1 PRE-FUNCTIONAL TEST SHEETS

A. Pre-functional checklists are important to ensure that the equipment and systems are installed and started up as per the design documents and the manufacturer's start-up procedures. The CA develops the pre-functional test sheets (checklists) for each system and component to be commissioned. **The Contractor then fills out the pre-functional test sheets, and submits it for review.** The pre-functional test sheets and check-out by the CA is a parallel activity, and does not relieve the Contractors from their duties of verifying system installation and proper system start-up. The CA will share the test sheets with the Contractors for their review (if necessary). Once pre-functional test sheets are signed-off by the CA, functional performance testing may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout by the CA. In general, the pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

B. Pre-functional checklists (or Testing Abstracts) are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word pre-functional refers to before functional testing. Pre-functional checklists augment and are combined with the manufacturer's start-up checklist.

2.2 FUNCTIONAL PERFORMANCE VERIFICATION

A. Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just individual components) under full, part and seasonal requirements. Systems are tested under various loads and control sequences, such as low cooling and heating loads, component failures, unoccupied modes, etc. The systems are run through all the control sequences of operation and components are verified to be responding as the design intent and documents. Functional performance verification shall include; testing all sequences of operations, verification of system capacity, generating simulated signals to simulate sensor values, conducting simulated conditions to tests all loads and verify system performance during all conditions of operation and verifying design intent. In addition, each system shall be tested through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Proper responses, such as power failures, freeze conditions, low-oil pressures, equipment failures, etc., shall also be tested. The CA develops the functional test sheets and procedures in sequential written form, coordinates the testing, conducts the testing and documents the testing. Each Contractor is required is supply personnel to assist during the functional performance testing where applicable.

B. No system, equipment or component thereof shall be tested until the Contractor and the CM has certified, in writing, that the system, equipment and / or components are complete, have been tested, adjusted and balanced and are ready for validating and performance testing. FPV is scheduled by the CA after the pre-functional testing requirements are complete and signed-off

by the CM and the CA. FPV will not be conducted until a written notice of completion by the CM confirming that the system is ready for FPV. The air balancing and water balancing must be complete and the controls must be debugged prior to the performance verification.

C. If sampling strategies are utilized for functional performance testing of monitored terminal equipment, then trend logging must be employed post occupancy to demonstrate functional performance of all remaining non-sample group terminal equipment. Typical sampling percentages for monitored and non-monitored terminal equipment is 20%-25%. If a functionality failure rate of greater than 15% occurs within the sampling group commissioned, then the CxA shall notify the responsible contractor(s) to reconfirm functionality of all terminal equipment, and notify Owner with recommendation to commission additional 20%-25% sampling group(s).

D. Deferred Testing. The Contractor shall be available to assist in seasonal testing, tests delayed until weather or other conditions, until building construction is completed, required building occupancy or loading, or other conditions are suitable for the demonstration of equipment or system's performance, as specified. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible. Deferred testing shall be executed, documented and deficiencies corrected as specified herein for functional performance testing. Any adjustments or corrections to the O&M manuals and "As built" documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

2.3 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. The CA shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully. The testing form and any outstanding deficiencies shall be provided to the CM / Owner within two days of test completion. The CA shall review the Contractor's startup testing procedures and reports and shall submit either a non-compliance report or an approval form to the Contractor. The CA shall work with the Contractor and others as necessary, to correct and retest all cost deficiencies or uncompleted items. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report with a Statement of Correction on the original non-compliance report. When all requirements are satisfactorily completed, the CA shall recommend approval of the startup and pre-functional testing of each system and schedule the functional testing of the equipment or system.

B. As functional performance testing progresses and a deficiency is identified, the CA shall discuss the issue with the executing Contractor and the commissioning team.

1. When there is no dispute of the deficiency and the Contractor accepts responsibility for correcting it, the CA shall document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the contractor during the functional performance testing, at the discretion of the CA. Every effort shall be made or expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort.
2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the non-compliance form, certifying that the equipment is ready to be retested, and return the form to the CM. The CM shall sign the form and submit to the CA. The CA shall schedule the retest of the equipment or system involved.

3. If there is a dispute about an identified deficiency, the CA shall document the deficiency and the Contractor's response, and provide a copy to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. When the dispute resolution has been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and returns the form to the CA. The CA shall schedule the retest of the equipment or system involved. Final interpretive authority shall be the A/E. Final acceptance authority shall be the Owner.

C. During the functional performance testing of multiple units of similar equipment, the CA shall test all of the equipment and components that are to be commissioned. If, under such a testing procedure, three or more, identical pieces of equipment (size alone does not constitute difference) fail to perform to the requirements of the Contract Documents (mechanically or substantively) due to manufacturing or installation defects not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CA. In such case, the Contractor shall provide the CA with the following:

1. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CA within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor shall provide the CA and the A/E a signed and dated, written explanation of the problem, cause of failures, etc. and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solution shall not be for less than the specification requirements of the original installation.
3. When approved, two examples of the proposed solution shall be installed by the Contractor and the CA shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the CA shall recommend the acceptance or disapproval of the proposed solution to the Owner.
4. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair all identical items, at their expenses and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week of approval of the proposed solution.
5. Where 15% or more of a group of devices or components have failed, it shall be deemed that the entire group failed and will require retesting once the corrections have been made. The CM shall submit a letter to the CA that the corrections have been made by the Contractor and system can be retested.

D. Cost of Retesting

1. The cost for CA and/or Owner personnel to conduct the retesting of a functional performance testing requirements necessitated because a specific pre-functional or startup test item, reported to have been successfully completed, but found to be incomplete or faulty, shall be the responsibility of the Contractor.
2. For a deficiency identified during the functional testing, not related to any pre-functional checklist or start-up fault, the CA and Owner shall direct the retesting of the equipment once all deficiencies have been rectified. However, all costs for any subsequent retesting shall be the responsibility of the Contractor.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party.

2.4 OPERATION AND MAINTENANCE MANUALS

A. Each Contractor shall submit operational and maintenance manuals to the CA, through the CM, prior to training. The CA reviews the O&M manuals, documentation and redline as-builts for systems that are commissioned to verify compliance with the Specifications. The CA provides written feedback on O&M manuals to the PM. Upon successful review of the corrections, the CA shall recommend approval and acceptance of these sections. The CA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the Architect and Engineers responsibilities according to their contract.

B. The O&M manuals shall be project specific, include all wiring diagrams and interconnections between trades. O&M manuals must meet at minimum the required checklist before acceptance for each component:

1. Must be in a three-ring binder, with table of contents and tabbed sections.
2. Building name, project title, project number, contractor name and contractor project number must appear on both the front cover and the spine of the binder.
3. Provide a copy of the valve tag schedule at the front of the O&M manual
4. Except for minor equipment, provide complete nameplate information at the front of the O&M. Include all data: serial numbers as well as complete motor nameplate data of corresponding equipment.
5. Provide a sheet at the beginning of the O&M listing equipment and the local supplier (with address and phone number) of that specific equipment.
6. For all equipment with warranties in excess of one-year (example VSD's), include extended warranty information in the front of the binder.
7. All information must be project specific. Do not provide generic vendor O&M manuals that cover multiple model numbers of equipment. Edit vendor O&M manuals to reflect exact equipment supplied. Cross out extraneous information not applicable to the specific equipment provided. Highlight applicable information for each piece of equipment installed.
8. For each piece of equipment, provide complete data relative to the make/model number, size, capacity data, manufacturer name and address, accessories included, etc. (i.e., provide complete information that would allow ordering the exact piece of equipment supplied). To accomplish this, include *portions* of the approved submittal for the piece of the equipment submitted. Do not include extraneous submittal information that does not facilitate actually ordering that piece of equipment.
9. If a piece of equipment contains multiple sub-assemblies provided by different manufacturers, include make/model number, size, capacity data, etc., to allow the ordering of the exact replacement. For example: for an air-handling unit, provide information on each coil, filter, damper, fan etc.
10. Job specific, as-built, wiring diagrams, piping diagrams, etc., must be supplied for all equipment. All external connections must be shown on these diagrams. Example #1: for VSD's, terminal strip numbers where external control signal is landed must be indicated. Example #2: A piece of equipment is supplied with controls that interface with the museum DDC system. Wiring diagram must be project specific and indicate interface with the existing DDC system.
11. For all pumps and fans, include performance curves, accessories and motor manufacturer information.

12. For all flow elements (pitot tubes, triple duty valves, circuit setters, etc.) provide all flow curves.
13. For all air-handling systems, include sound power data (normally this was included in the equipment submittal).
14. For all filters, clean and dirty filter drops must be provided.
15. For all electrical equipment sensor calibration and setup requirements must be detailed in the O&M manuals.
16. Provide a list of all manufacturer spare parts for major equipment installed.
17. Provide an approved copy of the air and water balancing reports in the O&M.
18. Provide an as-built copy of the project control drawings in the O&M, along with the installation and maintenance information on individual control components.
19. Provide a copy of the equipment vibration test report in the O&M.
20. For equipment requiring a factory start-up, a start-up report is required for the O&M.

2.5 TRAINING REQUIREMENTS

A. Each Contractor is responsible for the training requirements. The CA shall be responsible for overseeing and approving the content of training the Owner's personnel for the equipment being commissioned. The CA will provide supplemental training if required by the Owner. Owner training and orientation on equipment and systems provided by the Contractor is accomplished in three general steps.

1. Training Plan. After reviewing the specifications, and after interviewing facility staff, the Owner and CA document equipment for which training or orientation will be provided and designate responsible parties. This document lists, among other things, the type and number of trainees, rigor of training desired by the Owner, the primary responsible subcontractor, the trainer's company and columns for tracking training agendas. The Commissioning authority provides this form to the Contractor for reference.
2. Training Syllabus & Agendas. For each piece of equipment or system for which training is provided, the contractor shall develop a Training Syllabus and Agenda for review and approval by the Owner and CA. The syllabus and agenda includes information regarding the scope of training, intended audience, training materials, etc. The training shall include a plan for including in the training session contractors/trainers from different disciplines, when appropriate. For example, the controls contractor may be asked to provide brief training on controls in the same session with the mechanical training for equipment controlled by the building automation system. Approved syllabus and agendas shall be utilized and followed during each training session, with copies provided to each trainee.
3. Training Record. The contractor shall document the training session by means of a signed attendance sheet by both the trainer(s) and the attendees. The trainer checks off subjects covered on the Agenda. When the training is complete, the Contractor provides a copy of the training record, and the trainer's agenda to the Owner and CA. The Owner and CA review the training record and make final approval by signing it. The CA will, as appropriate, witness the training sessions. Where required by other sections of the specifications, the contractor shall video (DVD) the training session and provide to the CA and Owner the final and edited copy of the video for review and acceptance.

2.6 SCHEDULING REQUIREMENTS

A. The As-Built drawings shall be updated to date and reviewed with the CA for approval no more than 45-days after all material is installed and in place.

B. Testing and Start-ups schedules shall be kept up to date. Advise the CA and the Owner (in writing) with a minimum of 3 days prior to commencement.

C. Notify the CA and the Owner with a minimum of 2-weeks prior to the commencement of the TAB work for both the air and the hydronic systems. Follow requirements set forth in section 230800.

D. Conduct a controls meeting as required in 230800 and 260800.

END OF SECTION 019113

Building #144, Cook Chill Production Center
BMS Replacement
DASNY Project No. 3608809999

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

G. Storage or sale of removed items or materials on-site is not permitted.

H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least <**Insert number**> hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 024296 "Historic Removal and Dismantling."

D. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.

2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 02 82 00 - ASBESTOS REMOVAL

PART 1 GENERAL

1.1 SCOPE OF WORK

A. There is no anticipated removal and disposal of asbestos-containing materials (ACMs). If suspect ACM is encountered, notify DASNY and EME immediately. See Appendix A for Asbestos Report for this work.

END OF SECTION 02 82 00

APPENDIX A

ACM Sampling and testing Report

PRE-RENOVATION ENVIRONMENTAL SURVEY

FOR THE

ROCKLAND PSYCHIATRIC CENTER
BUILDING 144
COOK CHILL PRODUCTION CENTER
BMS REPLACEMENT PROJECT
DASNY PROJECT NO. 3608809999

AT

145 OLD ORANGEBURGE ROAD
ORANGEBURG, NY

AUGUST 2021 – REVISION 3

PREPARED FOR:

EME Consulting Engineering Group, LLC
129 West 27th Street
New York, NY

FOR SUBMISSION TO:

Dormitory Authority State of New York (DASNY)
515 Broadway
Albany, NY

PREPARED BY:

325 Gold Street, Suite 701
Brooklyn, NY 11201
p: 646.998.3677

WATTS
ARCHITECTURE &
ENGINEERING

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1.0 – EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

Watts Architecture & Engineering (Watts) was retained by EME Consulting Engineering Group, LLC (EME Group) to perform a pre-renovation survey for asbestos-containing materials (ACM), polychlorinated biphenyls (PCBs) in caulk/sealants, lead-based paint (LBP), mold and universal waste/hazardous waste that may be disturbed during the BMS replacement project in the Cook Chill Production Center (Building 144) at the Rockland Psychiatric Center, located at 145 Old Orangeburg Road, Orangeburg, NY. The purpose of the survey was to determine if any materials that may be disturbed by the project are ACM (greater than 1%), contains PCBs (equal to or greater than 50 ppm), or if LBP, universal waste or mold is present.

Per information provided by EME Group, components including the temperature, humidity and DP sensors in Cook Chill Production Center will be renovated at the Rockland Psychiatric Center. The proposed work will also include limited demolition in the basement mechanical rooms B14 and B19 including removal of insolation valves from low pressure steam supply and return piping serving AHU heating coils and heat exchangers and chilled water supply and chilled water return piping, removal of existing controllers, temperature sensors, pneumatic dampener actuators. Watts reviewed the reports by Adelaide Environmental Health Associates, Inc., dated July 6, 2016, September 28, 2019 and December 6, 2019 as part of our investigation.

Field work was conducted on December 23, 2020, March 26, 2021 and May 13, 2021. During the site visits Watts' personnel investigated areas of the building where proposed work is scheduled to be performed.

The field survey work conducted by Watts' personnel included the following:

- Review of the scope of work as described by EME Group. The EME Group Pre-Schematic Report, Revision 1, dated August 13, 2020 and the demolition plans dated May 11, 2021 prepared by EME Group was used as the basis for the investigation.
- A visual site inspection to identify suspect ACM, PCBs, LBP, mold and universal waste in the areas that were identified to be within the project limits.
- Collection and laboratory analysis of bulk samples for asbestos from identified suspect materials within the project limits for laboratory analysis.
- Documentation of suspect ACM bulk sample locations on drawings and chain-of-custody forms; and
- Photographs.

Building 144 is a single-story building with a basement built in approximately 1992. In general, the walls consist of CMU with some drywall partitions. The flooring is a mixture of concrete and floor tile. There is suspended ceiling tile throughout the building.

Field work conducted on December 23, 2020 was performed by Watts' employee Naseem Khan, a certified NYSDOL Asbestos Inspector (certification 01-03166) and a certified NYSDOL Mold Assessor (certification MA02193). Bulk samples collected in December 2020 were

submitted with the chain-of-custody forms to Laboratory Testing Services, Inc. (LTS) located at 45-09 Greenpoint Avenue, Long Island City, NY (ELAP No. 10955 and NVLAP No. 101958-0) for asbestos analysis.

Field work conducted on March 26, 2021 was performed by Watts' employee Leo Abramov, a certified NYSDOL Asbestos Inspector (certification 07-05058). Bulk samples collected in March 2021 were submitted with the chain-of-custody forms to AmeriSci New York located at 117 East 30Th Street, New York NY, NY (ELAP No. 11480 and NVLAP No. 200546-0) for asbestos analysis.

Field work conducted on May 13, 2021 was performed by Watts' employee Edward Jones, a certified NYSDOL Asbestos Inspector (Certification 96-01576). Bulk samples collected in May 2021 were submitted with the chain-of-custody forms to EMSL Analytical located at 490 Rowley Road, Depew, NY (ELAP No. 11606 and NVLAP No. 200056-0) for asbestos analysis.

Copies of Watts' NYSDOL Asbestos Handling License (No. 68007), employee certifications and laboratory certifications are provided in the appendices to this report.

ASBESTOS-CONTAINING MATERIALS

Watts' onsite activities included the collection and analysis of a total of sixty-six (66) bulk samples to represent the identified suspect ACM. ACM is defined as any material containing more than one percent (1%) of asbestos as per 56-2.1 (p) of Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (12 NYCRR Part 56 as amended, effective March 21, 2007). Watts did not identify any ACM based on our sampling activities.

The following material was identified to be ACM by Adelaide Environmental and Health Associates, Inc., in the September 28, 2019 report in basement mechanical electrical room (MER B-14:

- Gaskets for valve/flange mechanical room at LL level in mechanical room MER B-14. Based on the Adeliade 2019 report was a friable black gasket on air handling unit AC-1. Air handling units HV-1, HV-3 and AC-1 were to be removed and replaced. This type of gasket was not observed by Watts' personnel on flanges or gaskets on components that will be disturbed by the proposed work during the March or May 2021 site visits.

No other ACMs were identified within project limits.

NON-ASBESTOS-CONTAINING MATERIALS

The following materials, which may be disturbed by the BMS Replacement project were sampled by Watts as part of this inspection. The following materials have been determined to be non-asbestos-containing materials (Non-ACM) by laboratory analysis (no asbestos detected).

- Mortar associated with cinder block wall.
- Paper wrap over fiberglass pipe and elbow insulation & valves.
- Sealant on ends of fiberglass insulations.
- 2′ x 2′ suspended ceiling tiles (pin hole).
- Mastic associated with 12″x12″ floor tiles over concrete floor.
- 12″ x 12″ floor tiles over concrete floor.
- Mastic associated with cove base on wall.
- Cove base on wall.
- Sealant on metal duct joints (also identified as red duct seal).
- Sheetrock walls and ceilings.
- Joint compound to sheetrock.
- Paper tape on joints.
- 2′ x 2′ suspended ceiling tiles (acoustical).
- Carpet mastic on concrete floor.
- Wall paper (self-sticking).
- 2′ x 2′ suspended ceiling tiles (plain).
- Dark gray gaskets associated with steam traps in basement MER-14.
- Brown gaskets associated with lo-pressure steam supply lines in basement MER-14.
- Green-brown gaskets associated with low pressure steam supply lines in MER-14.
- Blue gaskets in Basement MER B-14.
- Dark gray metallic gaskets associated with gate valves in basement MER-14.
- Black friable gaskets with white coating associated with lo pressure steam supply lines in basement MER-14.
- Dark gray gaskets associated with low pressure steam supply lines in basement MER-14.
- White gaskets associated with the hot water converters in basement MER-19.
- Red gaskets at valves in basement MER-19.

The following materials were confirmed as non-asbestos-containing as per Adelaide Environmental and Health Associates, Inc., dated July 6, 2016.

- Red fire stop at penetrations in the basement
- White sealant on pipe ends in the basement
- Mudded fittings on fiberglass in basement
- Concrete floor in basement

The following materials in the survey report were confirmed as non-asbestos-containing as per Adelaide Environmental and Health Associates, Inc., dated September 28, 2019.

- Fiberglass pipe insulation wrap HV-1 & 3 at the LL level
- Sealant at ends of fiberglass pipe HV-1 at the LL level
- Sealant at duct seams HV/AC-1 at the LL level
- Sealant at unit connections HV-1 & 3 at the LL level
- Vibration cloth HV-3 at the LL level

- Plenum wall insulation wrap at LL level
- Concrete floor mechanical room at LL level
- Exterior caulk at louver

The following materials in the survey report were confirmed as non-asbestos-containing as per Adelaide Environmental and Health Associates, Inc., dated December 6, 2019.

- Quarry tile grout in Room 1-14 first floor.
- Quarry tile mud set in Room 1-14 first floor.
- Quarry tile blue barrier in Room 1-14 first floor.
- Epoxy floor in Room 1-14 first floor.
- Caulk at pipe penetrations in Room 1-14 first floor.
- Fiberglass pipe wrap in Room B-16 basement.
- Pipe insulation end sealant in Room B-16 basement.
- Concrete floor in Room B-16 basement.
- CMU in corridor of basement.
- CMU mortar in corridor of basement.

It is the belief of Watts that this testing has identified all suspect ACM within the project limits where work will occur. However, if additional suspect materials are identified during the project that has not been sampled, it is recommended that samples of each material be collected and analyzed for asbestos.

POLYCHLORINATED BIPHENYLS (PCBs)

Watts investigated the caulk and sealants within the project limits to determine if polychlorinated biphenyls (PCBs) were present in these materials. The Environmental Protection Agency (EPA) regulates PCBs and considers any debris generated from construction materials manufactured with PCBs derived from building renovation projects with a concentration of equal to or greater than 50 parts per million (ppm) as "PCB bulk product waste". The Toxic Substances Control Act (TSCA) regulations (40 CFR Part 761) prescribe requirements for the proper management of PCB materials, including their handling and disposal. PCB bulk product waste at concentrations $\geq$50 ppm must follow specific storage, transport and disposal requirements.

There were two (2) samples collected for PCBs during Watts' site visit on December 23, 2020. The following sealants were tested:

- Sealant on the ends of fiberglass insulation.
- Sealant on the ducts.

The laboratory results indicated no PCBs were reported at or above 50 ppm.

LEAD-BASED PAINT

Bulk Paint Chip Samples

No bulk paint chip samples were collected per the lead-based paint inspection sampling protocol that was applied following "Inspections in Multifamily Housing" Chapter 7 of the HUD

Guidelines (2012 revision) and the protocol as referenced in USEPA 40 CFR Part 745.

MOLD OBSERVATIONS

During Watts investigated (visually) for mold growth within the project limits. Mold growth was not visually observed by Watts during the site investigation performed on December 23, 2020. Naseem Khan conducted the mold assessment.

Note: Watts' evaluation included observations of readily accessible areas. Destructive investigation of walls and ceilings was not performed nor was sampling and analysis. The evaluation did not include a structural evaluation or evaluation of any of the other systems (i.e. mechanical, electrical or plumbing).

UNIVERSAL WASTE

Watts conducted a Universal and Miscellaneous Hazardous Materials survey for the BMS replacement project. At the time this report was prepared, components with suspect universal waste or miscellaneous hazardous materials were not planned to be disturbed by the project.

OBSERVATIONS

The Watts' site visits and sampling events that were conducted on March 26, 2021 and May 13, 2021 were focused on evaluating gaskets that may be disturbed by the BMS replacement project. These visits focused on the investigation of gaskets associated with valves from low pressure steam and low pressure steam piping, chilled water supply and chilled water return piing servicing cooling cools and associated isolation valves. Watts' personnel also attempted to locate the black gasket associated with air handling unit AC-1 in basement MER B-14 that was identified to be ACM in the Adeliade Environmental September 2019 report. Bulk samples of gaskets collected on piping that may disturbed by the current project have been determined to be non-ACM.

Based on site observations and laboratory analysis on bulk samples of accessible gaskets collected by Watts' personnel, it is possible that asbestos gasket collected by Adelaide in 2019 in mechanical room B-14 was on a component to AC-1 that is not included in the current project. The photograph of "HA 008 gaskets in flange/valves - 66.7% chrysotile") in the Adeliade Environmental report was identified, but that location was never sampled. It appears as though it was a typical photograph of insulated piping in B-14. In addition, it is also possible that the asbestos gasket at AC-1 has been removed as part of prior air handling unit upgrades in the facility.

Watts' personnel did not detect any asbestos-containing gaskets in mechanical Room B19, which has much smaller piping that is threaded with no observed flanges. The only spot with a flange on a component that may be disturbed was sampled and was determined to be non-

ACM.

It is the belief of Watts that this testing has identified all suspect ACM within the project limits where work will occur. PCB and LBP materials within the project limits will not be disturbed. However, if additional suspect materials are identified during the project that has not been sampled, it is recommended that samples of each material be collected and analyzed for asbestos, PCB and LBP content, as appropriate.

Included in this report are: drawings indicating approximate bulk sample locations, chain-of-custody forms, laboratory results, laboratory accreditations, and consultant's license and certifications.

2.0 – ASBESTOS-CONTAINING MATERIALS

2.0 ASBESTOS-CONTAINING MATERIALS

Sampling and Laboratory Methodology

A NYSDOL-certified asbestos inspector collected bulk samples of all suspect ACM that may be disturbed by upgrading the temperature, humidity and DP sensors in the Cook Chill Production Center at the Rockland Psychiatric Center, located at 145 Old Orangeburg Road, Orangeburg, NY in accordance with NYSDOL and EPA requirements. Bulk samples were collected using simple hand tools from each matrix identified as a potential ACM.

Samples were delivered with the proper chain-of-custody forms to Laboratory Testing Services, Inc. Long Island City, NY (ELAP No. 10955 and NVLAP No. 101958-0), to AmeriSci New York (ELAP No. 11480) and NVLAP No. 200546-0), and EMSL Analytical Inc. Depew, NY (ELAP No. 11606 and NVLAP No. 200056-0). All analytical laboratories are New York State accredited facilities that participate in the Environmental Laboratory Approval Program.

All materials, except non-friable organically bound (NOB) materials, were analyzed using Polarized Light Microscopy (PLM) using Method 198.1. In addition, all samples analyzed via 198.1 were examined for the presence of vermiculite. NOBs, which include, but are not limited to, roofing materials, mastics, and caulks, as well as cellulose-containing ceiling tiles, underwent gravimetric reduction and were analyzed by Polarized Light Microscopy (PLM) Method 198.6. Any NOB and cellulose-containing ceiling tiles materials that were found to be negative under PLM were then analyzed by Transmission Electron Microscopy (TEM) Method 198.4. The New York State Department of Health (NYSDOH) protocol requires analysis by TEM if the PLM NOB analysis does not confirm the presence of asbestos.

This section includes information on all suspect ACM sampled. This section contains the following: a Homogeneous Materials List containing the homogeneous materials identified, their corresponding sample numbers, and whether or not they are ACM, as well as a drawing identifying the approximate locations of asbestos bulk samples.

Where possible, Watts visually inspected the identified ACM to assess its condition. The condition of the ACM was classified as good, fair or poor. The requirement for each designation is as follows:

Good: Material with no visible damage or deterioration or showing very limited damage or deterioration.

Fair: The surface of the material is crumbling, blistering, water-stained, gouged, punctured or otherwise damaged with the damage covering less than one tenth of the surface if the damage is evenly distributed or up to 25% of the material if the damage is localized.

Poor: The surface of the material is crumbling, blistering, water-stained, gouged, punctured or otherwise damaged with the damage covering more than one tenth of the surface if the damage is evenly distributed or more than 25% of the material if the damage is localized. Material with large areas hanging from the substrate, delaminated, heavily gouged, crushed, etc.

TABLE 2.1
HOMOGENEOUS MATERIALS LIST
ROCKLAND PSYCHIATRIC CENTER
COOK CHILL PRODUCTION CENTER - BMS REPLACEMENT PROJECT
145 OLD ORANGEGURG ROAD, ORANGEBURG, NY 10962

HM ID No.	Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)			ACM (Y/N)
					PLM	PLM NOB	TEM NOB	
Samples Collected December 23, 2020								
01	Mortar associated with cinder block wall	Basement – Room B-5 Basement – Room B-7 Basement – Room B-19	M	01 02 03	NAD NAD NAD	NA NA NA	NA NA NA	N
02	Paper wrap over fiberglass pipe and elbow insulation & valves	Basement – Room B-5 Basement – Room B-5 Basement – Room B-19	T	04 05 06	NAD NAD NAD	NA NA NA	NA NA NA	N
03	Sealant on ends of fiberglass insulation	Basement – Room B-5 Basement – Room B-19	M	07 08	NA NA	NAD NAD	NAD NAD	N
04	2′ x 2′ suspended ceiling tiles (pin hole)	Basement – Room B-7 Basement – Room B-7	M	09 10	NA NA	NAD NAD	NAD NAD	N
05	Mastic associated with 12″ x 12″ floor tiles over concrete floor	Basement – Room B-7 Basement – Room B-7	M	11 12	NA NA	NAD NAD	NAD NAD	N
06	12″ x 12″ floor tiles over concrete floor	Basement – Room B-7 Basement – Room B-7	M	13 14	NA NA	NAD NAD	NAD NAD	N
07	Mastic associated with cove base on wall	Basement – Room B-7 Basement – Room B-7	M	15 16	NA NA	NAD NAD	NAD NAD	N
08	Cove base on wall	Basement – Room B-7 Basement – Room B-7	M	17 18	NA NA	NAD NAD	NAD NAD	N
09	Sealant on metal duct joints	Basement – Room B-19 Basement – Room B-19	M	19 20	NA NA	NAD NAD	NAD NAD	N
10	Sheetrock wall and ceiling	First Floor – Room 1-30 North First Floor – Room 1-30 West First Floor – Room 1-42 South	M	21 22 23	NAD NAD NAD	NA NA NA	NA NA NA	N

TABLE 2.1
HOMOGENEOUS MATERIALS LIST
ROCKLAND PSYCHIATRIC CENTER
COOK CHILL PRODUCTION CENTER - BMS REPLACEMENT PROJECT
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HM ID No.	Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)			ACM (Y/N)
					PLM	PLM NOB	TEM NOB	
11	Joint compound to sheetrock	First Floor – Room 1-30 North First Floor – Room 1-30 West First Floor – Room 1-42 South	M	24 25 26	NAD NAD NAD	NA NA NA	NA NA NA	N
12	Paper tape on joints	First Floor – Room 1-30 North First Floor – Room 1-30 West First Floor – Room 1-42 South	M	27 28 29	NAD NAD NAD	NA NA NA	NA NA NA	N
13	Paper wrap over fiberglass pipe and elbow insulation	First Floor – Room 1-30 West First Floor – Room 1-30 North First Floor – Room 1-42 South	T	30 31 32	NAD NAD NAD	NA NA NA	NA NA NA	N
14	2′ x 2′ suspended ceiling tiles (acoustical)	First Floor – Room 1-30 North First Floor – Room 1-42 South	M	33 34	NA NA	NAD NAD	NAD NAD	N
15	Carpet mastic on concrete floor	First Floor – Room 1-42 North First Floor – Room 1-42 South	M	35 36	NA NA	NAD NAD	NAD NAD	N
16	Wall paper (self-sticking)	First Floor – Room 1-42 East First Floor – Room 1-42 West	M	37 38	NA NA	NAD NAD	NAD NAD	N
17	2′ x 2′ suspended ceiling tiles (plain)	First Floor – Room 1-17 North First Floor – Room 1-17 South	M	39 40	NA NA	NAD NAD	NAD NAD	N
18	Mortar associated with wall cinder blocks	First Floor Hallway – Room 1-17 First Floor – Near Room 1-1	M	41 42	NAD NAD	NA NA	NA NA	N

TABLE 2.1
HOMOGENEOUS MATERIALS LIST
ROCKLAND PSYCHIATRIC CENTER
COOK CHILL PRODUCTION CENTER - BMS REPLACEMENT PROJECT
145 OLD ORANGEGURG ROAD, ORANGEBURG, NY 10962

HM ID No.	Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)			ACM (Y/N)
					PLM	PLM NOB	TEM NOB	
Samples Collected March 26, 2021								
19	Red Gasket at Valves	MER B-19 Room, Center West Area	M	1717506-43	NA	NAD	NAD	N
		MER B-19 Room, Center North Area		1717506-44	NA	NAD	NAD	
20	Green Gasket at Valves	MER B-14 Room – North West Side Present only at 1 Valve	M	1717506-45	NA	NAD	NAD	N
				1717506-46	NA	NAD	NAD	
21	Blue Gasket at Valves	MER B-14 Room Center West Area	M	1717506-47	NA	NAD	NAD	N
				1717506-48	NA	NAD	NAD	
22	Duct Seal, Red	1st Floor, North Hallway By RSI Work Conduit	M	1717506-49	NA	NAD	NAD	N
				1717506-50	NA	NAD	NAD	
Samples Collected May 13, 2021								
23	Dark Gray Gasket at Steam Trap at AC-1	MER B-14 at AC-1 Steam Condensate Line Upper North	M	1717506-G01	NA	Insufficient Material	Insufficient Material	NA
		MER B-14 at AC-1 Steam Condensate Line Lower North		1717506-G02	NA	Insufficient Material	Insufficient Material	

TABLE 2.1
HOMOGENEOUS MATERIALS LIST
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COOK CHILL PRODUCTION CENTER - BMS REPLACEMENT PROJECT
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HM ID No.	Material Description	Sample Location	Type	Sample Number	Results (% Asbestos)			ACM (Y/N)
					PLM	PLM NOB	TEM NOB	
24	Dark Gray Gasket at Steam Trap HV-1	MER B-14 at HV-1 South Side Lower	M	1717506-G03	NA	ND	ND	N
		MER B-14,at HV-1 South Side West Tag at ST17		1717506-G04	NA	NA	NA	
25	Brown Gasket Lo Pressure Steam Supply	MER B-14 at HV-1 South Side Lo-Pressure Steam Supply Tag LPS-304	M	1717506-G05 1717506-G06	NA NA	ND ND	ND ND	N
26	Dark Gray Metallic Gasket at Gate Valve	MER B-14 at HV-1 Top Flange Gate Valve Steam Coil on HV-1 South Side	M	1717506-G07 171706-G08	NA NA	ND ND	ND ND	N
27	Green-Brown Gasket at Valve	MER B-14 at HV-3 North End Lo Pressure Upper Steam Supply Line	M	1717506-G09	ND	NA	NA	N
				1717506-G10	ND	NA	NA	
28	White Basket with Black Coating at Valve	MER B-14 at HV03 North End Lo-Pressure Steam Supply Flange by Green Gasket	M	1717506-G11 1717506-G12	NA NA	ND ND	ND ND	N
29	Dark Gray Gasket Lo Pressure Steam Supply	MER G-14 at AC-4 North Side Low Pressure Steam Supply at Flange	M	1717506-G13 1717506-G14	NA NA	ND ND	ND ND	N
30	White Gasket at Hot Water Converter	MER 2 B19 at North End Hot Water Converter 2 East Flange	M	1717506-G15	ND	NA	NA	N
		MER B19 at North End Hot Water Converter 2 West Flange		1717506-G16	ND	NA	NA	

Abbreviations:
NA = Not analyzed
NAD = No Asbestos detected (LTS and AmeriSci nomenclature)

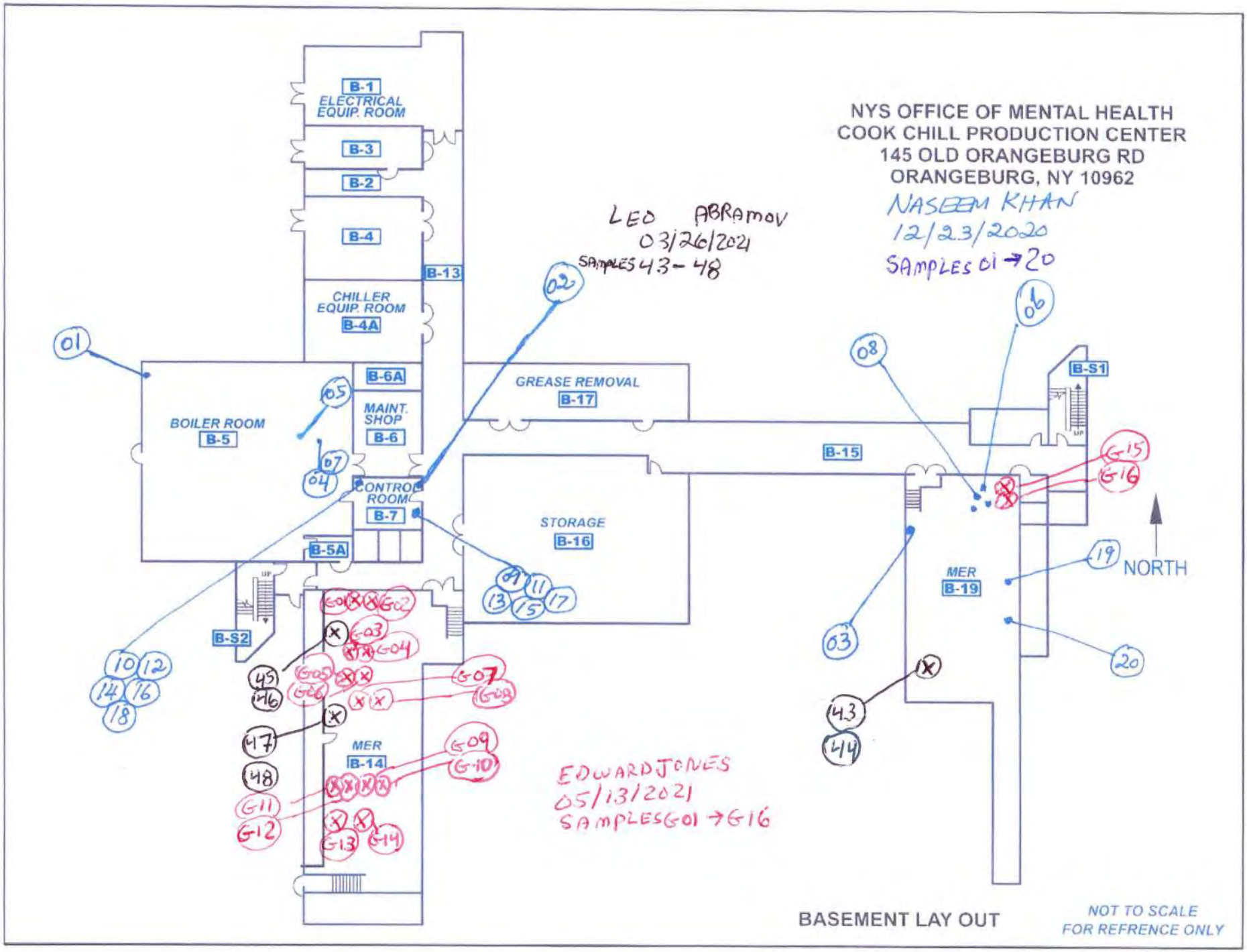
ACM
Y = Yes
N = No

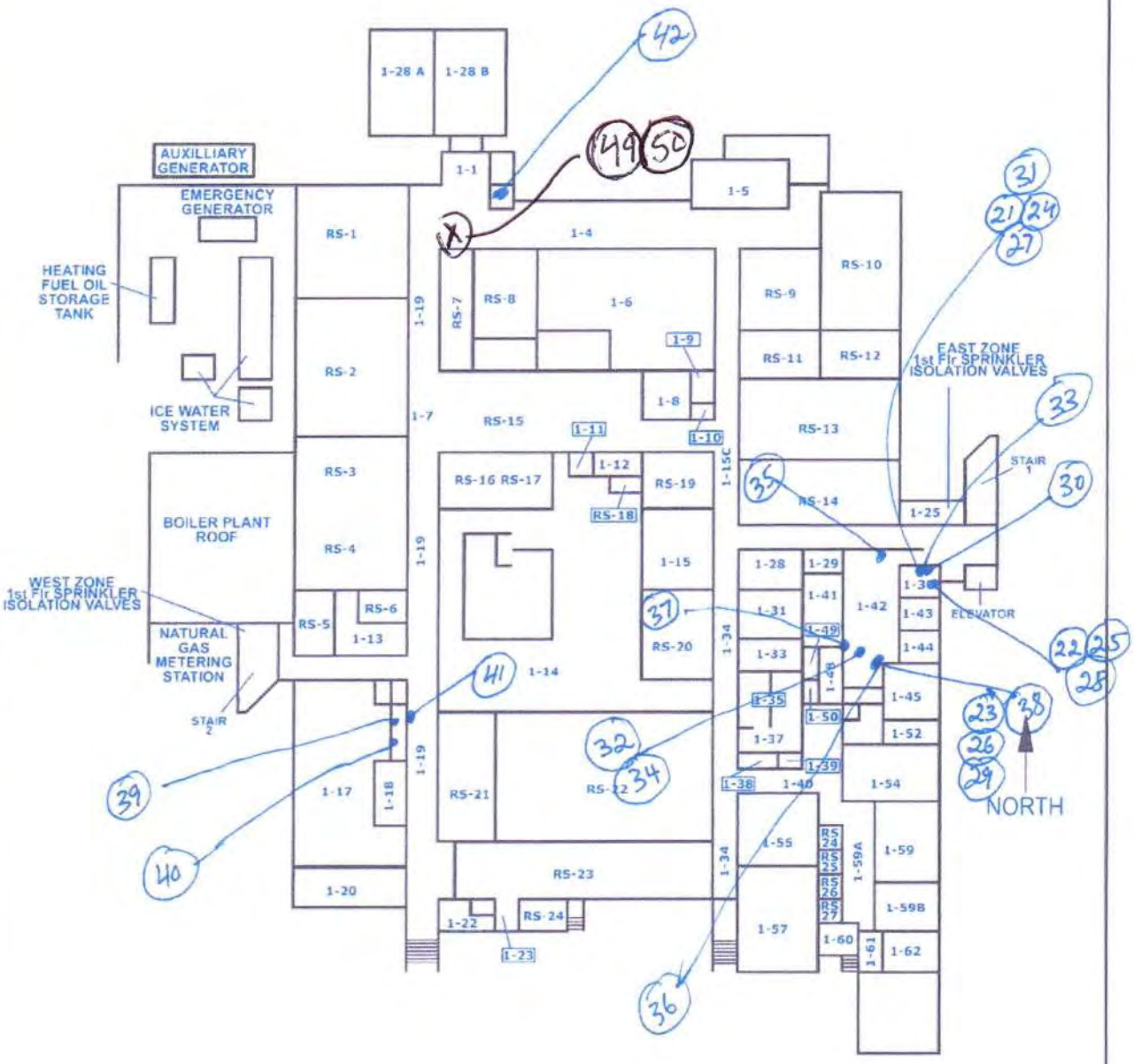
Type
T = Thermal
S = Surfacing

ND = Not Detected (EMSL nomenclature)
NA/PS = Not analyzed/positive stop
HM = Homogeneous Material Identification Number
Bold rows identify asbestos-containing materials (greater than 1%)

M = Miscellaneous

2.1 – BULK SAMPLE LOCATION DRAWINGS


NYS OFFICE OF MENTAL HEALTH
COOK CHILL PRODUCTION CENTER
145 OLD ORANGEBURG RD
ORANGEBURG, NY 10962
NASEEM KHAN
12/23/2020
SAMPLES 01 → 20
LEO ABRAMOV
03/26/2021
SAMPLES 43 - 48
EDWARD JONES
05/13/2021
SAMPLES G01 → G16
B-1 ELECTRICAL EQUIP. ROOM
B-3
B-2
B-4
B-13
CHILLER EQUIP. ROOM B-4A
B-6A
MAINT. SHOP B-6
BOILER ROOM B-5
B-5A
CONTROL ROOM B-7
B-S2
GREASE REMOVAL B-17
B-15
STORAGE B-16
MER B-14
MER B-19
B-S1
NORTH
BASEMENT LAY OUT
NOT TO SCALE
FOR REFRENCE ONLY



NYS OFFICE OF MENTAL HEALTH
COOK CHILL PRODUCTION CENTER
145 OLD ORANGEBURG RD
ORANGEBURG, NY 10962

1st Flr LAY OUT

NASEEM KHAN
12/23/2020
SAMPLES 21 → 42

LEO ABRAMOV
03/26/2021
SAMPLES 49-50

NOT TO SCALE
FOR REFRENCE ONLY

2.2 – SITE PHOTOGRAPHS

Photo 1 – View of the non-asbestos mortar for cinder block wall, 2'x 2' suspended pinhole ceiling tile and panel boards in basement room B-7. Photo taken December 23, 2020.

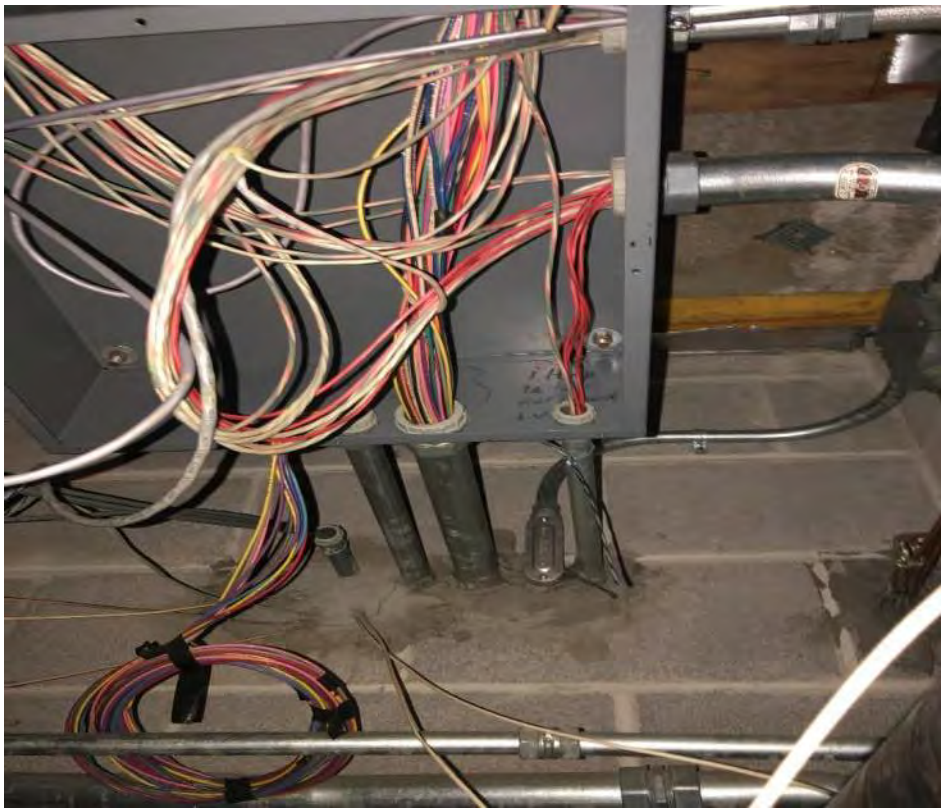


Photo 2 – View of the non-suspect wires in the electrical box in basement room B-7. Photo taken December 23, 2020.

Photo 3 – View of 12″x12″ floor tiles/mastic and cove base/mastic in basement room B-7. No asbestos was detected in these materials. Photo taken December 23, 2020.

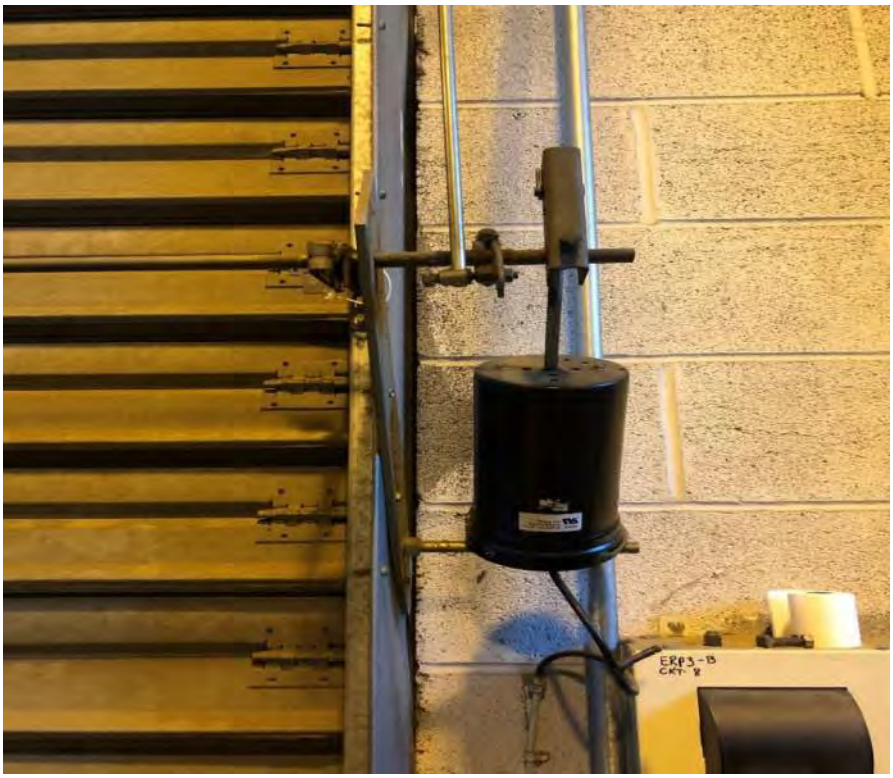


Photo 4 – View of non-suspect louver actuator in basement room B-5. Photo taken December 23, 2020.

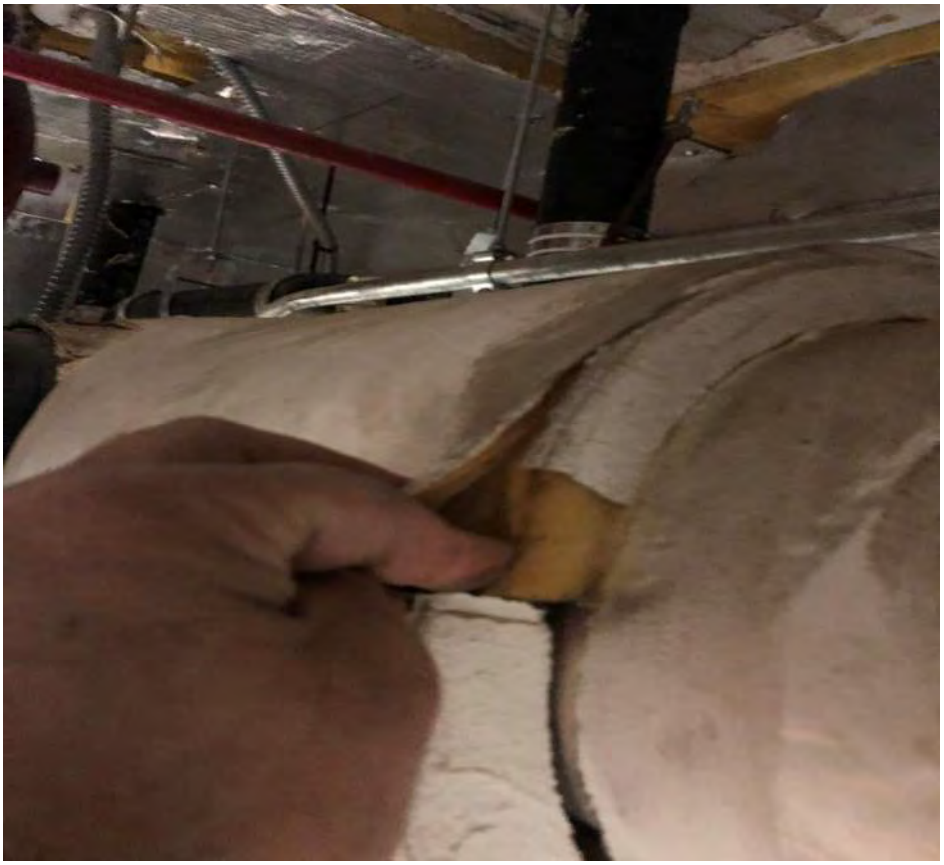


Photo 5 – View of paper wrap and sealant on end of fiberglass pipes in basement room B-5. No asbestos was detected in sealant. Photo taken December 23, 2020.

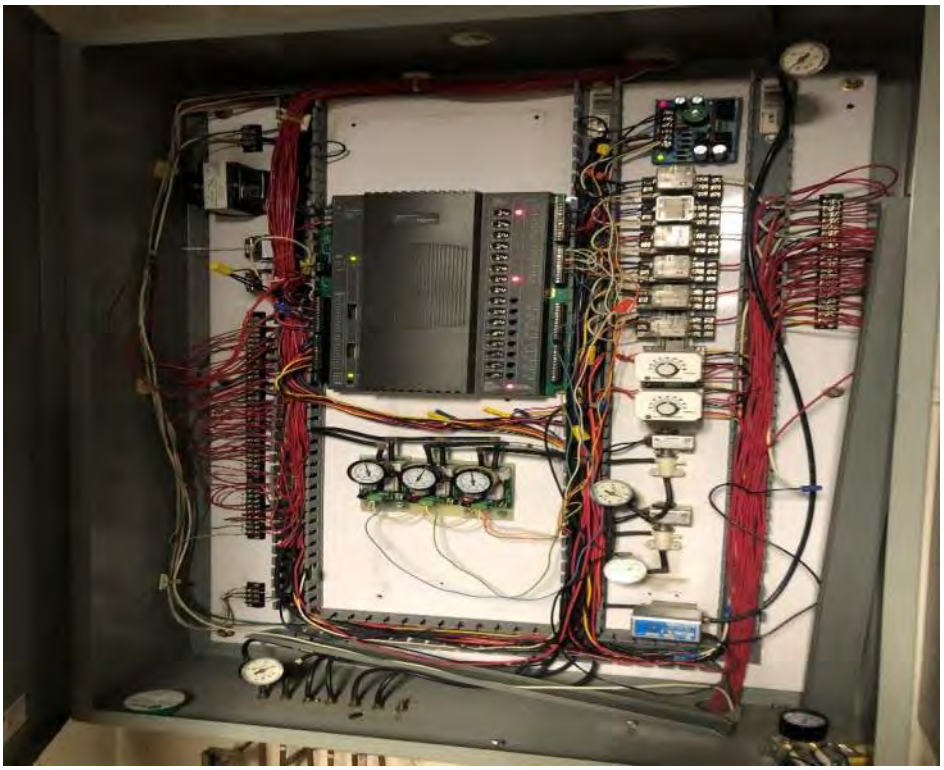


Photo 6 – View of non-suspect wire insulation and metal backer board in basement room B-19. Photo taken December 23, 2020.

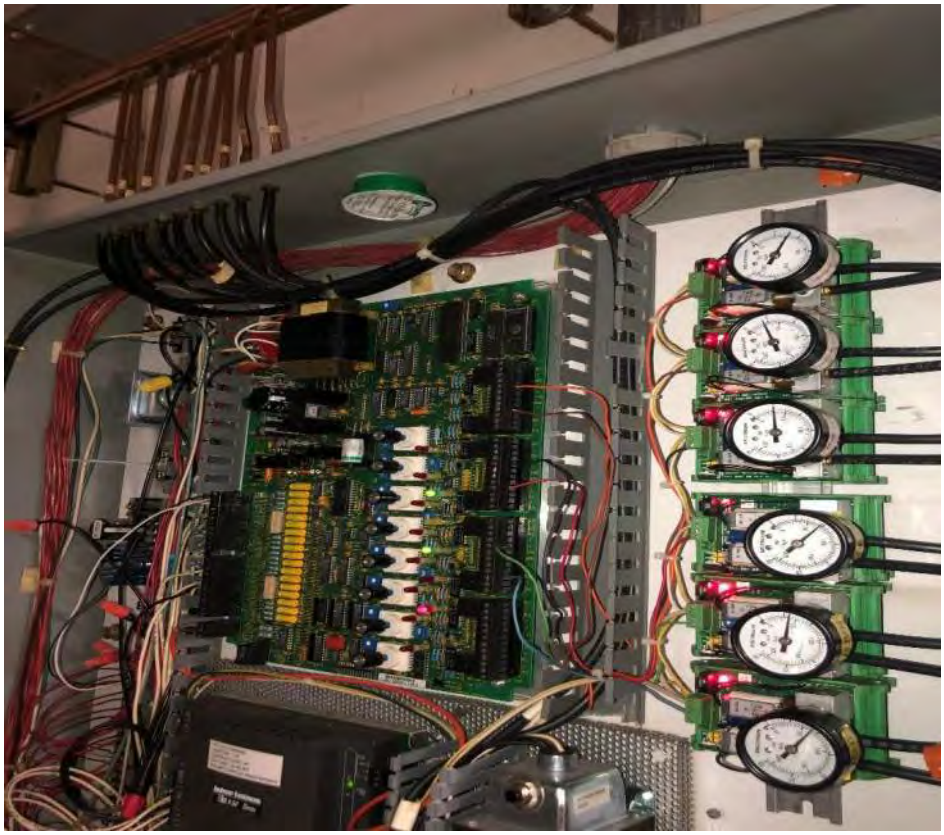


Photo 7 – View of non-suspect wire insulation and metal backer board in basement room B-19.
Photo taken December 23, 2020.

Photo 8 – View of non-suspect wire insulation and metal backer board in basement room B-19.
Photo taken December 23, 2020.

Photo 9 – View of non-suspect wire insulation and metal back board in basement room B-19. Photo taken December 23, 2020.

Photo 10 – View of non-suspect louver actuator in basement room B-19 and sealant on metal duct joints. No asbestos was detected in the sealant. Photo taken December 23, 2020.

Photo 11 – View of non-suspect louver actuator in basement room B-19 and sealant on metal duct joints. No asbestos was detected in the sealant. Photo taken December 23, 2020.

Photo 12 – View of paper tape, joint compound, wall sheetrock and paper wrap on fiberglass pipe insulation on the first floor. No asbestos was detected in these materials. Photo taken December 23, 2020.

Photo 13 – View of carpet mastic and self-sticking wall paper on the first floor. No asbestos was detected in these materials. Photo taken December 23, 2020.

Photo 14 – View of quarry floor tiles, grout, mud-set & blue barrier on the first floor. No asbestos was detected in these materials. Photo taken December 23, 2020.

Photo 15 – View of 2'x 2' suspended ceiling tiles (plain) in first floor room 1-17. No asbestos was detected in the ceiling tiles. Photo taken December 23, 2020.

Photo 16 – View of epoxy floor at first floor salad room. No asbestos was detected in the epoxy floor materials. Photo taken December 23, 2020.

Photo 17 – View of an air conditioning unit in basement Mechanical Room MER B14. No asbestos was detected in gasket samples collected by Watts' personnel in 2021. Photo taken May 13, 2021.

Photo 18 – View of a flange and gasket at a low pressure steam line at AC-4 in basement Mechanical Room MER B14. No asbestos was detected in accessible gaskets collected by Watts' personnel in 2021. Photo taken May 13, 2021.

Photo 19 – View of piping in basement Mechanical Room MER 2 B-19. The majority of piping was threaded. No asbestos was detected in gasket samples collected by Watts' personnel in 2021. Photo taken May 13, 2021.

Photo 20 – View of the hot water converters in basement Mechanical Room MER 2 B-19. No asbestos was detected in gaskets at flanges the hot water converters. Photo taken May 13, 2021.

2.3 – LABORATORY REPORT AND CHAIN OF CUSTODY FORMS

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # / Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% AII	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
1 20-12-146-01	A	GR	E			Mortar Of Cinderblock Wall (Grey), Basement-Room B-5	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												
2 20-12-146-02	A	GR	E			Mortar Of Cinderblock Wall (Grey), Basement-Room B-7	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												
3 20-12-146-03	A	GR	E			Mortar Of Cinderblock Wall (Grey), Basement-Room B-19	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												
4 20-12-146-04	A	S/BE	E	10		Paper Wrap Over Fiberglass Pipe & Elbow Insulation & Valves (White), Basement-Room B-5	30.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D	60	H												
5 20-12-146-05	A	S/BE	E	10		Paper Wrap Over Fiberglass Pipe & Elbow Insulation & Valves (White), Basement-Room B-5	30.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D	60	H												
6 20-12-146-06	A	S/BE	E	10		Paper Wrap Over Fiberglass Pipe & Elbow Insulation & Valves (White), Basement-Room B-19	30.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D	60	H												

LABORATORY TESTING SERVICES INC. 45-09 Greenpoint Ave. LIC, NY 11104 Phone: (718) 389 3470, Fax: (718) 389 3471

BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # Lab ID #	Stereomicroscope Analysis				Sample Description	% Non-Fibrous Material	% Friable Results	% All	% PLM NOB Results	% TEM NOB Results	% TOTAL Asbestos
7 20-12-146-07	A	WH	E		Sealant On Ends Of Fiberglass Insulations (White), Basement-Room B-5			15.31	NAD	NAD	NAD
	B	1	F								
	C	198.4/6	G								
	D		H								
8 20-12-146-08	A	WH	E		Sealant On Ends Of Fiberglass Insulations (White), Basement-Room B-19			15.64	NAD	NAD	NAD
	B	1	F								
	C	198.4/6	G								
	D		H								
9 20-12-146-09	A	GR	E		2'x2' Suspended Ceiling Tiles (White/Grey), Basement-Room B-7			75.81	NAD	NAD	NAD
	B	1	F								
	C	198.4/6	G								
	D		H								
10 20-12-146-10	A	GR	E		2'x2' Suspended Ceiling Tiles (White/Grey), Basement-Room B-7			81.54	NAD	NAD	NAD
	B	1	F								
	C	198.4/6	G								
	D		H								
11 20-12-146-11	A	BK	E		Mastic Of 12"x12" Floor Tiles Over Concrete Floor (Black), Basement-Room B-7			15.07	NAD	NAD	NAD
	B	1	F								
	C	198.4/6	G								
	D		H								
12 20-12-146-12	A	BK	E		Mastic Of 12"x12" Floor Tiles Over Concrete Floor (Black), Basement-Room B-7			16.10	NAD	NAD	NAD
	B	1	F								
	C	198.4/6	G								
	D		H								

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BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # / Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results	% All	% PLM NOB Results	% TEM NOB Results	% TOTAL Asbestos
13 / 20-12-146-13	A	GR	E			12"x12" Floor Tiles Over Concrete (Grey), Basement-Room B-7			30.69	NAD	NAD	NAD
	B	1	F									
	C	198.4/6	G									
	D		H									
14 / 20-12-146-14	A	GR	E			12"x12" Floor Tiles Over Concrete (Grey), Basement-Room B-7			10.84	NAD	NAD	NAD
	B	1	F									
	C	198.4/6	G									
	D		H									
15 / 20-12-146-15	A	Y	E			Mastic Of Cove Base On Wall (Brown/Grey), Basement-Room B-7			31.54	NAD	NAD	NAD
	B	1	F									
	C	198.4/6	G									
	D		H									
16 / 20-12-146-16	A	Y	E			Mastic Of Cove Base On Wall (Brown/Grey), Basement-Room B-7			20.70	NAD	NAD	NAD
	B	1	F									
	C	198.4/6	G									
	D		H									
17 / 20-12-146-17	A	GR	E			Cove Base On Wall (Grey), Basement-Room B-7			3.18	NAD	NAD	NAD
	B	1	F									
	C	198.4/6	G									
	D		H									
18 / 20-12-146-18	A	GR	E			Cove Base On Wall (Grey), Basement-Room B-7			0.94	NAD	NAD	NAD
	B	1	F									
	C	198.4/6	G									
	D		H									

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BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # / Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% AII	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
19	A	BR	E			Sealant On Metal Duct Joints (Brown), Basement-Room B-19				10.32	NAD		NAD		NAD
20-12-146-19	B	1	F												
	C	198.4/6	G												
	D		H												
20	A	BR	E			Sealant On Metal Duct Joints (Brown), Basement-Room B-19				10.38	NAD		NAD		NAD
20-12-146-20	B	1	F												
	C	198.4/6	G												
	D		H												
21	A	GR/BR	E	10		Sheetrock Wall & Ceiling (Grey), First Floor-Entire	75.00	NAD							NAD
20-12-146-21	B	2	F												
	C	198.1	G												
	D	15	H												
22	A	GR/BR	E	12		Sheetrock Wall & Ceiling (Grey), First Floor-Entire	68.00	NAD							NAD
20-12-146-22	B	2	F												
	C	198.1	G												
	D	20	H												
23	A	GR/BR	E	10		Sheetrock Wall & Ceiling (Grey), First Floor-Entire	74.00	NAD							NAD
20-12-146-23	B	2	F												
	C	198.1	G												
	D	16	H												
24	A	WH	E			Joint Compound To Sheetrock (White), First Floor-Entire	100.00	NAD							NAD
20-12-146-24	B	1	F												
	C	198.1	G												
	D		H												

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BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # / Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% AII	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
25 / 20-12-146-25	A	WH	E			Joint Compound To Sheetrock (White), First Floor-Entire	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												
26 / 20-12-146-26	A	WH	E			Joint Compound To Sheetrock (White), First Floor-Entire	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												
27 / 20-12-146-27	A	BE	E			Paper Tape On Joints (Light Brown), First Floor-Entire	0.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D	100	H												
28 / 20-12-146-28	A	BE	E			Paper Tape On Joints (Light Brown), First Floor-Entire	0.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D	100	H												
29 / 20-12-146-29	A	BE	E			Paper Tape On Joints (Light Brown), First Floor-Entire	0.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D	100	H												
30 / 20-12-146-30	A	WH/S	E	10		Paper Wrap Over Fiberglass Pipe & Elbow Insulation (White), First Floor-Entire	30.00	NAD							NAD
	B	2	F												
	C	198.1	G												
	D	60	H												

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BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # / Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% All	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
31 / 20-12-146-31	A	WH/S	E	15		Paper Wrap Over Fiberglass Pipe & Elbow Insulation (White), First Floor-Entire	35.00	NAD							NAD
	B	2	F												
	C	198.1	G												
	D	50	H												
32 / 20-12-146-32	A	WH/S	E	10		Paper Wrap Over Fiberglass Pipe & Elbow Insulation (White), First Floor-Entire	35.00	NAD							NAD
	B	2	F												
	C	198.1	G												
	D	55	H												
33 / 20-12-146-33	A	GR	E			2'x2' Suspended Ceiling Tiles (Acoustical) (White/Grey), First Floor-Entire				65.72	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
34 / 20-12-146-34	A	GR	E			2'x2' Suspended Ceiling Tiles (Acoustical) (White/Grey), First Floor-Entire				75.15	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
35 / 20-12-146-35	A	O	E			Carpet Mastic On Concrete (Brown), First Floor-Entire				8.82	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
36 / 20-12-146-36	A	O	E			Carpet Mastic On Concrete (Brown), First Floor-Entire				2.61	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												

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BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203 | **Project:** 145 Old Orangeburg Road, NY | **Project #:** 1717506

Laboratory ID: 20-12-146 | **Date of Report:** 12/28/20 | **Date of Analysis:** 12/26/20 - 12/28/20

Client ID # / Lab ID #	Stereomicroscope Analysis					Sample Description	% Non-Fibrous Material	% Friable Results		% AII	% PLM NOB Results		% TEM NOB Results		% TOTAL Asbestos
37 20-12-146-37	A	WH	E			Wall Paper (Self Sticking) Off White, First Floor-Entire				8.52	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
38 20-12-146-38	A	WH	E			Wall Paper (Self Sticking) Off White, First Floor-Entire				13.12	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
39 20-12-146-39	A	GR	E			2'x2' Suspended Plain Ceiling Tiles (Grey), First Floor-Room 1-17				71.06	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
40 20-12-146-40	A	GR	E			2'x2' Suspended Plain Ceiling Tiles (Grey), First Floor-Room 1-17				72.17	NAD		NAD		NAD
	B	1	F												
	C	198.4/6	G												
	D		H												
41 20-12-146-41	A	GR	E			Mortar Of Wall Cinderblocks (Grey), First Floor-Outside 1-17	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												
42 20-12-146-42	A	GR	E			Mortar Of Wall Cinderblocks (Grey), First Floor-Closet 1-1	100.00	NAD							NAD
	B	1	F												
	C	198.1	G												
	D		H												

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BULK ASBESTOS TEST REPORT

Client/Address: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo NY 14203		**Project:** 145 Old Orangeburg Road, NY **Project #:** 1717506
Laboratory ID: 20-12-146	**Date of Report:** 12/28/20	**Date of Analysis:** 12/26/20 - 12/28/20

PLM ANALYST
D. Diallo

PLM-NOB ANALYST
K. Esnard

TEM-NOB ANALYST
E. Loukianova

LABORATORY DIRECTOR
E. Dimitrakas

LABORATORY ACCREDITATION NUMBERS: NVLAP Lab Code 101958-0, NYSDOH ELAP Lab ID 10955

- Samples will be stored for sixty (60) days. LTS Inc. should be notified within this time frame for a true duplicate analysis.
- Above results relate only to samples submitted and analyzed. This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Govemment. Test reports may not be reproduced except in full and with prior approval of LTS Inc.
- The liability of LTS Inc., with respect to the services charged, shall in no event exceed the amount of the invoice.
- Analytical Methodologies: EPA 600/M4-82-020 (Point Count only) and ELAP Methods 198.1, 198.4,198.6.
- NAD: No Asbestos Detected, NVD: No Vermiculite Detected, SAFP: Stopped at First Positive, CH: Chrysotile, AMOS: Amosite, TRE: Tremolite, ANTH: Anthophyllite, ACT: Actinolite, and CRO: Crocidolite.
- Stereomicroscopic Analysis: A: Color, B: Layers, C: Methodology, D: Cellulose, E: Fiberglass, F: Hair, G: Vermiculite, H: OTHER
- Color: BK: Black, BR: Brown, Dk BR: Dark Brown, Lt BR: Light Brown, R BR: Reddish Brown, GR: Gray, Dk GR: Dark Gray, Lt GR: Light Gray, BE: Beige, P: Pink, R: Red, T: Tan, WH: White, Off WH: Off White, Y: Yellow, BL: Blue, CR: Cream, GN: Green, O: Orange, Multi.: Multiple Colors

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Watts Architecture & Engineers
Attn: Greg Andrews
95 Perry Street
Suite 300
Buffalo, NY 14203

Date Received 04/07/21
Date Examined 04/08/21
ELAP # 11480
AmeriSci Job # 221041490
P.O. #
Page 1 **of** 2
RE: 1717506; DASNY/EMS Group; Rockland PC/Cook Chill Plant, 145 Old Orangeburg Road, Orangeburg, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1717506-43 19	221041490-01 **Location:** MER B-49 Room, Center West - Red Gasket At Valves	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.7%			
1717506-44 19	221041490-02 **Location:** MER B-49 Room, Center North - Red Gasket At Valves	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.2%			
1717506-45 20	221041490-03 **Location:** MER B 14 Room, North West Side - Green Gasket At Valves	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Gray/Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 67.8%			
1717506-46 20	221041490-04 **Location:** MER B 14 Room, North West Side - Green Gasket At Valves	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Gray/Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 69.6%			
1717506-47 21	221041490-05 **Location:** MER B 14 Room, Center West - Blue Gasket At Valves	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 79.5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

1717506; DASNY/EMS Group; Rockland PC/Cook Chill Plant,
145 Old Orangeburg Road, Orangeburg, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1717506-48 21	221041490-06 **Location:** MER B 14 Room, Center West - Blue Gasket At Valves	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 76.3%			
1717506-49 22	221041490-07 **Location:** 1st Floor North Hallway By RSI, North Conduit - Duct Seal Red	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Red, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 1%, Non-fibrous 11.1%			
1717506-50 22	221041490-08 **Location:** 1st Floor North Hallway By RSI, South Conduit - Duct Seal Red	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 04/08/21
Analyst Description: Red, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 2%, Non-fibrous 15.9%			

Reporting Notes:

Analyzed by: Valeriu Voicu
Date: 4/8/2021

Reviewed by: Gabriella Morozov

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Client Name: Watts Architecture & Engineers

Table I
Summary of Bulk Asbestos Analysis Results

1717506; DASNY/EMS Group; Rockland PC/Cook Chill Plant, 145 Old Orangeburg Road, Orangeburg, NY

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1717506-43	19	0.199	28.4	61.9	9.7	NAD	NAD
Location:	MER B-49 Room, Center West - Red Gasket At Valves							
02	1717506-44	19	0.190	24.5	66.3	9.2	NAD	NAD
Location:	MER B-49 Room, Center North - Red Gasket At Valves							
03	1717506-45	20	0.172	26.9	5.2	67.8	NAD	NAD
Location:	MER B 14 Room, North West Side - Green Gasket At Valves							
04	1717506-46	20	0.101	25.0	5.4	69.6	NAD	NAD
Location:	MER B 14 Room, North West Side - Green Gasket At Valves							
05	1717506-47	21	0.070	15.1	5.5	79.5	NAD	NAD
Location:	MER B 14 Room, Center West - Blue Gasket At Valves							
06	1717506-48	21	0.048	14.7	9.0	76.3	NAD	NAD
Location:	MER B 14 Room, Center West - Blue Gasket At Valves							
07	1717506-49	22	0.142	42.2	45.6	12.1	NAD	NAD
Location:	1st Floor North Hallway By RSI, North Conduit - Duct Seal Red							
08	1717506-50	22	0.223	45.4	36.6	17.9	NAD	NAD
Location:	1st Floor North Hallway By RSI, South Conduit - Duct Seal Red							

Analyzed by: Gabriella Morozov 

Date: 4/9/2021

Reviewed by: Gabriella Morozov 

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

EMSL Analytical, Inc.

490 Rowley Road Depew, NY 14043
Tel/Fax: (716) 651-0030 / (716) 651-0394
http://www.EMSL.com / buffalolab@emsl.com

EMSL Order: 142101623
Customer ID: WATT50
Customer PO:
Project ID:

Attention: Ed Jones
Watts Architecture & Engineering
95 Perry Street
Suite 300
Buffalo, NY 14203

Phone: (716) 206-5100
Fax: (716) 206-5199
Received Date: 05/17/2021 8:00 AM
Analysis Date: 05/17/2021 - 05/18/2021
Collected Date: 05/13/2021

Project: 1717506 / Cook Chill Production Center / 145 Old Orangeburg Road, Orangeburg, NY

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos
Sample ID 1717506-G01 *142101623-0001*		**Description**	Dark Gray Gasket at Steam Trap AC-1		
		Homogeneity			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021				**Insufficient Material**
TEM NYS 198.4 NOB	05/18/2021				**Insufficient Material**
Sample ID 1717506-G02 *142101623-0002*		**Description**	Dark Gray Gasket at Steam Trap AC-1		
		Homogeneity			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021				**Insufficient Material**
TEM NYS 198.4 NOB	05/18/2021				**Insufficient Material**
Sample ID 1717506-G03 *142101623-0003*		**Description**	Dark Gray Gasket at Steam Trap HV-1		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray		100.00% Other	**None Detected**
Sample ID 1717506-G04 *142101623-0004*		**Description**	Dark Gray Gasket at Steam Trap HV-1		
		Homogeneity			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021				**Insufficient Material**
TEM NYS 198.4 NOB	05/18/2021				**Insufficient Material**
Sample ID 1717506-G05 *142101623-0005*		**Description**	Brown Gasket Lo-Pressure Steam Supply HV-1		
		Homogeneity	Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray/ Rust		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray/ Rust		100.00% Other	**None Detected**

Initial report from: 05/18/2021 10:34:20

EMSL Analytical, Inc.
490 Rowley Road Depew, NY 14043
Tel/Fax: (716) 651-0030 / (716) 651-0394
http://www.EMSL.com / buffalolab@emsl.com

EMSL Order: 142101623
Customer ID: WATT50
Customer PO:
Project ID:

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos
Sample ID 1717506-G06 *142101623-0006*		**Description** Brown Gasket Lo-Pressure Steam Supply HV-1 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray/ Rust		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray/ Rust		100.00% Other	**None Detected**
Sample ID 1717506-G07 *142101623-0007*		**Description** Dark Gray Metalic Gasket Gate Valve HV-1 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Black/ Rust		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Black/ Rust		100.00% Other	**None Detected**
Sample ID 1717506-G08 *142101623-0008*		**Description** Dark Gray Metalic Gasket Gate Valve HV-1 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Black/ Rust		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Black/ Rust		100.00% Other	**None Detected**
Sample ID 1717506-G09 *142101623-0009*		**Description** Green-Brown Gasket Valve HV-3 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	05/17/2021	Brown	20.00% Synthetic	80.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 1717506-G10 *142101623-0010*		**Description** Green-Brown Gasket Valve HV-3 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	05/17/2021	Brown	15.00% Synthetic	85.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 1717506-G11 *142101623-0011*		**Description** White Gasket Black Coating Valve HV-3 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray/ Black		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray/ Black		100.00% Other	**None Detected**

Initial report from: 05/18/2021 10:34:20

EMSL Analytical, Inc.
490 Rowley Road Depew, NY 14043
Tel/Fax: (716) 651-0030 / (716) 651-0394
http://www.EMSL.com / buffalolab@emsl.com

EMSL Order:	142101623
Customer ID:	WATT50
Customer PO:	
Project ID:	

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos
Sample ID 1717506-G12 *142101623-0012*		**Description** White Gasket Black Coating Valve HV-3 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray/ Black		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray/ Black		100.00% Other	**None Detected**
Sample ID 1717506-G13 *142101623-0013*		**Description** Dark Gray Gasket AC-4 Lo Pressure Steam Supply **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray		100.00% Other	**None Detected**
Sample ID 1717506-G14 *142101623-0014*		**Description** Dark Gray Gasket AC-4 Lo Pressure Steam Supply **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	05/18/2021	Gray		100.00% Other	**Inconclusive: None Detected**
TEM NYS 198.4 NOB	05/18/2021	Gray		100.00% Other	**None Detected**
Sample ID 1717506-G15 *142101623-0015*		**Description** White Gasket Hot Water Converter 2A Room B19 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	05/17/2021	Brown	10.00% Cellulose 15.00% Synthetic	75.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 1717506-G16 *142101623-0016*		**Description** White Gasket Hot Water Converter 2A Room B19 **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	05/17/2021	Brown	10.00% Cellulose 15.00% Synthetic	75.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

Initial report from: 05/18/2021 10:34:20

EMSL Analytical, Inc.
490 Rowley Road Depew, NY 14043
Tel/Fax: (716) 651-0030 / (716) 651-0394
http://www.EMSL.com / buffalolab@emsl.com

EMSL Order:	142101623
Customer ID:	WATT50
Customer PO:	
Project ID:	

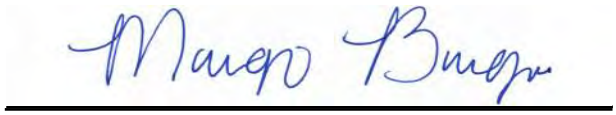
Test Report:Asbestos Analysis of Bulk Material

The samples in this report were submitted to EMSL for analysis by Asbestos Analysis of Bulk Materials via NYS ELAP Approved Methods . The reference number for these samples is the EMSL Order ID above. Please use this reference number when calling about these samples.

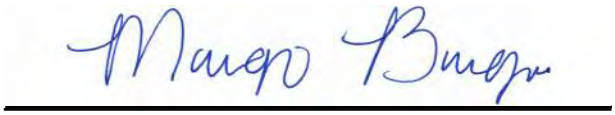
Report Comments:

Sample Receipt Date:	5/17/2021	Sample Receipt Time:	8:00 AM
Analysis Completed Date:	5/18/2021	Analysis Completed Time:	10:04 AM

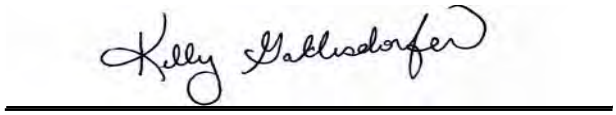
Analyst(s):



Margo Burgio PLM NYS 198.1 Friable (4)



Margo Burgio PLM NYS 198.6 NOB (9)



Kelly Gallisdorfer TEM NYS 198.4 NOB (9)

Samples reviewed and approved by:

Rhonda McGee, Laboratory Manager
or Other Approved Signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.
All samples examined for the presence of vermiculite when analyzed via NYS 198.1.
-NYS Guidelines for Vermiculite containing samples are available at http ://www.wadsworth.org/labcert/elapcert/forms/ VermiculiteInterimGuidance_Rev070913.pdf EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations . Interpretation and use of test results are the responsibility of the client. Samples were received in good condition unless otherwise noted.
This report must not be used by the client to claim product certification , approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation .

Samples analyzed by EMSL Analytical, Inc. Depew, NY NYS ELAP 11606, NVLAP Lab Code 200056-0

Initial report from: 05/18/2021 10:34:20

BULK SAMPLE CHAIN-OF-CUSTODY FORM

The purpose of the chain-of-custody form is to reduce the possibility of misidentifying individual samples, to help trace any samples that may be lost, and to provide a record certifying that the samples were delivered to and received by the analytical laboratory.

An important feature of this form is the signature section at the bottom, identifying all persons who handled the samples.

20-12-146

WATTS ARCHITECTURE & ENGINEERING

Watts Architecture & Engineering
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

POSTED

Client: EME GROUP CONSULTING ENGINEERS
Project: COOK CHILL PRODUCTION CENTER
Building/Location: 145 OLD ORANGEBURG ROAD, ORANGEBURG, NY 10962
Samples Collected by: NASEEM KHAN At 917-642-6632
Email Results to: nkhan@watts-ae.com
Mail Report & Invoice to: Watts Architecture & Engineering
95 Perry Street, Suite 300, Buffalo, NY 14203

Date: 12/ 23 /2020
Watts Project No.: 1717506

Turnaround Requested:
6 Hr. | 72 Hr
12 Hr. | 4 Day
24 Hr. | X 5 Day
48 Hr. | Other

Analysis Requested: PLM X TEM X

HA#	Sample Number	Material Description	Friable (Y/N)	Sample Location	Notes	Qtys	Laboratory Results
01	01	MORTAR OF CINDER BLOCK WALL (GREY)	Y	BASEMENT- ROOM B-5		(-) NAD	
↓	02	↓	↓	- B-7		↓	
↓	03	↓	↓	- B-19			
02	04	PAPER WRAP OVER FIBERGLASS PIPE & ELBOW INSULATION & VALVES (WHITE)		- ROOM B-5		(-) NAD	
↓	05	↓	↓	- ↓		↓	
↓	06	↓	↓	- B-19			
03	07	SEALANT ON ENDS OF FIBERGLASS INSULATIONS (WHITE)	N	- B-5			(-) NAD (-) NAD
↓	08	↓	↓	- B-19			↓ ↓
04	09	2'X2' SUSPENDED CEILING TILES (WHITE/GREY)	Y	- ROOM B-7			(-) NAD (-) NAD
↓	10	↓	↓	- ↓ ↓			↓ ↓
05	11	MASTIC OF 12"X12" FLOORTILES OVER CONCRETE FLOOR (BLACK)	N	-			(-) NAD (-) NAD
↓	12	↓	↓	-			↓ ↓
06	13	12"X12" FLOORTILES OVER CONCRETE (GREY)		-			(-) NAD (-) NAD
↓	14	↓	↓	-			↓ ↓
07	15	MASTIC OF COVE BASE ON WALL (BROWN/GREY)		-			(-) NAD (-) NAD
↓	16	↓	↓	- ↓ ↓			↓ ↓

Relinquished By: NASEEM KHAN (Print Name) Date: 12-24-20 Time: 1300 Received By: Ariel Patanova (Print Name) Date: 12/24/20 13:00

Relinquished By: E. Loukianoye Esq (Signature) Date: 12.28.20 Time: _____ Received By: _____ (Signature) Date: _____

Comments: *Please stop at the first positive in each Homogenous Area. Please analyze only material listed on the chain of custody.*

20-12-146

WATTS ARCHITECTURE & ENGINEERING

Watts Architecture & Engineering
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: EME GROUP CONSULTING ENGINEERS
Date: 12/ 23 /2020
Project: COOK CHILL PRODUCTION CENTER
Watts Project No.: 1717506
Building/Location: 145 OLD ORANGEBURG ROAD, ORANGEBURG, NY 10962
Samples Collected by: NASEEM KHAN **At** 917-642-6632
Email Results to: nkhan@watts-ae.com
Mail Report & Invoice to: Watts Architecture & Engineering
95 Perry Street, Suite 300, Buffalo, NY 14203

Turnaround Requested: 6 Hr. / 12 Hr. / 24 Hr. / 48 Hr. / 72 Hr / 4 Day / X 5 Day / Other
Analysis Requested: PLM X TEM X

HA#	Sample Number	Material Description	Friable (Y/N)	Sample Location	Notes	Qtys	Laboratory Results
08	17	COVEBASE ON WALL (GREY)	N	BASEMENT- ROOM B-7			(-) NAD (-) NAD
↓	18	↓	↓	↓			↓
09	19	SEALANT ON METAL DUCT JOINTS (BROWN)		B-19			(-) NAD (-) NAD
↓	20	↓	↓	↓			↓
10	21	SHEETROCK WALL & CEILING (GREY)	Y	FIRST FLOOR - ENTIRE		(-) NAD	
↓	22	↓	↓	↓		↓	
↓	23	↓	↓	↓			
11	24	JOINT COMPOUND TO SHEETROCK (WHITE)				(-) NAD	
↓	25	↓	↓	↓		↓	
↓	26	↓	↓	↓			
12	27	PAPER TAPE ON JOINTS (LIGHT BROWN)				(-) NAD	
↓	28 X	↓	↓	↓		↓	
↓	29	↓	↓	↓			
13	30	PAPER WRAP OVER FIBERGLASS PIPE & ELBOW INSULATION (WHITE)				(-) NAD	
↓	31	↓	↓	↓		↓	
↓	32	↓	↓	↓			

Relinquished By: NASEEM KHAN (Print Name) Date: 12-24-20 Time: 1300 Received By: [signature] (Print Name) Date: 12/24/20 13:00

~~Relinquished~~ By: [signature] (Signature) Date: 12.28.20 Time: _____ Received By: _____ (Signature) Date: _____

Comments: *Please stop at the first positive in each Homogenous Area. Please analyze only material listed on the chain of custody.*

20-12-146

WATTS ARCHITECTURE & ENGINEERING

Watts Architecture & Engineering
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: EME GROUP CONSULTING ENGINEERS — **Date:** 12/ 23 /2020

Project: COOK CHILL PRODUCTION CENTER — **Watts Project No.:** 1717506

Building/Location: 145 OLD ORANGEBURG ROAD, ORANGEBURG, NY 10962

Samples Collected by: NASEEM KHAN — **At** 917-642-6632

Email Results to: nkhan@watts-ae.com

Mail Report & Invoice to: Watts Architecture & Engineering, 95 Perry Street, Suite 300, Buffalo, NY 14203

Turnaround Requested: 6 Hr. / 12 Hr. / 24 Hr. / 48 Hr. / 72 Hr / 4 Day / X 5 Day / Other

Analysis Requested: PLM X TEM X

HA#	Sample Number	Material Description	Friable (Y/N)	Sample Location	Notes	Qtys	Laboratory Results	
14	33	2'x2' SUSPENDED CEILING TILES (ACOUSTICAL) (WHITE/GREY)	Y	FIRST FLOOR – ENTIRE			(-)NAD	(-)NAD
↓	34	↓	↓	↓			↓	↓
15	35	CARPET MASTIC ON CONCRETE (BROWN)	N	–			(-)NAD	(-)NAD
↓	36	↓	↓	–			↓	↓
16	37	WALL PAPER (SELF STICKING) OFF WHITE		–			(-)NAD	(-)NAD
↓	38	↓	↓	– ↓			↓	↓
17	39	2'x2' SUSPENDED PLAIN CEILING TILES (GREY)	Y	– ROOM 1-17			(-)NAD	(-)NAD
↓	40	↓	↓	– ↓			↓	↓
18	41	MORTAR OF WALL CINDERBLOCKS (GREY)		– OUTSIDE 1-17		(-)NAD		
↓	42	↓	↓	– CLOSET 1-1		↓		

Relinquished By: NASEEM KHAN (Print Name) Date: 12-24-20 Time: 1300 Received By: Print Name Date: 12/24/20 13:00

Relinquished By: E. Loukianova (Signature) Date: 12.28.20 Time: Received By: (Signature) Date:

Comments: *Please stop at the first positive in each Homogenous Area. Please analyze only material listed on the chain of custody.*

Watts Architecture & Engineering

ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

Client: DASNY/EMS Group **Date:** 03/26/2021

Project: Rockland PC/Cook Chill Plant **Watts Project No.:** 1717506

Building/Location: 145 Old Orangeburg Road, Orangeburg, NY

Samples Collected by: Leo Abramov, Vladimir Kasheev **at (646) 954-4458**

Email Results to: labramov@watts-ae.com

Mail Report & Invoice to: Watts Architecture & Engineering
95 Perry Street, Suite 300, Buffalo, NY 14203

Turnaround Requested: 6 Hr. ___ | 12 Hr. ___ | 24 Hr. ___ | 48 Hr. ___ | 72 Hr. ___ | 4 Day X | 5 Day ___ | Other: ___

Analysis Requested: PLM X TEM X

HA#	Sample Number	Material Description	Friable (Y/N)	Sample Location	Notes	Laboratory Results	
19	1717506-43	Red Gasket at Valves	N	MER B-19 Room – Center West			
↓	1717506-44	↓	↓	– Center North			
20	1717506-45	Green Gasket at Valves	N	MER B 14 Room – North West side	Present only at 1 Valve		
↓	1717506-46	↓	↓	↓	1 gasket 1 SD		
21	1717506-47	Blue Gasket at Valves	N	MER B 14 Room – Center West			
↓	1717506-48	↓	↓	↓			
22	1717506-49	Duct Seal, Red	N	1st Floor North Hallway By RS1 – North conduit			
↓	1717506-50	↓	↓	– South Conduit			
	1717506-						
	1717506-						
	1717506-						
	1717506-						
	1717506-						
	1717506-						
	1717506-						
	1717506-						

№221041490

Relinquished By: L. Abramov (Print Name) Date: 03/26/21

Relinquished By: (Signature) Date: 03/26/21

Received By: M. Villatoro (Print Name) Date: 4/7/2021

Received By: (Signature) Date: 0730

Comments: *Please stop at the first positive in each Homogenous Area*

WATTS ARCHITECTURE & ENGINEERING
ASBESTOS BULK SAMPLE CHAIN-OF-CUSTODY

142101623 Page: 1 of 1

Client: EME Group / DASNY
Project: Cook Chill Production Center
Building / Location: 145 Old Orangeburg Road, Orangeburg, NY
Contact: Edward Jones at (716) 206-5142
Preliminary Results to: ejones@watts-ae.com
Mail Report & Invoice to: Watts Architecture & Engineering, 95 Perry Street, Buffalo, NY 14203

Date: Thurs. May 13, 2021
Watts Project No.: 1717506

Turnaround Requested:

3 Hr.	48 Hr.
6 Hr.	72 Hr.
12 Hr.	X 4 Day
24 Hr.	5 Day
	7 Day

Analysis Requested: 198.1 x 198.6 x 198.4 x

Sample Number	Material Description	HA	Sample Location	Laboratory Results PLM	Laboratory Results TEM
17 17506-G01	Dark Gray Gasket at steam Trap, AC-1	23	Basement MER B-14, AC-1 steam condensate Line upper North	9 traps	
17 17506-G02	Dark Gray Gasket at steam trap AC-1	23	Basement MER B-14, AC-1 steam condensate Line Lower North		
17 17506-G03	Dark Gray Gasket at steam Trap HV-1	24	Basement MER B-14, HV-1 South side Lower	8 traps	
17 17506-G04	Dark Gray Gasket at steam Trap HV-1	24	Basement MER B-14, HV-1 South side - west at TAG ST17		
17 17506-G05	Brown Gasket Lo-Pressure steam supply HV-1	25	Basement MER B-14, HV-1 South side Lo-pressure steam supply TAG LPS-304		
17 17506-G06	Brown Gasket Lo-Pressure Steam Supply HV-1	25	Basement MER B-14, HV-1 South side Lo-pressure steam supply TAG LPS-304		
17 17506-G07	Dark Gray metalic Gasket Gate Valve HV-1	26	Basement MER B-14 HV-1 Top Flange Gate Valve steam Coil on HV-1 South		
17 17506-G08	Dark Gray metalic Gasket Gate Valve HV-1	26	Basement MER B-14 HV-1 Top Flange Gate Valve steam Coil on HV-1 South		
17 17506-G09	Green-Brown Gasket Valve HV-3	27	Basement MER B-14 HV-3 North end Lo-pressure upper steam supply Line		
17 17506-G10	Green-Brown Gasket Valve HV-3	27	Basement MER B-14 HV-3 North End Lo-pressure upper steam supply Line		
17 17506-G11	white Gasket Black Coating Valve HV-3	28	Basement MER B-14 HV-3 North End Lo-pressure steam supply Line Flange By Green gasket		
17 17506-G12	white Gasket Black Coating Valve HV-3	28	Basement MER B-14 HV-3 North End Lo-pressure steam supply Line Flange By Green gasket		
17 17506-G13	Dark Gray Gasket AC-4 Lo pressure steam supply	29	Basement MER B-14 AC-4 North side Lo-pressure steam supply Flange	4 steam traps	only accessible Gasket
17 17506-G14	Dark Gray Gasket AC-4 Lo Pressure steam supply	29	Basement MER B-14 AC-4 North side Lo-pressure Steam supply Flange		
17 17506-G15	white Gasket Hot water Converter 2A Room B19	30	Basement MER 2 B-19 North End Hot water converter 2 East Flange at TAG LPS valve 392		2 valves 4 Flanges 2 per valve
17 17506-G16	white Gasket Hot water Converter 2A Room B19	30	Basement MER 2 B-19 North End Hot water converter 2 west Flange at TAG LPS valve 392		

RECEIVED
MAY 17 2021
BY:

Sampled By: Edward J. Jones Date: 05/13/2021 Received By: Date: 8:00am DB
Relinquished By: Edward J. Jones Date: 05/15/2021 10:09 Received By: Date:

Comments: If PLM NOB is negative, analyze by TEM. Stop at first positive for each homogeneous material description group.
If Vermiculite is detected, cease analysis on that material and contact the Watts Project Manager for further instructions.

Page 1 Of 1

OrderID: 142101623

3.0 – POLYCHLORINATED BIPHENYLS (PCBs) IN CAULK/SEALANTS

3.0 PCBS IN CAULK/SEALANTS

Sampling and Laboratory Methodology

The Environmental Protection Agency (EPA) regulates PCBs and considers any debris generated from construction materials manufactured with PCBs derived from building renovation projects with a concentration of equal to or greater than 50 parts per million (ppm) as PCB bulk product waste. The Toxic Substances Control Act (TSCA) regulations (40 CFR Part 761) prescribes requirements for the proper management of PCB materials, including their handling and disposal. PCB bulk product waste at concentrations $\geq$50 ppm must follow specific storage, transport and disposal requirements.

There were two (2) samples collected for PCBs during Watts' site visit on December 23, 2020. The following sealants were tested:

- Sealant on the ends of fiberglass insulation
- Sealant on the ducts

The laboratory results indicated no PCBs were reported at or above 50 ppm.

HOMOGENEOUS MATERIALS LIST
ROCKLAND PSYCHIATRIC CENTER
COOK CHILL PRODUCTION CENTER - BMS REPLACEMENT PROJECT
145 OLD ORANGEGURG ROAD, ORANGEBURG, NY 10962

PCB Concentration (mg/kg or ppm)										
Sample Number	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Sample Description
PCB 01	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sealant on Ends of Fiberglass Insulation (White)
PCB 02	ND	ND	ND	ND	ND	ND	ND	ND	ND	Sealant on Metal Ducts (Brown)

Bold rows indicate PCB concentration >50ppm.
*Indicates that the material contains asbestos.

Abbreviations:
ND = Non Detected, below Reporting Limit
mg/kg = milligram per kilogram
ppm = parts per million

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Cook Chill Production Center
Location: 145 Old Orangeburg Road
Number: 1717506

Order #: 401022

Matrix Bulk
Received 01/15/21
Reported 01/20/21

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID / Method	Result	RL*	Units	Analysis Date	Analyst
401022-001	PCB-01 / Basement Room B5 & B19					
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1221	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1232	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1242	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1248	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1254	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1260	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1262	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
Aroclor - 1268	SW846 8082A	**<9840**	9840	µg/kg	01/15/21	BRW
PCB - Surrogate Recoveries						
DCB	D					
TCMX	D					
401022-002	PCB-02 / Basement Room B19					
Semi-volatile Organic Compounds						
Aroclor - 1016	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1221	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1232	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1242	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1248	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1254	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1260	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1262	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
Aroclor - 1268	SW846 8082A	**<451**	450	µg/kg	01/15/21	BRW
PCB - Surrogate Recoveries						
DCB	285%					
TCMX	111%					

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Analysis Report

Schneider Laboratories Global, Inc

2512 W. Cary Street • Richmond, Virginia • 23220-5117
804-353-6778 • 800-785-LABS (5227) • Fax 804-359-1475

Customer: Watts Architecture & Engineering (4637)
Address: 95 Perry Street Suite 300
Buffalo, NY 14203

Attn:

Project: Cook Chill Production Center
Location: 145 Old Orangeburg Road
Number: 1717506

Order #: 401022

Matrix Bulk
Received 01/15/21
Reported 01/20/21

PO Number: 7628

Sample ID / Parameter	Cust. Sample ID / Method	Result	RL*	Units	Analysis Date	Analyst
401022-01/20/21 12:22 PM						

Reviewed By: **Jennifer Lee**
Manager

State Certifications

Method	Parameter	New York	Virginia
SW846 8082A	Aroclor - 1016	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1221	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1232	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1242	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1248	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1254	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1260	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1262	ELAP Certified	VELAP Certified
SW846 8082A	Aroclor - 1268	ELAP Certified	VELAP Certified

State	Certificate Number
New York	ELAP 61372
Virginia	VELAP 11110

All internal QC parameters were met. Unusual sample conditions, if any, are described. Surrogate Spike results designated with "D" indicate that the analyte was diluted out. "MI" indicates matrix interference. Concentration and *Reporting Limit (RL) based on areas provided by client. Values are reported to three significant figures. Solid PPM = mg/kg | PPB = µg/kg and Water PPM = mg/L | PPB = µg/L. The test results reported relate only to the samples submitted.

Watts Architecture & Engineering

POLYCHLORINATED BIPHENYLS (PCBs) BULK SAMPLE CHAIN-OF-CUSTODY

Client: EME GROUP CONSULTING ENGINEERS
Project: COOK CHILL PRODUCTION CENTER
Building/Location: 145 OLD ORANGEGURG ROAD, ORANGEBURG, NY 10962
Samples Collected by: NASEEM KHAN **at (917) 642-6632**

Date: 12/23 /2020
Watts Project No.: 1717506
Turnaround Requested: X **7 Day** _____ **Other**

Email Results to: nkhan@watts-ae.com
Mail Report & Invoice to: **Watts Architecture & Engineering**
95 Perry Street, Suite 300, Buffalo, NY 14203

Analysis Requested: X **EPA SW-846 3540C/8082A**

Sample Number	Date Sampled	Time Sampled	ACM HA#	Sample Description	Sample Location
PCB-01	12/23/2020		03	SEALANTS ON ENDS OF FIBERGLASS INSULATION (WHITE)	BASEMENT – ROOM-B5 & B19
PCB-02	12/23/2020		09	SEALANTS ON METAL DUCTS A/C 3 AND 21 (BROWN)	BASEMENT – ROOM-B19

O 2
401022
V:\401\401022
fghraizi
UPS
1/15/2021 10:03:46 AM
1Z2E28998463346060

Sampled By: NASEEM KHAN Date: 12/23/2020 Received By: _____ Date: _____

Relinquished By: NASEEM KHAN Date: 1/13/2021 Received By: _____ Date: _____

Comments: _____

4.0 - LEAD-BASED PAINT

4.0 LEAD-BASED PAINT

Methodology

Painted building components were grouped by testing combinations. A testing combination is characterized by location, component type, substrate, and visible color. Refer to section 3.1 for a complete listing of all building component XRF readings taken in this building.

The LBP survey was performed using the Department of Housing and Urban Development (HUD) protocol. Certain aspects of the HUD guidelines are typically applied to public and commercial buildings, most commonly the levels used to establish LBP. HUD defines LBP, when analyzed by a portable XRF, as paint that contains lead at 1.0 milligram per square centimeter (1.0 mg/cm^2) or greater. When paint chips are analyzed by Atomic Absorption Spectroscopy (AAS), HUD defines LBP as paint containing 0.5 percent or greater ($\geq$0.5%) lead by weight.

For the purposes of this project, the Occupational Safety & Health Administration's (OSHA) Lead in Construction Standard (29 CFR 1926.62) applies. This standard applies to all construction work where an employee may be occupationally exposed to lead. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

- Demolition or salvage of structures where lead or materials containing lead are present;
- Removal or encapsulation of materials containing lead;
- New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- Installation of products containing lead;
- Lead contamination/emergency cleanup;
- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- Maintenance operations associated with the construction activities.

No lead-based paint samples were collected on December 23, 2020 within the project limits for the BMS replacement project since the scope of work will not impact the painted surfaces.

5.0 - UNIVERSAL WASTES AND MISCELLANEOUS HAZARDOUS MATERIALS

5.0 UNIVERSAL WASTES AND MISCELLANEOUS HAZARDOUS MATERIALS

Watts' conducted a Universal and Miscellaneous Hazardous Materials survey for the upgrades of the BMS Replacement project at the Rockland Psychiatric Center, located at 145 Old Orangeburg Road, Orangeburg, NY. No fluorescent-style lights with ballasts or other suspect universal waste or hazardous materials will be disturbed by this project.

At the time of Watts' site visit on December 23, 2020 within the project limits, disturbance to components with suspect universal waste or miscellaneous hazardous materials are not anticipated within the project limits.

6.0 – VISUAL OBSERVATIONS FOR MOLD

6.0 VISUAL OBSERVATIONS FOR MOLD

Watts was requested to observe (visually) for mold growth within the project limits. Mold Assessment Definition: Chapter Amendment to Article 32 of the NY State Labor Law, *"Mold Assessment"* means an inspection or assessment of real property that is designed to discover mold, conditions that facilitate mold, indicia of conditions that are likely to facilitate mold, or any combination thereof.

MOLD ASSESSMENT DEFINITION: As per the February 5, 2015 Chapter Amendment to Article 32 of the NY State Labor Law, *"Mold Assessment" means an inspection or assessment of real property that is designed to discover mold, conditions that facilitate mold, indicia of conditions that are likely to facilitate mold, or any combination thereof*.

For the purpose of describing the size of mold-affected areas, Watts refers to areas as being "Small", Medium", or "Large", as defined in the U.S. EPA document entitled *Mold Remediation in Schools and Commercial Buildings* (September 2008 version).

- A "Small" area is generally considered an area where the total surface area affected is less than ten (10) square feet.
- A "Medium" area is generally considered an area where the total surface area affected is between ten (10) and one hundred (100) square feet.
- A "Large" area is generally considered an area where the total surface area affected is greater than one hundred (100) square feet, or potential for increased occupant or remediator exposure during remediation is estimated to be significant.

REQUIREMENTS OF A MOLD REMEDIATION PLAN: As per the February 5, 2015 Chapter Amendment to Article 32 of the NY State Labor Law, a mold assessment licensee (i.e. a NYS licensed Mold Assessor) must prepare a Mold Remediation Plan as part of a Mold Assessment that is specific to each remediation project and provide the plan to the client before a remediation project begins.

During Watts' visit on December 23, 2020 and subsequent visits in 2021, visual evidence of mold growth was not observed on the surfaces that will be disturbed by the BMS Replacement Project at the Cook Chill Production Center at the Rockland Psychiatric Center. Naseem Khan was the mold assessor in 2020 and Leonid Abramov and Edward Jones were the assessors in 2021.

7.0 – LABORATORY ACCREDITATIONS

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. EMANUEL DIMITRAKAS
LABORATORY TESTING SERVICES INC
45-09 GREENPOINT AVENUE
LONG ISLAND CITY, NY 11104

NY Lab Id No: 10955

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual
Lead in Dust Wipes	EPA 7000B
Lead in Paint	ASTM D3335-85A

Sample Preparation Methods

ASTM E-1644-17

Serial No.: 61820

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 101958-0

Laboratory Testing Services Inc.

Long Island City, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2020-07-01 through 2021-06-30

Effective Dates

DEPARTMENT OF COMMERCE * UNITED STATES OF AMERICA *

For the National Voluntary Laboratory Accreditation Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos In Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos In Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 63000

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

AmeriSci New York
117 E. 30th Street
New York, NY 10016
Mr. Paul Mucha
Phone: 212-679-8600 Fax: 212-679-2711
Email: pmucha@amerisci.com
http://www.amerisci.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 200546-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

Effective 2020-07-01 through 2021-06-30

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200546-0

AmeriSci New York

New York, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2020-07-01 through 2021-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2022
Issued April 01, 2021

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. RHONDA R. MCGEE
EMSL ANALYTICAL INC
490 ROWLEY ROAD
DEPEW, NY 14043

NY Lab Id No: 11606

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 63042

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200056-0

EMSL Analytical, Inc.

Depew, NY

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2020-07-01 through 2021-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

EMSL Analytical, Inc.
490 Rowley Road
Depew, NY 14043
Ms. Rhonda McGee
Phone: (716) 651-0030 Fax: (716) 651-0394
Email: rmcgee@emsl.com
http://www.emsl.com/

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 200056-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

8.0 – CONSULTANT'S LICENSES AND CERTIFICATION

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

325 Gold Street, Suite 701
Brooklyn, NY 11201

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Watts Architecture & Engineering, D.P.C.
Suite 300
95 Perry Street

Buffalo, NY 14203

FILE NUMBER: 12-68007
LICENSE NUMBER: 68007
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 08/28/2020
EXPIRATION DATE: 09/30/2021

Duly Authorized Representative – Edward Watts:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

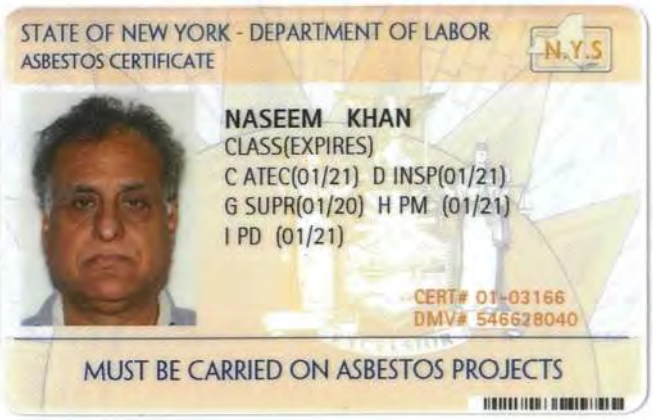
Eileen M. Franko, Director
For the Commissioner of Labor

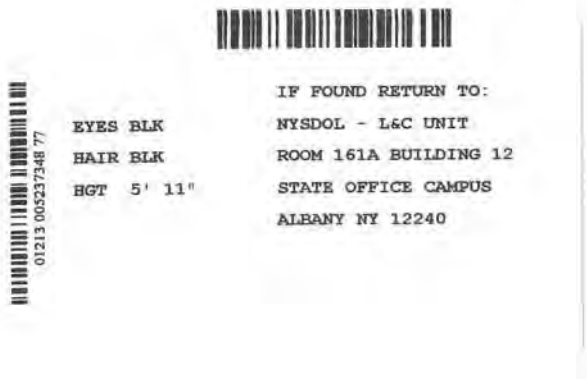
SH 432 (8/12)

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

325 Gold Street, Suite 701
Brooklyn, NY 11201





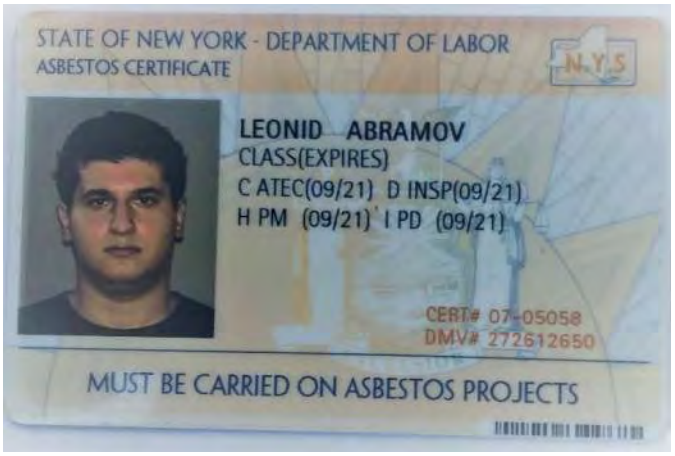
Naseem Khan

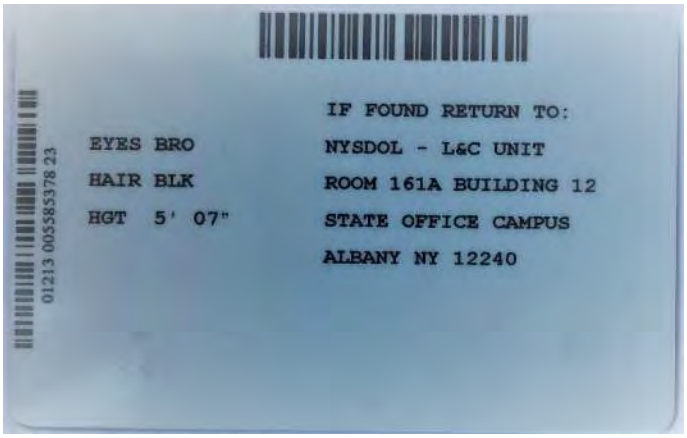
C – Air Sampling Technician
D – Inspector
G– Supervisor
H – Project Monitor
I – Project Designer

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

325 Gold Street, Suite 701
Brooklyn, NY 11201





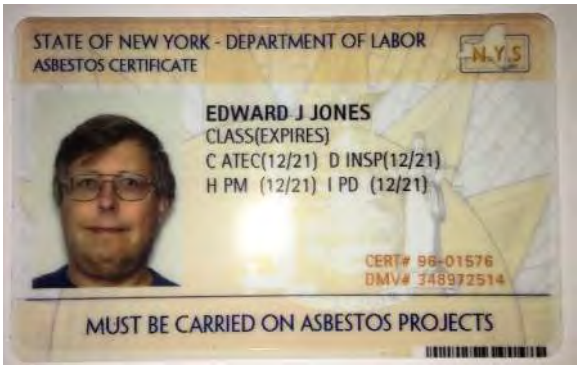
Leo Abramov

C – Air Sampling Technician
D – Inspector
H – Project Monitor
I – Project Designer

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

325 Gold Street, Suite 701
Brooklyn, NY 11201



Edward Jones

C – Air Sampling Technician
D – Inspector
H – Project Monitor
I – Project Designer

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300325
Buffalo, NY 14203

Gold Street, Suite 701
Brooklyn, NY 11201

United States Environmental Protection Agency

This is to certify that

Watts Architecture & Engineering

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires May 21, 2024

LBP-1952-2
Certification #

March 17, 2021
Issued On

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300325
Buffalo, NY 14203

Gold Street, Suite 701
Brooklyn, NY 11201

United States Environmental Protection Agency

This is to certify that

Naseem Khan

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires May 07, 2023

LBP-I-7286-2
Certification #

March 31, 2020
Issued On

Susan Schulz, Acting Chief
Chemicals and Multimedia Programs Branch

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

325 Gold Street, Suite 701
Brooklyn, NY 11201

NEW YORK STATE - DEPARTMENT OF LABOR
DIVISION OF SAFETY AND HEALTH
LICENSE AND CERTIFICATE UNIT
STATE CAMPUS BUILDING 12

Mold Assessor Company License

Watts Architecture + Engineering, D.P.C.
d\b\a\: Edward O. Watts
95 Perry St, Suite 300
BUFFALO, NY 14203

LICENSE NUMBER: 00127
DATE OF ISSUE: 1/31/2020
EXPIRATION DATE 12/31/2021

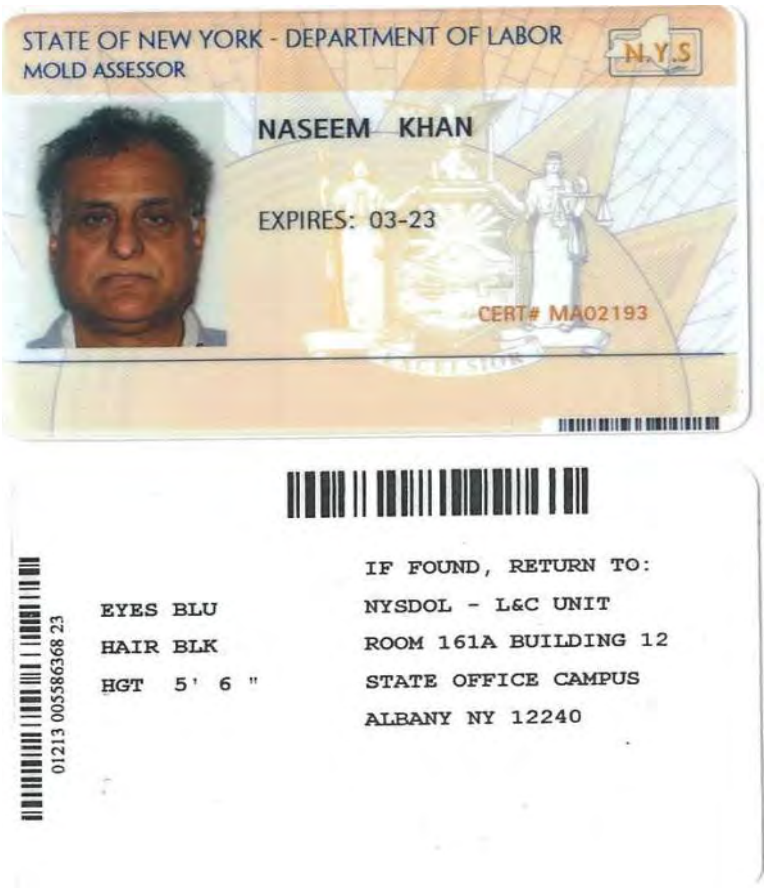
This license is valid only for the contractor named above.

Eileen Franko, Director
FOR THE COMMISSIONER OF LABOR

120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

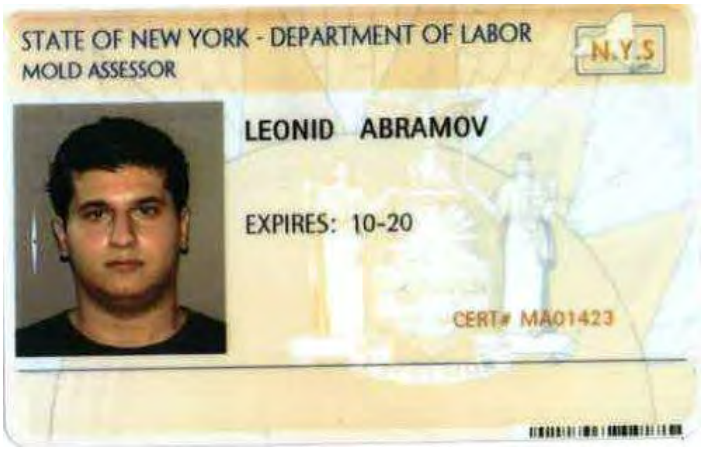
325 Gold Street, Suite 701
Brooklyn, NY 11201



120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

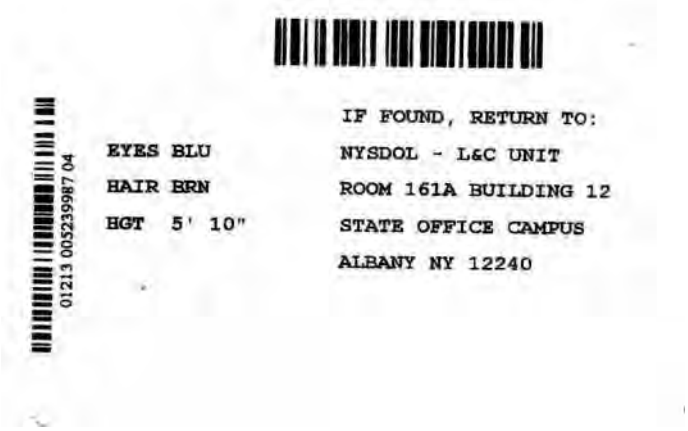
325 Gold Street, Suite 701
Brooklyn, NY 11201



120 E. Washington St., Suite 414
Syracuse, NY 13202

95 Perry Street, Suite 300
Buffalo, NY 14203

325 Gold Street, Suite 701
Brooklyn, NY 11201



APPENDIX A – PREVIOUS TESTING

Adelaide
Environmental Health Associates, Inc.

1511 Route 22, Suite C24
Brewster, NY 10509 845.278.7710

90 State Street, Suite 700
Albany, NY 12207 518.874.0617

1967 Wehrle Drive, Suite One
Buffalo, NY 14221 716.402.4580

E-mail: adelaidemail@adelaidellc.com
Fax: 845.278.7750

RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS AND LEAD BASED PAINT

PERFORMED AT:

Cook Chill Production Center
Kettle Replacement
145 Old Orangeburg Road
Orangeburg, New York 10962
Adelaide Project# MACF: 16147.00-IN
OGS Project No.: 45426

PREPARED FOR:

John Miranowski
McFarland Johnson
49 Court Street
P.O. Box 1980
Binghamton, New York 13902

PREPARED BY:
Jason Fullum
July 6, 2016

REVIEWED BY:

Stephanie A. Soter
President

RENOVATION SURVEY FOR ASBESTOS CONTAINING MATERIALS AND LEAD BASED PAINT

TABLE OF CONTENTS

APPENDICES

1.0 BACKGROUND/PURPOSE

Adelaide Environmental Health Associates, Inc. (Adelaide) was retained by McFarland Johnson to perform an investigative asbestos and lead based paint survey at the Cook Chill Production Center in Orangeburg, New York. This survey was based on the scope provided by John Miranowski for renovation work to provide new kettles to the cooking area. The inspection was performed on June 28, 2016 by Adelaide representative Jason Fullum (NYS Asbestos Inspector and EPA Lead Based Paint Inspector).

2.0 EXECUTIVE SUMMARY OF INSPECTION RESULTS

Following the scope of work that was given to us, Adelaide inspected the above mentioned areas for asbestos and lead based paint. Adelaide collected ten (10) asbestos samples from the above mentioned areas. Zero (0) samples/homogenous areas tested positive for asbestos.

There were no painted surfaces to test for lead based paint. The first floor was not inspected as per OGS instructions that there were no suspect items due to past renovations.

2. 1 SUMMARY OF ASBESTOS CONTAINING MATERIALS

Samples Collected by Adelaide on June 28th, 2016

Sample #	Material Sampled	Approximate Quantity	Condition	Areas Affected
No Positive Samples				

2.2 SUMMARY OF LEAD BASED PAINT

Readings Taken by Adelaide on June 28th, 2016

Sample #	Sample Location	Material Sampled	Reading (mg/cm2)
No Readings Taken			

2.3 NEGATIVE MATERIALS LIST:

- Red Fire Stop
- White Sealant on Pipe Ends
- Mudded Fitting on Fiberglass Pipe Insulation
- Concrete

3.0 ASBESTOS FIELD PROCEDURES AND ANALYSIS METHODOLOGY

3.1 INSPECTION

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA). Field information was organized as

per the AHERA concept of a homogeneous area (HA); that is, suspect Asbestos Containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous.

Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster).

Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue).

Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

3.2 SAMPLING

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply

- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

3.3 ANALYSIS

Bulk samples of suspect ACM were analyzed by Polarized Light Microscopy (PLM) with dispersion staining, as described in 40CFR Part 763 and the National Emissions Standard for Hazardous Air Pollutants (NESHAPS).

The New York State (NYS) Department of Health has recently revised the PLM Stratified Point Counting Method. The new method, Polarized Light Microscopy for Identifying and Quantitating Asbestos in Bulk Samples can be found as Item 198.1 in the Environmental Laboratory Accreditation Program (ELAP) Certification manual.

The State of New York ELAP has determined that analysis of NOB materials is not reliably performed by PLM. Therefore, if PLM yields negative results for a non-friable material, it must be confirmed by Transmission Electron Microscopy (TEM) analysis.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This survey concluded that the materials listed in Section 2.0 Executive Summary is negative for asbestos and for lead based paint.

5.0 AREAS NOT ACCESSIBLE

Adelaide Environmental Health Associates inspected and sampled materials which were visible and/or accessible to the survey team. Adelaide does not inspect physically inaccessible areas, such as between walls, above fixed ceilings, under concrete slabs, etc. This report makes no representations as to the content of these areas or materials.

All materials present in those not accessible areas shall be assumed positive until tested.

6.0 REPORT CERTIFICATIONS

Adelaide Environmental Health Associates certifies that the information contained herein is based on the physical and visual inspections conducted by Adelaide and data collected during the inspection survey. This survey report does not constitute a NYS Asbestos Abatement Design and should not be used for bidding purposes. A NYS Abatement Design should be prepared by a NYS Asbestos Designer working for a NYS Asbestos Company (as required by NYS Code Rule 56).

7.0 TRANSMITTAL OF BUILDING/STRUCTURE ASBESTOS SURVEY

One (1) copy of the results of the building/structure asbestos survey shall be immediately transmitted by the building/structure owner as follows:

(1) One (1) copy of the completed asbestos survey shall be sent by the owner or their agent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling or repair work under applicable State or local laws.

(2) The completed asbestos survey for controlled demolition (as per Subpart 56-11.5) or pre-demolition asbestos projects shall also be submitted to the appropriate Asbestos Control Bureau district office.

(3) The completed asbestos survey shall be kept on the construction site with the asbestos notification and variance, if required, throughout the duration of the asbestos project and any associated demolition, renovation, remodeling or repair project.

APPENDIX A

ASBESTOS ANALYTICAL RESULTS

AND CHAIN OF CUSTODY FORMS

AmeriSci Job #: **216065004**

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

OGSx:16147.00-IN; Cook Chill Production Ctr.; 145 Old Orangeburg Road, Orangeburg, NY 10962

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	0.123	25.2	44.7	30.1	NAD	NAD
Location: Floor B - Red Fire Stop - Penetration								
02	2	1	0.179	41.9	43.0	15.1	NAD	NAD
Location: Floor B - Red Fire Stop - Penetration								
03	3	2	0.207	47.8	39.1	13.0	NAD	NAD
Location: Floor B - White Sealant On Pipe Ends								
04	4	2	0.240	46.7	37.5	15.8	NAD	NAD
Location: Floor B - White Sealant On Pipe Ends								
05	5	2	0.195	48.2	38.5	13.3	NAD	NAD
Location: Floor B - White Sealant On Pipe Ends								
06	6	3	---	---	---	---	NAD	NA
Location: Floor B - Mudded Fitting On Fiberglass								
07	7	3	---	---	---	---	NAD	NA
Location: Floor B - Mudded Fitting On Fiberglass								
08	8	3	---	---	---	---	NAD	NA
Location: Floor B - Mudded Fitting On Fiberglass								
09	9	4	---	---	---	---	NAD	NA
Location: Floor B - Concrete								
10	10	4	---	---	---	---	NAD	NA
Location: Floor B - Concrete								

Analyzed by: Marik Peysakhov_____; Date Analyzed 7/1/2016

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by EPA 600/M4-82-020 per 40 CFR or ELAP 198.1 for New York friable samples or ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (not covered by NVLAP Bulk accreditation) or ELAP 198.4; for New York samples; NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By:_____

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22, Suite C24

Brewster, NY 10509

Date Received 06/29/16 **AmeriSci Job #** 216065004
Date Examined 06/30/16 **P.O. #**
ELAP # 11480 **Page** 1 **of** 3
RE: OGSx:16147.00-IN; Cook Chill Production Ctr.; 145 Old Orangeburg Road, Orangeburg, NY 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1 1	216065004-01 **Location:** Floor B - Red Fire Stop - Penetration	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 06/30/16
	Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 1 %, Non-fibrous 29.1 %		
2 1	216065004-02 **Location:** Floor B - Red Fire Stop - Penetration	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 06/30/16
	Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 2 %, Non-fibrous 13.1 %		
3 2	216065004-03 **Location:** Floor B - White Sealant On Pipe Ends	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 06/30/16
	Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 13 %		
4 2	216065004-04 **Location:** Floor B - White Sealant On Pipe Ends	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 06/30/16
	Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 15.8 %		
5 2	216065004-05 **Location:** Floor B - White Sealant On Pipe Ends	*No*	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 06/30/16
	Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass Trace, Non-fibrous 13.3 %		

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSx:16147.00-IN; Cook Chill Production Ctr.; 145 Old Orangeburg Road, Orangeburg, NY 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	216065004-06 **Location:** Floor B - Mudded Fitting On Fiberglass	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 06/30/16
	Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 20 %, Non-fibrous 80 %		
7 3	216065004-07 **Location:** Floor B - Mudded Fitting On Fiberglass	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 06/30/16
	Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 25 %, Non-fibrous 75 %		
8 3	216065004-08 **Location:** Floor B - Mudded Fitting On Fiberglass	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 06/30/16
	Analyst Description: Grey, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Fibrous glass 15 %, Non-fibrous 85 %		
9 4	216065004-09 **Location:** Floor B - Concrete	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 06/30/16
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %		
10 4	216065004-10 **Location:** Floor B - Concrete	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 06/30/16
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %		

See Reporting notes on last page

PLM Bulk Asbestos Report

OGSx:16147.00-IN; Cook Chill Production Ctr.; 145 Old Orangeburg Road, Orangeburg, NY 10962

Reporting Notes:

Analyzed by: Valeriu Voicu

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by EPA 600/M4-82-020 per 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples or EPA 400 pt ct by EPA 600/M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:_____

END OF REPORT

Adelaide Environmental Health Associates, Inc
1511 Route 22, Suite C24
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#216065004

Site Address:	Date:	Inspector(s)
Cook Chill Production Ctr	06/28/16	Jason Fullum
145 Old Orangeburg Road		
Orangeburg, NY 10962	Project #: OGSx:16147.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
1	1	B	Red Fire Stop - Penetration	10SF	NF	D
2	1	B	↓ ↓	↓	↓	D
3	2	B	White Sealant on Pipe Ends	20SF	NF	G
4	2	B	↓	↓	↓	G
5	2	B	↓	↓	↓	G
6	3	B	Mudded fitting on Fiberglass	2 Fittings	F	D
7	3	B	↓	↓	F	D
8	3	B	↓	↓	F	D
9	4	B	Concrete	20SF	NF	G
10	4	B	↓	↓	↓	G

Special Instructions/ Turnaround Time:

Stop at 1st Positive per Homogenous Area — *3 day TAT*

E-Mail Results to AdelaideLabResults@adelaidellc.com

Relinquished by:

Received by:

Relinquished by:

Received by:

6/29/16 1353

APPENDIX B

PERSONNEL AND LABORATORY CERTIFICATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
Suite C24
1511 Route 22

Brewster, NY 10509

FILE NUMBER: 99-0656
LICENSE NUMBER: 29305
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 06/30/2016
EXPIRATION DATE: 07/31/2017

Duly Authorized Representative – John Soter

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2017

NAT-15081-1
Certification #

November 21, 2012
Issued On

Michelle Price, Chief
Lead, Heavy Metals, and Inorganics Branch

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2017
Issued April 01, 2016

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 54287

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

JASON P FULLUM
CLASS(EXPIRES)
C ATEC(02/17) D INSP(02/17)
H PM (02/17) I PD (02/17)

CERT# 97-20574
DMV# 375065936

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 0007298805 6

EYES BLU
HAIR BRO
HGT 5' 11"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

New York

RISK ASSESSOR

Certified Lead-Based Paint Professional

Certification No.	NY-R-12098-4
Date of Birth 02/26/1974	Expiration Date 07/11/2017
Address 3 Calmer Place Hyde Park, NY 12538	
Badge Holder's Name Jason Pierre Fullum	
Badge Holder's Signature	

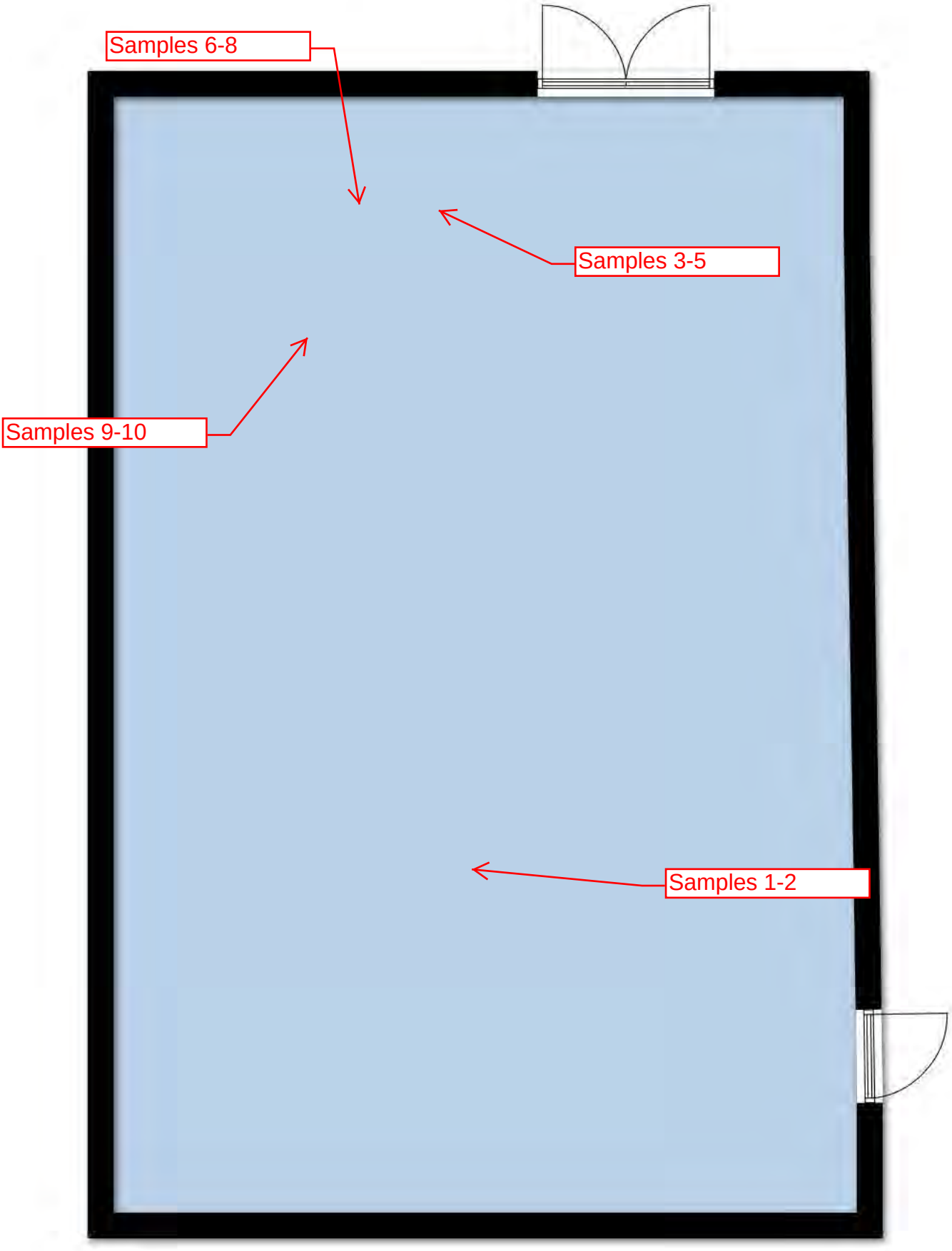
If found, drop in any mailbox
Postmaster: Please return to:

US EPA
1200 Pennsylvania Ave, NW
(MC-7404T)
Washington, DC 20460
or Call 1-800-424-LEAD

APPENDIX C

SAMPLE LOCATION MAP

Cook Chill Production Center
MACF:16147.00-IN
Basement



Adelaide
ENVIRONMENTAL HEALTH

1511 Route 22, Suite C24
Brewster, NY 10509 845.278.7710
90 State Street, Suite 700
Albany, NY 12207 518.874.0617
1967 Wehrle Drive, Suite One
Buffalo, NY 14221 716.402.4580
E-mail: adelaidemail@adelaidellc.com
Fax: 845.278.7750

LIMITED SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS, LEAD-BASED PAINT & PCBs

PERFORMED AT:

Rockland Cook-Chill Production Center
145 Old Orangeburg Road
Orangeburg, New York 10962
Adelaide Project# FPM:19318.01-IN

PREPARED FOR:

Chris Schwarz
FPM Group, Ltd.
909 Marconi Avenue
Ronkonkoma, New York 11779

PREPARED BY:
David Seddon
September 28, 2019

REVIEWED BY:

Stephanie A. Soter
President

TABLE OF CONTENTS

APPENDICES

1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos, Lead and PCB Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations, on September 12, 2019 for FPM Group throughout the basement MER room for removal and replacement of units HV-1, HV-3 and AC-1, located at Rockland Cook-Chill Production Center in Orangeburg, New York. The survey included 1) review of building/structure plans, provided by FPM Group, for references to the scope of work potentially affecting hazardous materials used in construction, renovation or repair; and, 2) a visual inspection/assessment for hazardous materials throughout accessible interior and/or exterior spaces of the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired. Certified **Adelaide** personnel (Appendix E), David Seddon (NYS Asbestos Inspector/Cert. #09-08546 and EPA Lead-based Paint Inspector/Cert. #LBP-I-101120-1), performed the visual assessment throughout inspection area(s) identified.

1.2 Executive Summary

Adelaide inspected all areas that will be affected by the removal and replacement of units HV-1, HV-3 and AC-1 for suspect ACM, LBP and PCBs. **Adelaide** collected twenty two (22) suspect asbestos samples/layers, zero (0) XRF readings [including calibrations] and one (1) suspect PCB sample from the above-mentioned area(s). One (1) samples/homogenous area tested positive for asbestos and zero (0) samples tested positive for PCBs.

1.2.1 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

1.2.2 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.1 tested ***positive for asbestos***.

- Subpart 56-5(h) of 12 NYCRR Part 56 requires that no demolition, renovation, remodeling, or repair work be commenced by any owner or the owner's agent prior to the completion of asbestos abatement. Asbestos abatement must be performed by an asbestos abatement contractor that maintains a current asbestos handling license, and employs NYSDOL/NYCDEP certified asbestos handlers and supervisors. It is recommended that a 12 NYCRR 56 certified Project Monitor oversee abatement activities.

- Subpart 56-5(g) of 12 NYCRR Part 56 specifies requirements for transmittal of asbestos survey information by the owner or owner's agent. (1) One copy of the asbestos survey report shall be sent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling, or repair work under applicable State or local laws. (2)If controlled demolition or pre-demolition activities will be performed, one copy of the asbestos survey report shall be submitted

to the appropriate Asbestos Control Bureau district office. (3) One copy of the asbestos survey report must be kept on the construction site throughout the duration of the asbestos project and any associated demolition, renovation, remodeling, or repair project.

1.2.3 Lead-based Paint (LBP)

- This survey concluded that no painted surfaces were observed to be impacted by the above-mentioned scope of work.

1.2.4 PolyChlorinated Biphenyls (PCB)

- This survey concluded that the materials listed in Appendix D tested ***negative for PCBs.***

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure.

Samples collected by **Adelaide** September 12, 2019

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
008	Valve/Flange Gasket	MRE Room – Valves/Flanges for HV-1, HV-3 and AC-1	Approx. 20 Gaskets 20-40SF	Good	No

2.2 Summary of Identified Non-ACM

Samples collected by **Adelaide** September 12, 2019

Identified Non-ACM	Sample Location(s) & HA's
Fiberglass Pipe Insulation Wrap	Basement MER Room
Sealant at Fiberglass Pipe Ends (white)	
Sealant at Duct Seams (gray)	
Sealant at Unit Connections (black)	
Vibration Cloth	
Sealant at Duct Seams (gray/brown)	
Duct Wall Fiberglass Insulation Wrap	
Concrete	
Caulking at Louvers	Exterior

2.3 ACM Photos

HA 008 Gaskets for Flange/Valves 66.7% Chrysotile	

2.4 Summary of Identified LBP

Based on review of the data generated by the Thermo Scientific Niton XLp 300A Analyzer, the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Readings collected by **Adelaide** September 12, 2019

Location of LBP	LBP Component	Substrate	Color	Condition	Readings (mg/cm2)
NO painted surfaces were observed to be impacted by the above-mentioned scope of work.					

2.5 Summary of Identified PCB-containing Materials

Samples collected by **Adelaide** September 12, 2019

Sample #	Location / Description	Material Matrix	Color	Substrate	Analytical Result
NO PCB-containing materials were identified above the USEPA 40 CFR 761 threshold of 50 ppm(mg/kg) of samples collected/analyzed in reference to the above-mentioned scope of work.					

2.6 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)

A visual inspection was performed and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

Representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Concrete.
- Wall Materials – Concrete.
- Flooring Materials – Concrete.
- Thermal System Insulation – Fiberglass Pipe Wrap, Duct Fiberglass Insulation Wrap.
- Miscellaneous Materials – Gaskets, Sealants (multiple types), Caulking, Vibration Cloth.
- Non-suspect Materials (not sampled) – Fiberglass Insulation, Silicone, Wood, Glass, Metal.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.

- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)
The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply
- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS
Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL
In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's

responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

NEW YORK CITY

Asbestos Control Program (ACP), Title 15, Chapter 1 of the New York City Department of Environmental Protection (NYCDEP) regulates all asbestos abatement activities occurring within the City of New York. The ACR regulations also require asbestos surveys and abatement work to be performed by a NYCDEP certified asbestos investigator and asbestos workers, respectively.

The New York City Department of Buildings (NYCDOB) requires an ACP notification to be included with the renovation/demolition permit applications. The notification is performed using an ACP 5 or ACP 20/21 forms.

All confirmed ACM will need to be removed prior to any building renovation or demolition. The removal and disposal of ACM must be performed by a NYS-DOL licensed asbestos handling contractor in accordance with Federal, state, and local regulations. Proper notifications must be filed with the US-EPA, NYS-DOL, NYC-DEP and other regulatory agencies prior to performing such activities.

As required by the NYS-DOL and NYC-DEP regulations, the abatement project must be monitored by a NYS-DOL certified project monitor. The project monitor oversees contractor's work practices and also performs pre, during, and final clearance post abatement air sampling in accordance with the state and city regulations.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 Lead-based Paint (LBP)

4.1 Applicable Standards/Guidelines for LBP

The U.S Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface ($\geq$1.0 mg Pb/cm^2) when measured with an XRF analyzer or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990". The state of New York's definition of the action level for lead-based paint is consistent with the level established by HUD.

Please note that although the HUD defines lead based paint as paint having lead concentrations equal or greater than 1.0 mg/cm2, the Occupational Safety and Health Administration (OSHA) considers any concentration of lead in paint to be lead containing paint. Regardless of the lead concentrations in paint, the contractor shall comply with 29 CFR 1926.62, OSHA regulations, and take precautionary measures for dust control and limit employee exposure to lead dust during the renovations.

Painted surfaces that would be impacted by planned activities such as drilling, cutting, scrapping, etc. and create dust should be properly addressed by following safe work practices, good housekeeping procedures and/or following proper abatement procedures. Grinding and sanding of paint without HEPA filter exhaust, open flame gas fired torch, unconfined abrasive blasting, and chemical strippers containing methylene chloride or other human carcinogenic chemicals are not recommended.

The Federal Resource Conservation and Recovery Act (RCRA) regulation governs the handling, transportation, and disposal of hazardous materials. Every demolition/renovation debris generator has the responsibility to determine whether the debris exhibits one or more of the characteristic wastes listed in subpart C of 40 CFR Part 261. In the case of demolition debris, lead in LBP is a characteristic waste, and therefore, it is the responsibility of the renovation/demolition debris generator to characterize the waste prior to its disposal and, if found to be hazardous waste as defined by Federal Statutes, to be properly handled and disposed.

Metal objects painted with LBP are exempt from disposal regulations applicable to lead, provided they are properly recycled. All metal objects that are painted with LBP should be sent to a certified recycling facility.

This report is not Lead-based Paint abatement specification and should not be used for specifying removal methods or techniques.

4.2 XRF Information

Thermo Scientific Niton XLp 300A X-Ray Fluorescence (XRF), Heuresis Corp. Pb200i X-Ray Fluorescence (XRF) Analyzer(s) were used to survey the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired for the presence of LBP. The XRF analyzers are using a sealed source of XLp 300A X-Ray Fluorescence (XRF) Cd109 with 40mCi and the Pb200i X-Ray Fluorescence (XRF) Co 57 with 5mCi sources , meeting HUD requirements for the analysis of paint films. During the analysis, the intensity of the x-rays is converted by the instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter. This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint. The results are displayed in milligrams per square centimeter (mg/cm2). The device(s) used for this inspection were the Thermo Scientific Niton XLp 300A Analyzer(s), Serial number 90719, Source date 3/15/14, Serial number 102951, Source date 9/15/17 and/or Serial number 101094, Source date 2/15/17 Heuresis Corp. Pb200i X-Ray Fluorescence (XRF) Analyzer(s)Serial Number 2104, Source date 1/24/19, Serial number 2231, Source date 4/22/19.

5.0 PolyChlorinated Biphenyls (PCB)

5.1 Background and Protocol for PCBs

PolyChlorinated Biphenyls (PCB) are a group of manmade chemicals. PCBs were widely used in building materials and electrical products in the past. The U.S. Environmental Protection Agency banned the manufacturing and certain uses of PCBs in 1978, but buildings constructed or renovated between 1950 and 1978 may still have building materials and electrical products that contain PCBs. Examples of products that may contain PCBs include caulk, paint, glues, plastics, fluorescent lighting ballasts, transformers and capacitors.

PCBs are currently prohibited from being used in caulk and other commodities (U.S. EPA, 40 CFR 761). However, prior to 1977, PCBs were present in some caulking materials used in the construction of schools and other buildings. Studies have shown that concentrations of PCB can exceed 1% (10,000 ppm) by weight in some caulk materials. An investigation of 24 buildings in the Greater Boston Area revealed that one-third of the buildings tested (8 of 24) contained caulking materials with polychlorinated biphenyl (PCB) content exceeding 50 ppm by weight with an average concentration of 15,600 ppm or 1.5% (Herrick et al., 2004). These buildings included schools and other public buildings.

The U.S. EPA regulates the disposal of caulk, as well as soil and other materials contaminated with PCBs from caulk, if the concentration of PCBs exceeds 50 ppm. Such materials must be disposed at an appropriate approved or permitted facility.

U.S. EPA regulation 40 CFR 761 defines "PCB remediation waste" to include contaminated soil, and specifies a clean-up level of <1ppm without further conditions for unrestricted use in "high occupancy areas" (i.e., areas where individuals may be present for 335 hours or more per year). PCB caulk is defined

as a PCB bulk product waste, and its disposal is subject to U.S. EPA regulations under the Toxic Substances Control Act (40 CFR761.62).

This protocol has been developed in consultation with the New York State Department of Health, Division of Environmental Health Assessment, Bureau of Toxic Substance Assessment to address concerns about properly managing caulk containing PCBs that will be disturbed during building renovation and maintenance.

CAULK SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977 have a potential to contain PCBs in existing caulk. Representative samples of caulking materials from these buildings prior to renovation or demolition work should be tested to determine whether the caulk is contaminated with PCBs. Professional judgement should be used to design the sampling plan for characterizing caulk throughout the building. The consultant should pay particular attention to construction and maintenance records and to the appearance of caulking materials (likenesses and differences). Samples should be taken from window frames or expansion joints that have not been repaired or replaced since 1977. Depending on specific information provided in the workplan developed by the project manager, such as window placement, compositing of some caulk samples might be appropriate. Caulk from different time periods or that have a different appearance should not be composited together.

It is important to note that caulk used during the time period of interest may also contain asbestos or lead. Therefore, the work plan should include testing, handling and disposal requirements appropriate for such regulated materials.

SOIL SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977, which have undergone further renovation after 1977, may have residual PCB contamination in adjacent soils. An adequate representation of surface soils should be tested to assess the potential for residual PCB contamination.

When designing a representative soil sampling plan, the likelihood of soil contamination from deteriorated or deteriorating caulk should be considered. Caulk that has in the past dried out and fallen to the ground is the most important source of soil contamination. Thus, sampling should include soil beneath windows where caulk has obviously deteriorated or been replaced because of previous deterioration. Areas subject to the stress of sun and prevailing weather (typically the southern and western side of each structure) should be included for sampling. These samples would provide a conservative evaluation of soil conditions due to an increased potential for material failure, possibly resulting in contamination of soil. Also, if earlier renovation or demolition work may have stockpiled potentially contaminated caulk in other school areas, the school should consider having soils in those areas tested as well.

Soil sampling should focus on areas of the building where ”banks” or “gangs” of windows exist/were replaced and areas of the structure where large expansion joints are located. This would provide a conservative evaluation of potential soil contamination and permit efficient sampling.

Any obvious pieces of caulk encountered during the collection of soil samples should be removed from the soil, categorized (with respect to location and depth) and treated as a separate potential sample.

Depth – At each soil sample location, soil should be collected in depth intervals of 0-2 inches, 2-6 inches and 6-12 inches. The surface soil sample (0-2 inches) should be collected from below the vegetative surface layer, if present.

Distance from Structure – Samples should be collected within 1 foot of the building and 5 feet from the building.

Samples should be collected in a manner that prevents cross-contamination. Augers or driven core samplers should be avoided, as any caulk caught on the edge of this type of tool could be driven to lower intervals. Using a designated trowel for each sample location and each interval of depth is encouraged. If the sampling tool is field cleaned between samples, do so in a manner that does not add solvent contamination to the environment.

NOTE
Sampling was performed by **Adelaide** in compliance with protocols outlined by New York State Education Department (NYSED) and USEPA 40 CFR 761, as described above. Only one sample per homogeneous area was required for analysis of suspect PCB-containing materials. Bulk sample(s) were properly packaged and forwarded, with associated Chain of Custody (COC), to York Analytical Laboratories, Inc., for analysis using method SW846-3550B/8082. The analysis will determine if the suspect material will be classified as PCB-containing at or above 50 ppm or mg/kg as per the EPA regulations. Copies of the analytical results are contained within attached appendices for review.

6.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

7.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

This inspection report is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or Variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project. The Linear and/or Square Footages (LF / SF) listed within this Report are only approximates. Abatement Contractor(s) are required to visit the building(s) in order to take actual field measurements within each listed location.

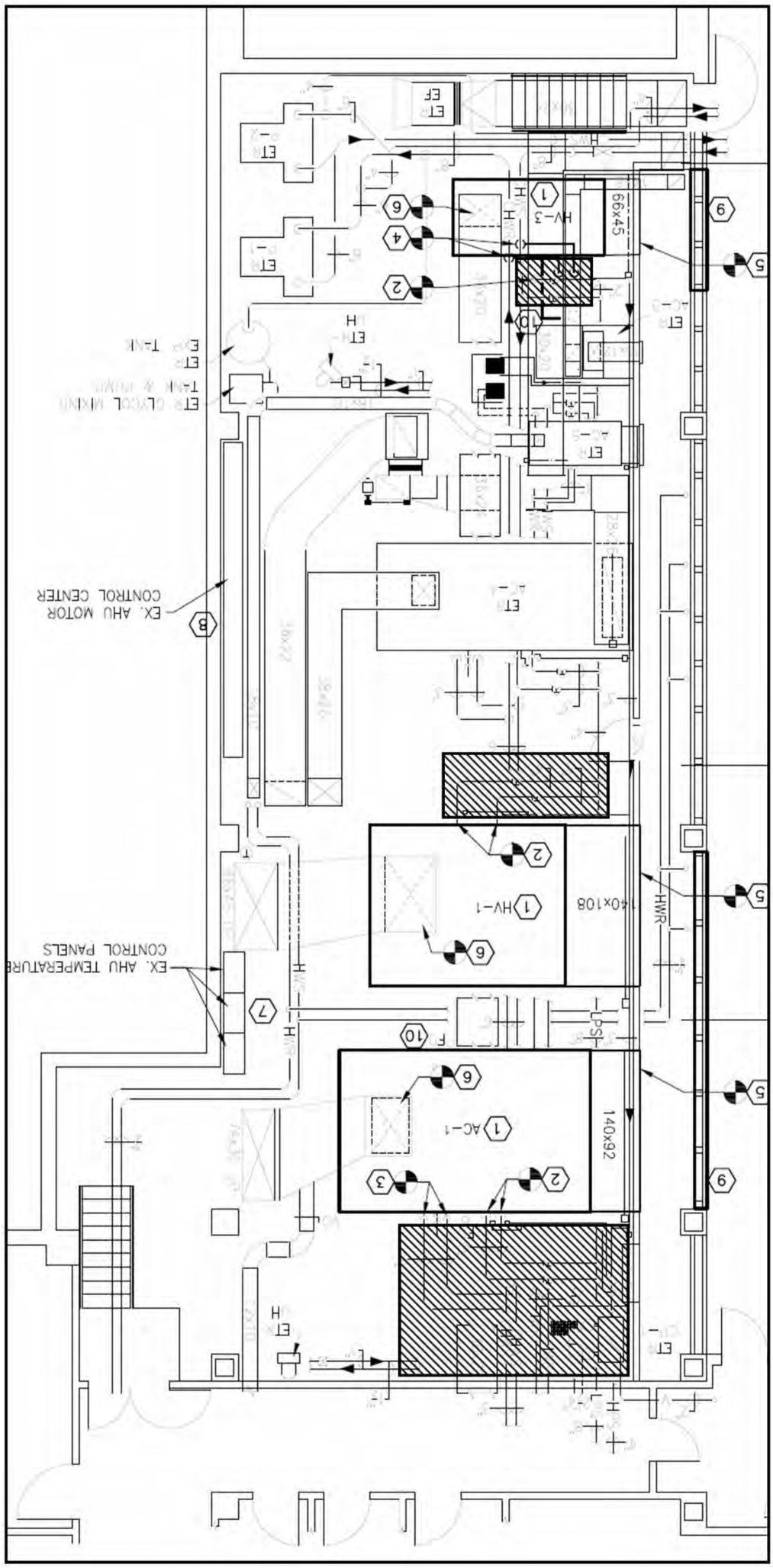
NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

ACM LOCATION MAP(S)

Partial Basement Floor Plan - ACM Locations.

Drawing Not to Scale



ACM LEGEND: (see report for details)

POSITIVE: Valve/Flange Gaskets

ASB -01

Date: 09/29/2019 **Version #** 1	
Issued For: Limited Asbestos Survey	
Adelaide Project NO. FPM: 19318.01-IN	
Drawing Prepared By: David Seddon	

Adelaide ENVIRONMENTAL HEALTH

1511 Route 22
Brewster , NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

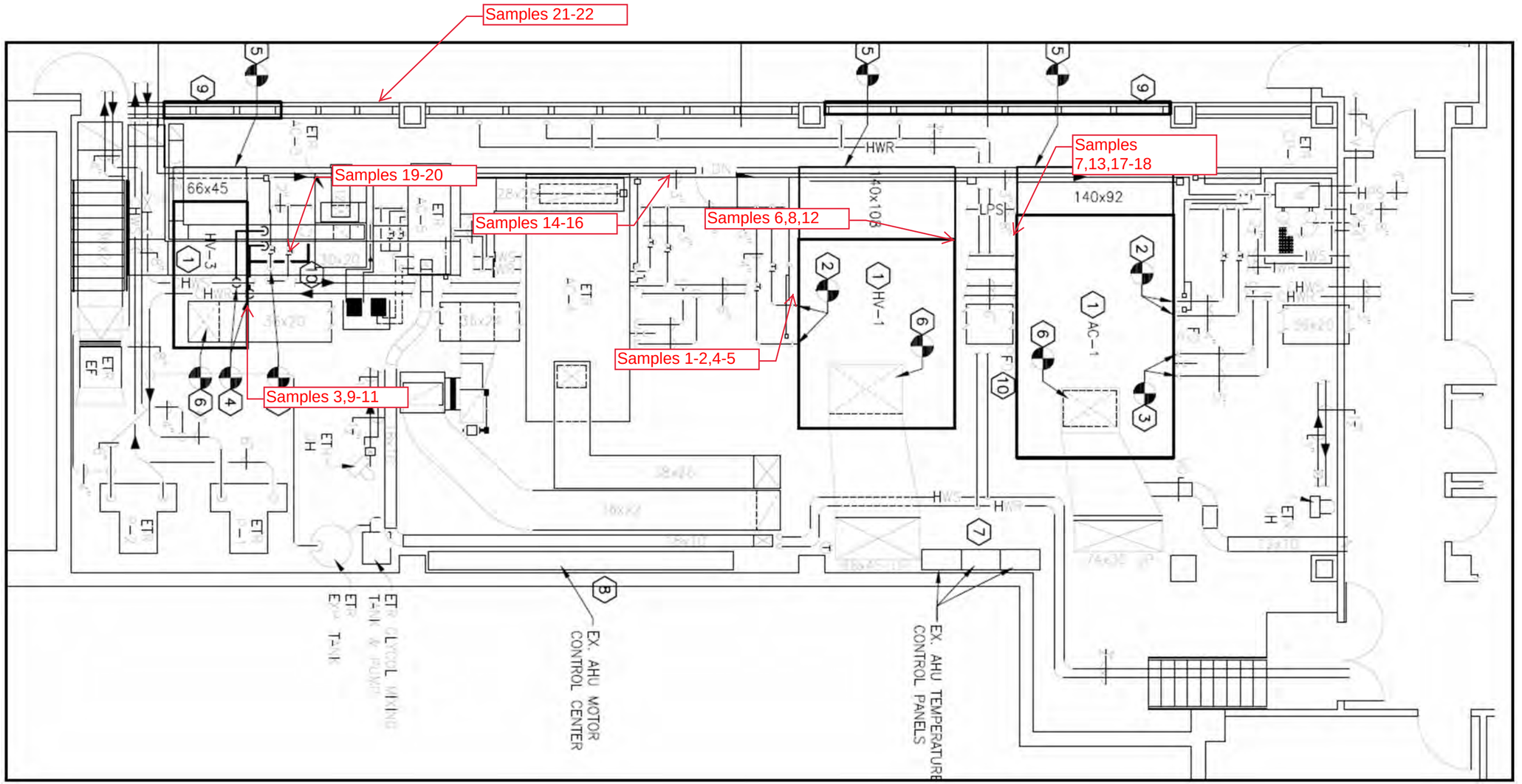
Client Project No.
N/A

Rockland Cook-Chill Production Center
145 Old Orangeburg Road
Orangeburg , New York 10962

FPM Group, Ltd.
909 Marconi Avenue
Ronkonkoma , New York 11779

APPENDIX B

SAMPLE LOCATION MAP(S)



Partial Basement Floor Plan - Sample Locations

Drawing Not to Scale

Rockland Cook-Chill Production Center
145 Old Orangeburg Road
Orangeburg , New York 10962

FPM Group, Ltd.
909 Marconi Avenue
Ronkonkoma , New York 11779

Client Project No.
N/A

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster , NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

Date: 09/29/2019
Version # 1

Issued For:
Limited Asbestos Survey

Adelaide Project NO.
FPM: 19318.01-IN

Drawing Prepared By:
David Seddon

SLM -01

APPENDIX C

ASBESTOS ANALYTICAL RESULTS

Table I
Summary of Bulk Asbestos Analysis Results

FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	----	----	----	----	NAD	NA
Location: LL, HV-1 - Fiberglass Pipe Insulation Wrap								
02	2	1	----	----	----	----	NAD	NA
Location: LL, HV-1 - Fiberglass Pipe Insulation Wrap								
03	3	1	----	----	----	----	NAD	NA
Location: LL, HV-3 - Fiberglass Pipe Insulation Wrap								
04	4	2	0.200	51.5	37.5	11.0	NAD	NAD
Location: LL, HV-1 - Sealant @ Ends Of FG Pipe								
05	5	2	0.164	47.0	39.0	14.0	NAD	NAD
Location: LL, HV-1 - Sealant @ Ends Of FG Pipe								
06	6	3	0.200	59.0	22.5	18.5	NAD	NAD
Location: LL, HV-1 - Sealant @ Duct Seams (Gray)								
07	7	3	0.185	59.5	22.7	17.8	NAD	NAD
Location: LL, AC-1 - Sealant @ Duct Seams (Gray)								
08	8	4	0.234	76.9	15.4	7.7	NAD	NAD
Location: LL, HV-1 - Sealant @ Unit Connections (Black)								
09	9	4	0.292	60.6	19.5	19.9	NAD	NAD
Location: LL, HV-3 - Sealant @ Unit Connections (Black)								
10	10	5	0.228	80.3	18.4	1.3	NAD	NAD
Location: LL, HV-3 - Vibration Cloth								
11	11	5	0.158	79.1	20.3	0.6	NAD	NAD
Location: LL, HV-3 - Vibration Cloth								
12	12	6	0.162	59.3	32.1	8.6	NAD	NAD
Location: LL, HV-1 - Sealant @ Duct Seams (Gray / Brown)								
13	13	6	0.106	62.3	25.5	12.3	NAD	NAD
Location: LL, AC-1 - Sealant @ Duct Seams (Gray / Brown)								
14	14	7	----	----	----	----	NAD	NA
Location: LL, Plenum - Wall Insulation Wrap								
15	15	7	----	----	----	----	NAD	NA
Location: LL, Plenum - Wall Insulation Wrap								
16	16	7	----	----	----	----	NAD	NA
Location: LL, Plenum - Wall Insulation Wrap								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	17	8	----	----	----	----	Chrysotile 66.7	NA
Location: LL, Mech. Room - Gasket For Valve / Flange								
18	18	8	----	----	----	----	NA/PS	NA
Location: LL, Mech. Room - Gasket For Valve / Flange								
19	19	9	----	----	----	----	NAD	NA
Location: LL, Mech. Room - Concrete								
20	20	9	----	----	----	----	NAD	NA
Location: LL, Mech. Room - Concrete								
21	21	10	0.101	63.4	32.7	4.0	NAD	NAD
Location: Ext., Exterior - Caulk @ Louvers								
22	22	10	0.143	62.9	31.5	5.6	NAD	NAD
Location: Ext., Exterior - Caulk @ Louvers								

Analyzed by: John P. Koubiadis; Date Analyzed 9/14/2019

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or ELAP 198.1 for New York friable samples or ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or ELAP 198.4; for New York samples; NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By:

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 09/13/19 **AmeriSci Job #** 219092291
Date Examined 09/14/19 **P.O. #**
ELAP # 11480 **Page** 1 **of** 5
RE: FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1 1	219092291-01 **Location:** LL, HV-1 - Fiberglass Pipe Insulation Wrap	***No***	NAD [1] (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
	Analyst Description: Silver/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60 %, Fibrous glass 10 %, Non-fibrous 30 %		
2 1	219092291-02 **Location:** LL, HV-1 - Fiberglass Pipe Insulation Wrap	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
	Analyst Description: Silver/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60 %, Fibrous glass 10 %, Non-fibrous 30 %		
3 1	219092291-03 **Location:** LL, HV-3 - Fiberglass Pipe Insulation Wrap	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
	Analyst Description: Silver/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60 %, Fibrous glass 10 %, Non-fibrous 30 %		
4 2	219092291-04 **Location:** LL, HV-1 - Sealant @ Ends Of FG Pipe	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
	Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11 %		
5 2	219092291-05 **Location:** LL, HV-1 - Sealant @ Ends Of FG Pipe	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
	Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14 %		

See Reporting notes on last page

PLM Bulk Asbestos Report

FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	219092291-06 **Location:** LL, HV-1 - Sealant @ Duct Seams (Gray)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.5 %			
7 3	219092291-07 **Location:** LL, AC-1 - Sealant @ Duct Seams (Gray)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.8 %			
8 4	219092291-08 **Location:** LL, HV-1 - Sealant @ Unit Connections (Black)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.7 %			
9 4	219092291-09 **Location:** LL, HV-3 - Sealant @ Unit Connections (Black)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19.9 %			
10 5	219092291-10 **Location:** LL, HV-3 - Vibration Cloth	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.3 %			
11 5	219092291-11 **Location:** LL, HV-3 - Vibration Cloth	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.6 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 6	219092291-12 **Location:** LL, HV-1 - Sealant @ Duct Seams (Gray / Brown)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Grey/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.6 %			
13 6	219092291-13 **Location:** LL, AC-1 - Sealant @ Duct Seams (Gray / Brown)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
Analyst Description: Grey/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.3 %			
14 7	219092291-14 **Location:** LL, Plenum - Wall Insulation Wrap	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
Analyst Description: Silver/Brown/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60 %, Fibrous glass 10 %, Non-fibrous 30 %			
15 7	219092291-15 **Location:** LL, Plenum - Wall Insulation Wrap	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
Analyst Description: Silver/Brown/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60 %, Fibrous glass 10 %, Non-fibrous 30 %			
16 7	219092291-16 **Location:** LL, Plenum - Wall Insulation Wrap	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
Analyst Description: Silver/Brown/White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60 %, Fibrous glass 10 %, Non-fibrous 30 %			
17 8	219092291-17 **Location:** LL, Mech. Room - Gasket For Valve / Flange	***Yes***	66.7 % (by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 66.7 % **Other Material:** Non-fibrous 33.3 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
18	219092291-18		NA/PS
8	**Location:** LL, Mech. Room - Gasket For Valve / Flange		
	Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**		
19	219092291-19	***No***	NAD
9	**Location:** LL, Mech. Room - Concrete		(by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %		
20	219092291-20	***No***	NAD
9	**Location:** LL, Mech. Room - Concrete		(by NYS ELAP 198.1) by John P. Koubiadis on 09/14/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100 %		
21	219092291-21	***No***	NAD
10	**Location:** Ext., Exterior - Caulk @ Louvers		(by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4 %		
22	219092291-22	***No***	NAD
10	**Location:** Ext., Exterior - Caulk @ Louvers		(by NYS ELAP 198.6) by John P. Koubiadis on 09/14/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.6 %		

See Reporting notes on last page

PLM Bulk Asbestos Report

FPM-19318.01-IN; Rockland Cook & Chill; 145 Old Orangeburg Rd., Orangeburg, NY 10962

Reporting Notes:

(1) This job was - Analyzed using Olympus BH-2 Pol Scope S/N 223705

Analyzed by: John P. Koubiadis

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples or EPA 400 pt ct by Appd E to Subpt E, 40 CFR 763 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By: _____ END OF REPORT

Adelaide Environmental Health Associates, Inc
1511 Route 22, Suite C24
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#219092291

Site Address: Rockland Cook & Chill	Date:	Inspector(s) David Seddon
145 Old Orangeburg RD	Start time / Stop Time	
Orangeburg NY 10962	Project #: FPM 1938.01-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
1	1	LL	HV-1 - Fiberglass Pipe Insulation Wrap			G
2	1	↓	HV-3 - ↓ ↓ ↓			↓
3	1	↓	↓ 3 - ↓ ↓ ↓			↓
4	2	↓	HV-1 - Sealant @ Ends of FF Pipe			↓
5	2	↓	↓ - ↓ ↓ ↓			↓
6	3	↓	HV-1 - Sealant @ Duct Seams (Gray)			↓
7	3	↓	AC-1 - ↓ ↓ ↓			↓
8	4	↓	HV-1 - Sealant @ Unit Conections (Black)			↓
9	4	↓	HV-3 - ↓ ↓ ↓			↓
10	5	↓	↓ - Vibration Cloth			↓
11	5	↓	↓ - ↓			↓
12	6	↓	HV-1 - Sealant @ Duct Seams (Gray/Brown)			↓
13	6	↓	AC 1 - ↓ ↓ ↓			↓

Special Instructions/ Turnaround Time: 24hr TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail Results to AdelaideLabResults@adelaidellc.com

Relinquished by: [signature]
Received by: KByrne 9/13/19 1145
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1511 Route 22, Suite C24
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

#2190922291

Site Address: Rockland Cook & Chill	Date: 9/12/19	Inspector(s): Daniel Sheldon
145 Old Orangeburg Rd	Start time Stop Time	
Orangeburg NY 10962	Project #: FPM 19318.01-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
14	7	LL	Plenum - Wall Insulation Wrap			G
15	7	"	" - " "			"
16	7	"	" - " "			"
17	8	"	Mech Room - Gasket for Valve/Flange			"
18	8	"	" - " "			"
19	9	"	" - Concrete			"
20	9	"	" - "			"
21	10	Ext	Exterior - Caulk & Louvers			"
22	10	"	" - " "			"

Special Instructions/ Turnaround Time: 24hr TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail Results to AdelaideLabResults@adelaidellc.com

Relinquished by:
Received by: [signature] 9/13/19 1145
Relinquished by:
Received by:

APPENDIX D

PCB ANALYTICAL RESULTS

Technical Report

prepared for:

Adelaide Environmental Health Associates, Inc.
1511 Route 22, Suite C24
Brewster NY, 10509
Attention: Mr. John Soter

Report Date: 09/17/2019
Client Project ID: FPM 19318.01-IN
York Project (SDG) No.: 19I0575

Report Date: 09/17/2019
Client Project ID: FPM 19318.01-IN
York Project (SDG) No.: 19I0575

Adelaide Environmental Health Associates, Inc.
1511 Route 22, Suite C24
Brewster NY, 10509
Attention: Mr. John Soter

Purpose and Results

This report contains the analytical data for the sample(s) identified on the attached chain-of-custody received in our laboratory on September 13, 2019 with a temperature of 5.0 C. The project was identified as your project: **FPM 19318.01-IN**.

The analyses were conducted utilizing appropriate EPA, Standard Methods, and ASTM methods as detailed in the data summary tables.

All samples were received in proper condition meeting the customary acceptance requirements for environmental samples except those indicated under the Sample and Analysis Qualifiers section of this report.

All analyses met the method and laboratory standard operating procedure requirements except as indicated by any data flags, the meaning of which are explained in the Sample and Data Qualifiers Relating to This Work Order section of this report and case narrative if applicable.

The results of the analyses, which are all reported on dry weight basis (soils) unless otherwise noted, are detailed in the following pages.

Please contact Client Services at 203.325.1371 with any questions regarding this report.

York Sample ID	Client Sample ID	Matrix	Date Collected	Date Received
19I0575-01	PCB-1	Caulk	09/12/2019	09/13/2019

General Notes for York Project (SDG) No.: 19I0575

1. The RLs and MDLs (Reporting Limit and Method Detection Limit respectively) reported are adjusted for any dilution necessary due to the levels of target and/or non-target analytes and matrix interference. The RL(REPORTING LIMIT) is based upon the lowest standard utilized for the calibration where applicable.
2. Samples are retained for a period of thirty days after submittal of report, unless other arrangements are made.
3. York's liability for the above data is limited to the dollar value paid to York for the referenced project.
4. This report shall not be reproduced without the written approval of York Analytical Laboratories, Inc.
5. All analyses conducted met method or Laboratory SOP requirements. See the Sample and Data Qualifiers Section for further information.
6. It is noted that no analyses reported herein were subcontracted to another laboratory, unless noted in the report.
7. This report reflects results that relate only to the samples submitted on the attached chain-of-custody form(s) received by York.
8. Analyses conducted at York Analytical Laboratories, Inc. Stratford, CT are indicated by NY Cert. No. 10854; those conducted at York Analytical Laboratories, Inc., Richmond Hill, NY are indicated by NY Cert. No. 12058.

Approved By: 

Date: 09/17/2019

Benjamin Gulizia
Laboratory Director

Sample Information

Client Sample ID: PCB-1 **York Sample ID:** 19I0575-01

York Project (SDG) No.	Client Project ID	Matrix	Collection Date/Time	Date Received
19I0575	FPM 19318.01-IN	Caulk	September 12, 2019 12:00 am	09/13/2019

Polychlorinated Biphenyls (PCB)

Log-in Notes:

Sample Notes:

Sample Prepared by Method: EPA 3550C

CAS No.	Parameter	Result	Flag	Units	Reported to LOQ	Dilution	Reference Method	Date/Time Prepared	Date/Time Analyzed	Analyst
12674-11-2	Aroclor 1016	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
11104-28-2	Aroclor 1221	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
11141-16-5	Aroclor 1232	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
53469-21-9	Aroclor 1242	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
12672-29-6	Aroclor 1248	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
11097-69-1	Aroclor 1254	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
11096-82-5	Aroclor 1260	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications: NELAC-NY10854,CTDOH,NJDEP			
1336-36-3	* Total PCBs	ND		mg/kg	0.446	1	EPA 8082A	09/16/2019 14:26	09/17/2019 11:00	SR
							Certifications:			

	Surrogate Recoveries	Result	Acceptance Range
877-09-8	*Surrogate: Tetrachloro-m-xylene*	*93.0 %*	*30-140*
2051-24-3	*Surrogate: Decachlorobiphenyl*	*61.0 %*	*30-140*

Sample and Data Qualifiers Relating to This Work Order

Definitions and Other Explanations

*	Analyte is not certified or the state of the samples origination does not offer certification for the Analyte.
ND	NOT DETECTED - the analyte is not detected at the Reported to level (LOQ/RL or LOD/MDL)
RL	REPORTING LIMIT - the minimum reportable value based upon the lowest point in the analyte calibration curve.
LOQ	LIMIT OF QUANTITATION - the minimum concentration of a target analyte that can be reported within a specified degree of confidence. This is the lowest point in an analyte calibration curve that has been subjected to all steps of the processing/analysis and verified to meet defined criteria. This is based upon NELAC 2009 Standards and applies to all analyses.
LOD	LIMIT OF DETECTION - a verified estimate of the minimum concentration of a substance in a given matrix that an analytical process can reliably detect. This is based upon NELAC 2009 Standards and applies to all analyses conducted under the auspices of EPA SW-846.
MDL	METHOD DETECTION LIMIT - a statistically derived estimate of the minimum amount of a substance an analytical system can reliably detect with a 99% confidence that the concentration of the substance is greater than zero. This is based upon 40 CFR Part 136 Appendix B and applies only to EPA 600 and 200 series methods.
Reported to	This indicates that the data for a particular analysis is reported to either the LOD/MDL, or the LOQ/RL. In cases where the "Reported to" is located above the LOD/MDL, any value between this and the LOQ represents an estimated value which is "J" flagged accordingly. This applies to volatile and semi-volatile target compounds only.
NR	Not reported
RPD	Relative Percent Difference
Wet	The data has been reported on an as-received (wet weight) basis
Low Bias	Low Bias flag indicates that the recovery of the flagged analyte is below the laboratory or regulatory lower control limit. The data user should take note that this analyte may be biased low but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
High Bias	High Bias flag indicates that the recovery of the flagged analyte is above the laboratory or regulatory upper control limit. The data user should take note that this analyte may be biased high but should evaluate multiple lines of evidence including the LCS and site-specific MS/MSD data to draw bias conclusions. In cases where no site-specific MS/MSD was requested, only the LCS data can be used to evaluate such bias.
Non-Dir.	Non-dir. flag (Non-Directional Bias) indicates that the Relative Percent Difference (RPD) (a measure of precision) among the MS and MSD data is outside the laboratory or regulatory control limit. This alerts the data user where the MS and MSD are from site-specific samples that the RPD is high due to either non-homogeneous distribution of target analyte between the MS/MSD or indicates poor reproducibility for other reasons.

If EPA SW-846 method 8270 is included herein it is noted that the target compound N-nitrosodiphenylamine (NDPA) decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine (DPA). These results could actually represent 100% DPA, 100% NDPA or some combination of the two. For this reason, York reports the combined result for n-nitrosodiphenylamine and diphenylamine for either of these compounds as a combined concentration as Diphenylamine.

If Total PCBs are detected and the target aroclors reported are "Not detected", the Total PCB value is reported due to the presence of either or both Aroclors 1262 and 1268 which are non-target aroclors for some regulatory lists.

2-chloroethylvinyl ether readily breaks down under acidic conditions. Samples that are acid preserved, including standards will exhibit breakdown. The data user should take note.

Certification for pH is no longer offered by NYDOH ELAP.

Semi-Volatile and Volatile analyses are reported down to the LOD/MDL, with values between the LOD/MDL and the LOQ being "J" flagged as estimated results.

For analyses by EPA SW-846-8270D, the Limit of Quantitation (LOQ) reported for benzidine is based upon the lowest standard used for calibration and is not a verified LOQ due to this compound's propensity for oxidative losses during extraction/concentration procedures and non-reproducible chromatographic performance.

York Analytical Laboratories, Inc.
120 Research Drive
Stratford, CT 06615
ph. (203) 325-1371
fx. (203) 357-0166

Field Chain-of-Custody Record

YORK Project No. 19I0575

Analysis Turnaround: 5-7 Days

Company: Adelaide Environmental
1511 Route 22, Suite C24
Brewster, NY 10509
Invoice to: Stephanie Soter
Results Send Via: AdelaideLabResults@adelaidellc.com
Cc Results:

Sampled By (Print): David Sedelow
Sampled By (Sign):
Project #: EPM 19318.01-IN
Project ID: Rockland Cook! Ch.11

SAMPLE #	LOCATION	SAMPLE DATE	MATRIX	ANALYSIS REQUESTED	CONTAINER
PCB-1	@ Exterior Louver	9/12/19	CAULK	PCB	BAG

Comments

Cool 4°C___ HNO3___ H2SO4___ NaOH___ NONE___ FROZEN___

Temperature on Receipt 5.0 °C

Samples Relinquished By — Date/Time: 9/12/19

Samples Received By Lab — Date/Time: 9-13-19 1300

APPENDIX E

PERSONNEL AND LABORATORY CERTIFICATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
Suite C24
1511 Route 22

Brewster, NY 10509

FILE NUMBER: 99-0656
LICENSE NUMBER: 29305
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 07/18/2019
EXPIRATION DATE: 07/31/2020

Duly Authorized Representative – John Soter

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2022

NAT-15081-2

Certification #

June 21, 2017

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

DAVID SEDDON
CLASS(EXPIRES)
C ATEC(12/19) D INSP(12/19)
E MGPL(12/19) H PM (12/19)

CERT# 09-08546
DMV# 879533539

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 004874201 90

EYES BRO
HAIR BRO
HGT 5' 10"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

United States Environmental Protection Agency

This is to certify that

David W Seddon

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 19, 2020

LBP-I-101120-1

Certification #

July 05, 2017

Issued On

John Gorman, Chief

Pesticides & Toxic Substances Branch

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2020
Issued April 01, 2019

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 59674

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2020
Issued April 01, 2019

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Methyl methacrylate	EPA 8260C
Amines	
1,2-Diphenylhydrazine	EPA 8270D
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Diphenylamine	EPA 8270D
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D
Benzidine	EPA 8270D
Characteristic Testing	
Corrosivity	EPA 9045D
Free Liquids	EPA 9095B
Ignitability	EPA 1010A
Synthetic Precipitation Leaching Proc.	EPA 1312
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B

Chlorinated Hydrocarbon Pesticides	
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
alpha-Chlordane	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
gamma-Chlordane	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Mirex	EPA 8081B
Toxaphene	EPA 8081B
Chlorinated Hydrocarbons	
1,2,3-Trichlorobenzene	EPA 8260C
1,2,4,5-Tetrachlorobenzene	EPA 8270D

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued April 01, 2019

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. ROBERT Q. BRADLEY
YORK ANALYTICAL LABORATORIES INC
120 RESEARCH DRIVE
STRATFORD, CT 06615

NY Lab Id No: 10854

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Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8270D

Chlorophenoxy Acid Pesticides

2,4,5-T	EPA 8151A
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A
Dicamba	EPA 8151A

Haloethers

2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D

Metals I

Barium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Cadmium, Total	EPA 6010C
	EPA 6010D

Metals I

Cadmium, Total	EPA 6020A
	EPA 6020B
Calcium, Total	EPA 6010C
	EPA 6010D
Chromium, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Copper, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Iron, Total	EPA 6010C
	EPA 6010D
Lead, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Magnesium, Total	EPA 6010C
	EPA 6010D
Manganese, Total	EPA 6010C
	EPA 6010D
	EPA 6020A
	EPA 6020B
Nickel, Total	EPA 6010C
	EPA 6010D

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Metals I		**Metals II**	
Nickel, Total	EPA 6020A	Chromium VI	EPA 7196A
	EPA 6020B	Mercury, Total	EPA 7471B
Potassium, Total	EPA 6010C		EPA 7473
	EPA 6010D	Selenium, Total	EPA 6010C
Silver, Total	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
Sodium, Total	EPA 6010C		EPA 6020B
	EPA 6010D	Vanadium, Total	EPA 6010C
Metals II			EPA 6010D
Aluminum, Total	EPA 6010C		EPA 6020A
	EPA 6010D		EPA 6020B
	EPA 6020A	Zinc, Total	EPA 6010C
	EPA 6020B		EPA 6010D
Antimony, Total	EPA 6010C		EPA 6020A
	EPA 6010D		EPA 6020B
	EPA 6020A	**Metals III**	
	EPA 6020B	Cobalt, Total	EPA 6010C
Arsenic, Total	EPA 6010C		EPA 6010D
	EPA 6010D		EPA 6020A
	EPA 6020A		EPA 6020B
	EPA 6020B	Molybdenum, Total	EPA 6010D
Beryllium, Total	EPA 6010C		EPA 6020A
	EPA 6010D	Thallium, Total	EPA 6010C
	EPA 6020A		EPA 6010D
	EPA 6020B		EPA 6020A

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Metals III	
Thallium, Total	EPA 6020B
Tin, Total	EPA 6020A
	EPA 6020B
Titanium, Total	EPA 6020A
Miscellaneous	
Boron, Total	EPA 6020A
	EPA 6020B
Cyanide, Total	EPA 9014
Extractable Organic Halides	EPA 9023
Lead in Dust Wipes	EPA 6010C
Lead in Paint	EPA 6010C
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 8270D
Isophorone	EPA 8270D
Nitrobenzene	EPA 8270D
Pyridine	EPA 8270D
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodi-n-propylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D
Organophosphate Pesticides	
Parathion ethyl	EPA 8270D

Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1016 (PCB-1016) in Oil	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1221 (PCB-1221) in Oil	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1232 (PCB-1232) in Oil	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1242 (PCB-1242) in Oil	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1248 (PCB-1248) in Oil	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1254 (PCB-1254) in Oil	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1260 (PCB-1260) in Oil	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A

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Polychlorinated Biphenyls	
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D
Priority Pollutant Phenols	
2,3,4,6 Tetrachlorophenol	EPA 8270D
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
Priority Pollutant Phenols	
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D
2-Nitrophenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Acetophenone	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C

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Volatile Aromatics	
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
m/p-Xylenes	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
o-Xylene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
Total Xylenes	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C

Volatile Halocarbons	
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C
1,1-Dichloropropene	EPA 8260C
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2,2-Dichloropropane	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C

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Volatile Halocarbons	
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
Trichloroethene	EPA 8260C
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C

Volatile Organics	
1,4-Dioxane	EPA 8260C
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Methyl acetate	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260C
Vinyl acetate	EPA 8260C

Sample Preparation Methods	
	EPA 5035A-L

Sample Preparation Methods	
	EPA 5035A-H
	EPA 3580A
	EPA 3010A
	EPA 3050B
	EPA 3550C
	EPA 3546
	EPA 3545A
	EPA 3060A
	EPA 9010C

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Adelaide
ENVIRONMENTAL HEALTH

1511 Route 22, Suite C24
Brewster, NY 10509 845.278.7710
90 State Street, Suite 700
Albany, NY 12207 518.874.0617
1967 Wehrle Drive, Suite One
Buffalo, NY 14221 716.402.4580
E-mail: adelaidemail@adelaidellc.com
Fax: 845.278.7750

LIMITED RENOVATION SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS

PERFORMED AT:

Rockland Cook-Chill Plant
145 Old Orangeburg Road
Orangeburg, New York 10962
Adelaide Project# OGS: 19318.03-IN
OGS Project# 45917

PREPARED FOR:

New York State Office of General Services
Design and Construction
Project Control, 35th Floor, Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242

PREPARED BY:
David Seddon
December 6, 2019

REVIEWED BY:

Stephanie A. Soter
President

TABLE OF CONTENTS

APPENDICES

1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations, on December 4, 2019 for New York State Office of General Services (OGS) throughout Room 1-14 (Tumble Chiller Area), B-16 (Storage Room), B-17 (Grease Removal Room), Corridors B-15 and B-13, B-6 (Maintenance Shop) and Boiler Room at the Rockland Cook-Chill Plant located at 145 Old Orangeburg Road, Orangeburg, New York 10962. The survey included 1) review of building/structure plans, provided by OGS marked and dated on November 20, 2019, for references to the scope of work potentially affecting hazardous materials used in construction, renovation or repair; and, 2) a visual inspection/assessment for hazardous materials throughout accessible interior and/or exterior spaces of the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired. Certified **Adelaide** personnel (Appendix C), David Seddon (NYS Asbestos Inspector/Cert. #09-08546), performed the visual assessment throughout inspection area(s) identified.

1.2 Executive Summary

Adelaide inspected all areas that will be affected by the tumble chiller replacement for suspect ACM. **Adelaide** collected twenty-one (21) suspect asbestos samples/layers from the above-mentioned area(s). Zero (0) samples/homogenous areas tested positive for asbestos.

1.2.1 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

1.2.2 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.2 tested ***negative for asbestos***.

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure.

Samples collected by **Adelaide** December 04, 2019

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
NO Asbestos-containing Materials (ACM) identified upon PLM, PLM-NOB, QTEM and/or PLM-SM-V analysis, by a laboratory approved under the NYSDOH ELAP, of samples collected/analyzed in reference to the above-mentioned scope of work.					

2.2 Summary of Identified Non-ACM

Samples collected by **Adelaide** December 04, 2019

Identified Non-ACM	Sample Location(s) & HA's
Quarry Tile – Grout, Mudset, Vapor Barrier	1-14 (Tumble Chiller)
Caulking - Gray	
Fiberglass Pipe Wrap	Boiler Room,B-6,B-13,B-15,B-16,B-17
Sealant at End of Fiberglass Pipe Insulation	
CMU and Mortar	
Concrete	

2.3 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)

A visual inspection was performed and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

Representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Concrete.
- Wall Materials – Concrete, CMU and Mortar.
- Flooring Materials – Ceramic Tile Systems (ie. grouts, mudsets, etc.), Vapor Barrier, Epoxy.
- Thermal System Insulation – Pipe Insulation Wrap.

- Miscellaneous Materials – Caulking.

- Non-suspect Materials (not sampled) – Fiberglass Insulation, Silicone, Wood, Glass, Metal.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply

- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

NEW YORK CITY

Asbestos Control Program (ACP), Title 15, Chapter 1 of the New York City Department of Environmental Protection (NYCDEP) regulates all asbestos abatement activities occurring within the City of New York. The ACR regulations also require asbestos surveys and abatement work to be performed by a NYCDEP certified asbestos investigator and asbestos workers, respectively.

The New York City Department of Buildings (NYCDOB) requires an ACP notification to be included with the renovation/demolition permit applications. The notification is performed using an ACP 5 or ACP 20/21 forms.

All confirmed ACM will need to be removed prior to any building renovation or demolition. The removal and disposal of ACM must be performed by a NYS-DOL licensed asbestos handling contractor in accordance with Federal, state, and local regulations. Proper notifications must be filed with the US-EPA, NYS-DOL, NYC-DEP and other regulatory agencies prior to performing such activities.

As required by the NYS-DOL and NYC-DEP regulations, the abatement project must be monitored by a NYS-DOL certified project monitor. The project monitor oversees contractor's work practices and also performs pre, during, and final clearance post abatement air sampling in accordance with the state and city regulations.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction

related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

5.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

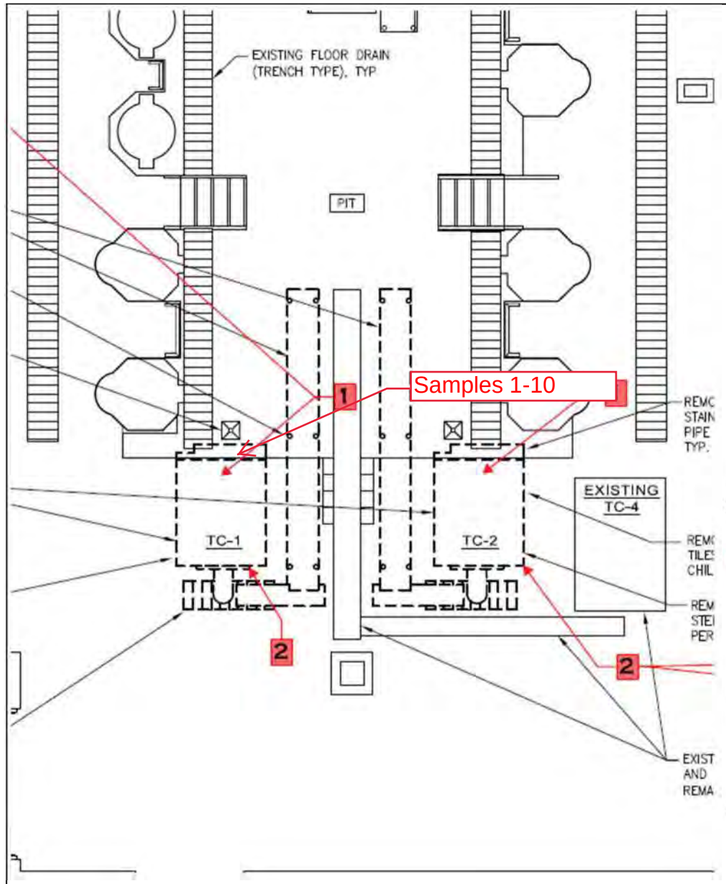
This inspection report is not intended to be used as the sole basis for soliciting pricing for asbestos abatement. An abatement plan, specification, drawing and/or Variances should be developed to identify scope, timing, phasing and remediation means & methods for any asbestos project. The Linear and/or Square Footages (LF / SF) listed within this Report are only approximates. Abatement Contractor(s) are required to visit the building(s) in order to take actual field measurements within each listed location.

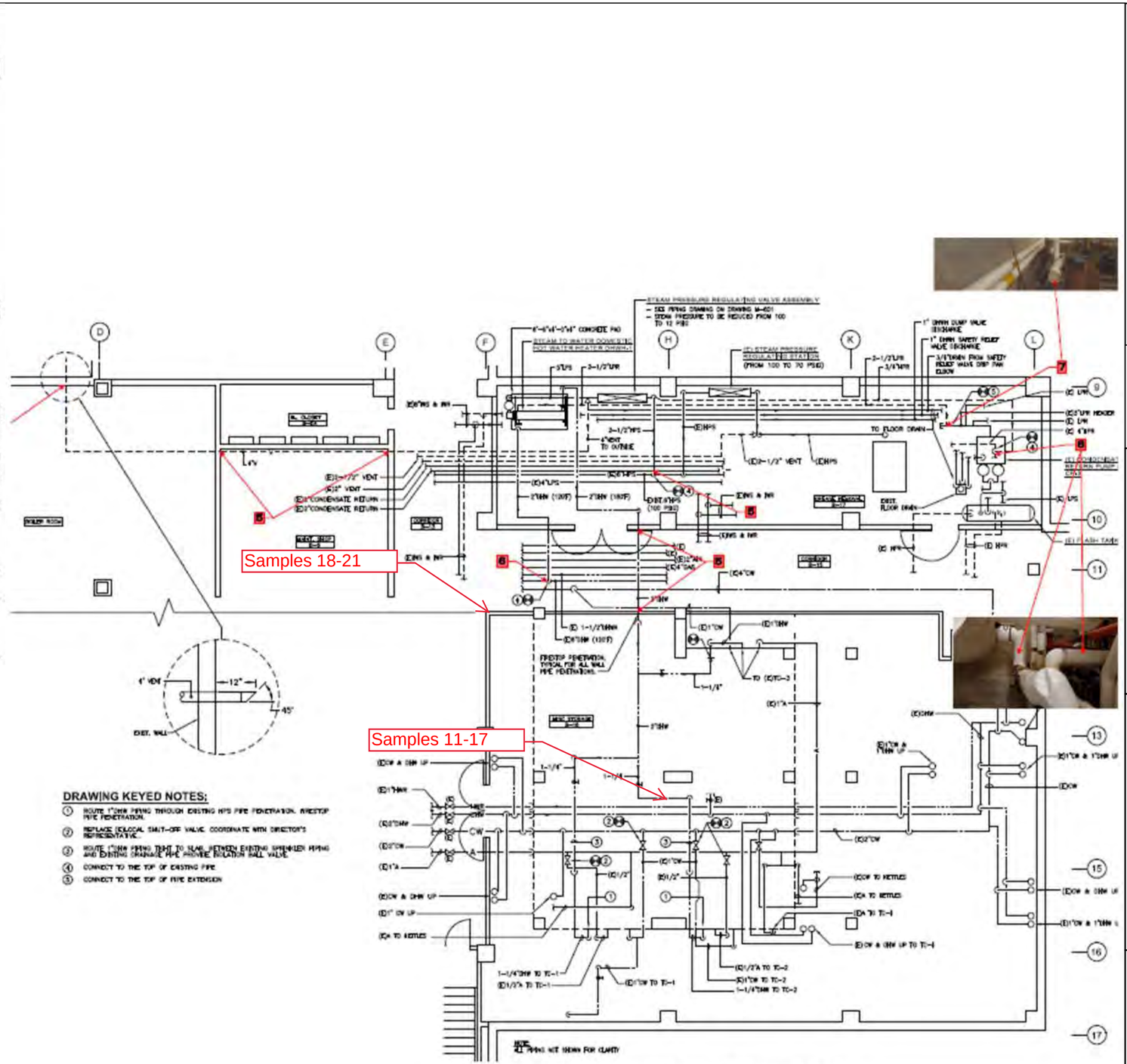
NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH

Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

SAMPLE LOCATION MAP(S)





Partial Basement and First Floor Key Plan - Sample Locations

Drawing Not to Scale

Rockland Cook -Chill Plant
145 Old Orangeburg Road
Orangeburg, New York 10962

New York State Office of General Services
Design and Construction
Project Control, 35th Floor, Corning Tower
The Governor Nelson A. Rockefeller Empire State Plaza
Albany, New York 12242

Client Project No.
45917

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster , NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

Date: 12-06-2019	**Version #** 1	**Issued For:** Asbestos Survey	**Adelaide Project NO.** OGS:19318.03-IN	**Drawing Prepared By:** David Seddon

SLM -01

APPENDIX B

ASBESTOS ANALYTICAL RESULTS

Table I
Summary of Bulk Asbestos Analysis Results

OGS:19318.03-IN; Rockland Cook-Chill; 145 Old Orangeburg Road, Orangeburg, New York 10962

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	----	----	----	----	NAD	NA
Location:	1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Grout							
02	2	1	----	----	----	----	NAD	NA
Location:	1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Grout							
03	3	2	----	----	----	----	NAD	NA
Location:	1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Mudset							
04	4	2	----	----	----	----	NAD	NA
Location:	1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Mudset							
05	5	3	0.164	63.4	25.0	11.6	NAD	NAD
Location:	1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Blue Barrier							
06	6	3	0.202	55.4	28.2	16.3	NAD	NAD
Location:	1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Blue Barrier							
07	7	4	0.278	26.3	20.5	53.2	NAD	NAD
Location:	1st Floor - Cook / Chill Room - 1-14 - Epoxy Floor							
08	8	4	0.274	25.2	49.6	25.2	NAD	NAD
Location:	1st Floor - Cook / Chill Room - 1-14 - Epoxy Floor							
09	9	5	0.196	50.5	46.9	2.6	NAD	NAD
Location:	1st Floor - Cook / Chill Room - 1-14 - Caulking @ Pipe Penetrations							
10	10	5	0.150	50.7	46.7	2.7	NAD	NAD
Location:	1st Floor - Cook / Chill Room - 1-14 - Caulking @ Pipe Penetrations							
11	11	6	----	----	----	----	NAD	NA
Location:	Basement - Room B-16 - Fiberglass Pipe Wrap							
12	12	6	----	----	----	----	NAD	NA
Location:	Basement - Room B-16 - Fiberglass Pipe Wrap							
13	13	6	----	----	----	----	NAD	NA
Location:	Basement - Room B-16 - Fiberglass Pipe Wrap							
14	14	7	0.181	40.9	53.6	5.5	NAD	NAD
Location:	Basement - Room B-16 - Pipe Insulation End Sealant							
15	15	7	0.194	32.5	51.0	16.5	NAD	NAD
Location:	Basement - Room B-16 - Pipe Insulation End Sealant							
16	16	8	----	----	----	----	NAD	NA
Location:	Basement - Room B-16 - Concrete							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

OGS:19318.03-IN; Rockland Cook-Chill; 145 Old Orangeburg Road, Orangeburg, New York 10962

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	17	8	----	----	----	----	NAD	NA
Location:	Basement - Room B-16 - Concrete							
18	18	9	----	----	----	----	NAD	NA
Location:	Basement - Corridor - CMU							
19	19	9	----	----	----	----	NAD	NA
Location:	Basement - Corridor - CMU							
20	20	10	----	----	----	----	NAD	NA
Location:	Basement - Corridor - CMU Mortar							
21	21	10	----	----	----	----	NAD	NA
Location:	Basement - Corridor - CMU Mortar							

Analyzed by: Khaalid W. Perine_____, Date Analyzed 12/6/2019

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or ELAP 198.1 for New York friable samples or ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or ELAP 198.4; for New York samples; NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, AIHA-LAP, LLC (PLM) Lab ID 102843.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

Reviewed By:_____

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22, Suite C24

Brewster, NY 10509

Date Received 12/05/19 **AmeriSci Job #** 219121324
Date Examined 12/05/19 **P.O. #**
ELAP # 11480 **Page** 1 **of** 4
RE: OGS:19318.03-IN; Rockland Cook-Chill; 145 Old Orangeburg Road, Orangeburg, New York 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1	219121324-01	*No*	NAD [1]
1	**Location:** 1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Grout		(by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types:		
	Other Material: Cellulose Trace, Non-fibrous 100 %		
2	219121324-02	*No*	NAD
1	**Location:** 1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Grout		(by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types:		
	Other Material: Cellulose Trace, Non-fibrous 100 %		
3	219121324-03	*No*	NAD
2	**Location:** 1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Mudset		(by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
	Analyst Description: Tan/Grey, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types:		
	Other Material: Cellulose Trace, Non-fibrous 100 %		
4	219121324-04	*No*	NAD
2	**Location:** 1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Mudset		(by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
	Analyst Description: Tan, Homogeneous, Non-Fibrous, Cementitious, Bulk Material		
	Asbestos Types:		
	Other Material: Cellulose Trace, Non-fibrous 100 %		
5	219121324-05	*No*	NAD
3	**Location:** 1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Blue Barrier		(by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
	Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material		
	Asbestos Types:		
	Other Material: Non-fibrous 11.6 %		

See Reporting notes on last page

PLM Bulk Asbestos Report

OGS:19318.03-IN; Rockland Cook-Chill; 145 Old Orangeburg Road, Orangeburg, New York 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	219121324-06 **Location:** 1st Floor - Cook / Chill Room - 1-14 - Quarry Tile - Blue Barrier	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
	Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.3 %		
7 4	219121324-07 **Location:** 1st Floor - Cook / Chill Room - 1-14 - Epoxy Floor	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
	Analyst Description: Tan/Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 53.2 %		
8 4	219121324-08 **Location:** 1st Floor - Cook / Chill Room - 1-14 - Epoxy Floor	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
	Analyst Description: Tan/Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25.2 %		
9 5	219121324-09 **Location:** 1st Floor - Cook / Chill Room - 1-14 - Caulking @ Pipe Penetrations	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.6 %		
10 5	219121324-10 **Location:** 1st Floor - Cook / Chill Room - 1-14 - Caulking @ Pipe Penetrations	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
	Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.7 %		
11 6	219121324-11 **Location:** Basement - Room B-16 - Fiberglass Pipe Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
	Analyst Description: Green/Silver/Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30 %, Fibrous glass 15 %, Non-fibrous 55 %		

See Reporting notes on last page

PLM Bulk Asbestos Report

OGS:19318.03-IN; Rockland Cook-Chill; 145 Old Orangeburg Road, Orangeburg, New York 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 6	219121324-12 **Location:** Basement - Room B-16 - Fiberglass Pipe Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Green/Silver/Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 25 %, Fibrous glass 20 %, Non-fibrous 55 %			
13 6	219121324-13 **Location:** Basement - Room B-16 - Fiberglass Pipe Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Green/Silver/Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 20 %, Fibrous glass 20 %, Non-fibrous 60 %			
14 7	219121324-14 **Location:** Basement - Room B-16 - Pipe Insulation End Sealant	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 2 %, Non-fibrous 3.5 %			
15 7	219121324-15 **Location:** Basement - Room B-16 - Pipe Insulation End Sealant	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/05/19
Analyst Description: White/Grey, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 2 %, Non-fibrous 14.5 %			
16 8	219121324-16 **Location:** Basement - Room B-16 - Concrete	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
17 8	219121324-17 **Location:** Basement - Room B-16 - Concrete	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

OGS:19318.03-IN; Rockland Cook-Chill; 145 Old Orangeburg Road, Orangeburg, New York 10962

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
18 9	219121324-18 **Location:** Basement - Corridor - CMU	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Grey/White, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
19 9	219121324-19 **Location:** Basement - Corridor - CMU	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Grey/White, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
20 10	219121324-20 **Location:** Basement - Corridor - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Grey/White, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			
21 10	219121324-21 **Location:** Basement - Corridor - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/05/19
Analyst Description: Grey/White, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100 %			

Reporting Notes:

(1) This job was - Analyzed using Olympus BH-2 Pol Scope S/N 229915

Analyzed by: Valeriu Voicu

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis by Appd E to Subpt E, 40 CFR 763 (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite or 198.6 for NOB samples or EPA 400 pt ct by Appd E to Subpt E, 40 CFR 763 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. AIHA-LAP, LLC Lab ID 102843, RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054.

Reviewed By:_____

END OF REPORT

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

219121324

Site Address: Rockland Cook-Chill	Date: 12/4/2019	Inspector(s) David Seddon
145 Old Orangeburg Road		
Orangeburg New York 10962	Project #: OGS: 19318.03-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
1	1	1	Cook/chill Room - 1-14 - Quarry Tile - Grout			G
2	1	1	" - " - "			"
3	2	1	" - " - Mudset			"
4	2	1	" - " - "			"
5	3	1	" - " - Blue Basecoat			"
6	3	1	" - " - "			"
7	4	1	" - Epoxy Floor			"
8	4	1	" - "			"
9	5	1	" - Caulking @ Pipe Penetrations			"
10	5	1	" - " - "			"
11	6	B	Room B-16 - Fiberglass Pipe Wrap			"
12	6	1	Room B-16 - "			"
13	6	"	" - " - "			"

Special Instructions/ Turnaround Time:

24 HRs
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/5/19 1125
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

219121324

Site Address: Rockland Cook-Chill	Date: 12/4/2019	Inspector(s) David Seddon
145 Old Orangeburg Road		
Orangeburg New York 10962	Project #: OGS: 19318.03-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable NonFriable	Condition g, d, sd
14	7	B	Room B-16 - Pipe Insulation End Sealant			G
15	7	"	" - " " "			"
16	8	"	" - Concrete			"
17	8	"	" - "			"
18	9	"	Corridor - CMU			"
19	9	"	" - "			"
20	10	"	" - Mastic			"
21	10	"	" - "			"

Special Instructions/ Turnaround Time:

24 HRs
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/5/19 1125
Relinquished by:
Received by:

APPENDIX C

PERSONNEL AND LABORATORY CERTIFICATIONS

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
Suite C24
1511 Route 22

Brewster, NY 10509

FILE NUMBER: 99-0656
LICENSE NUMBER: 29305
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 07/18/2019
EXPIRATION DATE: 07/31/2020

Duly Authorized Representative – John Soter

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

DAVID SEDDON
CLASS(EXPIRES)
C ATEC(12/19) D INSP(12/19)
E MGPL(12/19) H PM (12/19)

CERT# 09-08546
DMV# 879533539

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 004874201 90

EYES BRO
HAIR BRO
HGT 5' 10"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2020
Issued April 01, 2019

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 59674

SECTION 078000 – REFRIGERATED INSULATED BOX SEALANT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide sealant specified in this section for any penetrations of walk in coolers or walk in freezers associated with the work of this project. Sealant shall be applied per manufacturer's installation instructions.

B. DASNY and the Engineer will inspect all penetration seals/repairs on refrigerated boxes. Seals must be provided to the satification of DASNY and the Engineer.

C. .Submit catalog cur and MSDS sheet for product.

PART 2 - PRODUCTS

2.1 Sealant shall be Extreme Seal as manufactured by SILCO, or equal.

2.2 Producrt shall be a one-part extreme cold temperature polyurethane expanding foam that can cure below 0°F.

2.3 Product shall meet ASTM E-84 flame spread rating of 25 and smoke developed of 50.

2.4 Product shall meet the below properties:

PHYSICAL PROPERTIES

Cure System	Polyurethane
Core Density	1.0 lbs. /ft. ^{3} (16 kg./m.^{3})
R-Value ASTM C518	4-5 per inch, typically
RSI (Metric R-Value)	0.7-0.8/inch, 0.005-0.006/mm
Air Barrier Properties ASTM E-283	@6.24 psf (300 Pa) <0.01 cfm/ft^2(0.05 L/s/m^2 @1.57 psf (75 Pa) <0.0025 cfm/ft^2(0.0125 L/s/m^2)
Tack Over Time (min)	70°F, 60% RH ≈ 10 min.
Cure Time (hours)	12-24
Cuttable (1" bead)	<1 hour
Closed Cell Content	>70%
Volatile Organic Content	<20% by Weight

2.5 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following or equivalent manufacturers:

1. SILCO inc.
2. Approved Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.Clean existing surfaces.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that all pipes, conduits, cables, and/or other items which penetrate refrigerated boxes have been permanently installed prior to installation.

FIRESTOPPING SPECIFICATION
SECTION 078400 - FIRESTOPPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity of fire resistance rated construction by maintaining an effective barrier against the spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Building Code for this project.

B. Firestop systems shall be used in locations including, but not limited to, the following:

1. Penetrations through fire resistance rated floor and roof assemblies including both empty openings and openings containing penetrants.
2. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
3. Membrane penetrations in fire resistance rated wall assemblies where items penetrate one side of the barrier.
4. Joints between fire resistance rated assemblies.
5. Perimeter gaps between rated floors/roofs and an exterior wall assembly.

C. Related Sections include, but are not limited to, the following:

1. Division 23 – Heating, Ventilating and Air Conditioning
2. Division 26 – Electrical

1.3 REFERENCES

A. New York State Uniform Fire Prevention and Building Code

B. National Fire Protection Association (NFPA)

1. NFPA 101 (Life Safety Code)

C. American Society For Testing and Materials Standards (ASTM):

1. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E814: Standard Test Method for Fire Tests of Through-Penetration Firestops.
3. ASTM E1966: Test Method for Resistance of Building Joint Systems.
4. ASTM E1399: Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
5. ASTM E119: Methods of Fire Tests of Building Construction and Materials.
6. ASTM E2174: Standard Practice for On-Site Inspection of Installed Fire Stops
7. ASTM E2307: Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
8. ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

D. Underwriters Laboratories Inc. (UL):

1. UL Qualified Firestop Contractor Program.
2. UL 263: Fire Tests of Building Construction and Materials.
3. UL 723: Surface Burning Characteristics of Building Materials.
4. UL 1479: Fire Tests of Through-Penetration Fire Stops.
5. UL 2079: Tests for Fire Resistance of Building Joint Systems.

E. UL Fire Resistance Directory -Volume 2:

1. Through-Penetration Firestop Devices (XHJI)
2. Fire Resistive Ratings (BXUV)
3. Through-Penetration Firestop Systems (XHEZ)
4. Fill, Void, or Cavity Material (XHHW)

F. Omega Point Laboratories (OPL)

1. Building Products, Materials & Assemblies – Volume II

G. Factory Mutual Research (FM):

1. FM 4991: FM Approval Standard of Firestop Contractors – Class 4991

1.4 DEFINITIONS

A. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.

B. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s).

C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

D. Through-penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.

E. Membrane-penetration: Any penetration in a fire-rated wall or floor/roof-ceiling assembly that breaches only one side of the barrier.

F. Fire Resistive/Construction Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.

G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and an exterior wall assembly.

H. Approved Testing Agencies: Not limited to: Underwriters Laboratory (UL), Factory Mutual (FM), Warnock Hersey, and Omega Point Laboratory (OPL).

1.5 PERFORMANCE REQUIREMENTS

A. Penetrations: Provide through-penetration and membrane-penetration firestop systems that are produced and installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.

1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
2. F-Rated Systems: Provide firestop systems with F-ratings indicated, as determined per ASTM E814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the assembly being penetrated.

3. T-Rated Systems: Provide firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E814 or UL 1479, where required by the Building Code.
4. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.
5. W-Rated systems: Provide firestop systems that are resistant to water. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
6. For penetrations involving non-metallic, CPVC, PVC, or plastic piping, tubing or conduit, provide firestop systems that are chemically compatible in accordance with Manufacturer requirements.
7. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.
8. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E1399 and E1966), but not less than the fire resistance assembly rating of the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.

1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
2. For floor penetrations exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means, as specified by the Architect.
3. L- Rated Systems: Provide firestop systems with L- ratings less than 5cfm/sf.

C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less than 450, as determined per ASTM E 84. Note: Firestop products installed in plenum spaces shall have a smoke developed rating less that 50.

D. Engineering Judgment (EJ): Where there is no specific third party tested and classified firestop system available for an installed condition, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to the Approving Authority, Design Professional and Authority Having Jurisdiction for approval prior to installation. The EJ shall follow International Firestop Council (IFC) guidelines.

1.6 SUBMITTALS

A. Product Data: For each type of firestopping product selected. Manufacturers certification must verify that firestopping materials are free of asbestos, lead and contain volatile organic compounds (VOCs) within limits of the local jurisdiction.

B. Design Listings: Submit system design listings, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop configuration.

C. Installation Instructions: Submit the manufacturer’s installation instruction for each firestop assembly.

D. Where there is no specific third party tested and classified firestop system available for a particular configuration, the Contractor shall obtain from the firestopping material manufacturer an Engineering Judgment (EJ) for submittal.

E. Material Safety Data Sheet (MSDS): Submit for each type of firestopping product selected.

F. Qualification Data: For firms and persons specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Submit documents as per 1.7.

G. A quality control manual approved by FM or UL (if applicable).

H. Firestop Schedule: Submit schedule (see appendix A) itemizing the following:

1. Manufacturer’s product reference numbers and/or drawing numbers.
2. Listing agency’s design number.
3. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
4. Maximum allowable annular space or maximum size opening.
5. Wall type construction.
6. Floor type construction.
7. Hourly Fire resistance rating of wall or floor.
8. F rating.
9. T, L, and W rating, if applicable.

I. Firestop Application Log: A separate binder shall be prepared and kept on site for use by the Inspection Agency and the Authority Having Jurisdiction. The binder shall contain the following:

1. The binder shall be a three (3) ring binder.
2. Firestop Schedule (see appendix A)
3. All approved firestopping assemblies including engineering judgments shall be provided and organized by trade.
4. Copy of manufacturer’s installation instruction for each firestop assembly.
5. A matrix or table of contents listing each assembly shall be provided.
6. The binder shall be updated as new firestop assemblies or EJ’s are added.
7. The binder shall be kept on-site at a location approved by the Owner.
8. Qualifications or Certification of Installer

1.7 QUALITY ASSURANCE

A. Provide firestopping system design listings from UL, FM, Warnock Hersey or OPL in accordance with the appropriate ASTM Standard(s) per article 1.5.

B. Contractor Qualifications: An acceptable Firestop Contractor shall be:

1. Licensed by State or Local Authority where applicable, or
2. FM Research approved in accordance with FM Standard 4991, or
3. UL Qualified Firestop Contractor, or
4. Meet the following requirements
   i. Installation personnel shall be trained by the approved firestop manufacturer.
   ii. The installation firm shall be experienced in installing firestop systems and fire resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
   iii. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified tested and listed system requirements.
   iv. Minimum of three (3) years experience and shown to have successfully completed not less than 5 comparable scale projects and provide references.

C. Single Source Limitations: Obtain firestop systems for all conditions from a single manufacturer.

D. Materials from different firestop manufacturers shall not be installed in the same firestop system or opening.

E. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.

F. Firestopping sealants must be flexible, allowing for normal movement.

G. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces such that a void is created.

H. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.

I. Materials used shall be in accordance with the manufacturer's written installation instructions.

J. Identify installed firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and provide a label material that will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Firestop system designation of applicable testing and listing agency.
4. Date of installation.
5. Firestop system manufacturer's name.
6. Installer's name.
7. Inspector's name (if applicable)

K. Inspection of penetrations through fire rated floor and wall assemblies shall be in accordance with ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E2393-04 Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers. The Owner may engage a qualified, independent inspection agency, or material testing agency to perform these inspections.

L. Field Mock-up Installations: Prior to installing firestopping, erect mock-up installations for each type firestop system indicated in the Firestop Schedule to verify selections made and to establish standard of quality and performance by which the firestopping work will be judged by the Owner or Owner's Representative. Obtain acceptance of mock-up installations by the Owner or Owner's Representative before start of firestopping installation. Provide at least 72 hours notice to Owner or Owner's Representative prior to inspection.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture/expiration, lot number, listing agency's classification marking, and mixing instructions for multi-component materials.

B. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. All firestop materials shall be installed prior to expiration date.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within limits permitted by the manufacturer's written instructions. Do not install firestopping when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate per the manufacturers written instructions on the product's Material Safety Data Sheet.

C. Verify the condition of the substrates before starting work.

D. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

1.10 COORDINATION

A. Coordinate areas prior to firestopping installation with the Owner, Construction Manager and/or all other Contractors.

B. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed according to specified requirements. Opening shall not exceed maximum restrictions allowable for annular spacing per listing or acceptable Engineering Judgments.

C. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

D. Do not conceal firestopping installations until the Owner's inspection agency or Authorities Having Jurisdiction have examined each installation.

E. Schedule firestopping after installation of penetrants and joints but prior to concealing or obstructing access to areas requiring firestopping.

F. Preinstallation Conference: This conference should be a joint meeting attended by the Owner's Representative and all prime contractors, respective firestopping sub-contractors and firestopping company field advisor to review project requirements. The agenda for the conference should include the following topics:

1. Review scope of work.
2. Review shop drawings and firestop application log.
3. Review mock-up requirements.
4. Discuss identification labels and locations.
5. Review schedule, coordination and sequencing with all trades.
6. Review any engineering judgments or other special requirements.
7. Function and frequency of inspections and testing labs.

G. Destructive testing shall be performed at mock up and at pre determined intervals according to ASTM E 2174 and ASTM E 2393-04 by the inspector and with the installing Contractor present. Inspector to test for in place installation conformance to tested and listed system or engineering judgment details. Non conformances will result in additional destructive testing, at the cost of the installer.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Firestopping products specified in system design listings by approved testing agencies may be used providing they conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate assembly.

B. Manufacturer of firestopping products shall have been successfully producing and supplying these products for a period of not less than three years and be able to show evidence of at least ten projects where similar products have been installed and accepted.

C. Accessories: Provide components for each firestop system that is needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by the firestopping manufacturer and by the approved testing agencies for the firestop systems indicated. Accessories include, but are not limited to the following items:

1. Permanent forming/damming/backing materials, including the following:
    i. Slag wool fiber insulation.
    ii. Foams or sealants used to prevent leakage of fill materials in liquid state.
    iii. Fire-rated form board.
    iv. Polyethylene/polyurethane backer rod.
    v. Rigid polystyrene board.
2. Temporary forming materials.
3. Substrate primers.
4. Steel sleeves

D. All firestopping products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed.

2.2 MIXING

A. For those products requiring mixing before application, comply with firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.3 MANUFACTURERS

A. Subject to compliance with the requirements, provide products by one of the following or equivalent manufacturers:
    1. Grace Construction Products.
    2. Nelson Firestop Products.
    3. Hilti Firestop Products.
    4. A/D Fire Protection Systems Inc.
    5. RectorSeal Corporation (The).
    6. Specified Technologies Inc.
    7. 3M; Fire Protection Products Division.
    8. Tremco; Sealant/Weatherproofing Division.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Verify that all pipes, conduits, cables, and/or other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

3.3 FIRESTOP SYSTEMS INSTALLATION

A. General: Install firestop systems to comply with "Performance Requirements" article in Part 1 and firestopping manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Installation of firestopping shall be performed by an applicator/installer qualified as described in article 1.7.

C. Apply firestopping in accordance with approved testing agencies listed system designs or manufacturer's EJ per the manufacturer's installation instructions.

D. Verify that environmental conditions are safe and suitable for installation of firestop products.

E. Install forming/damming/backing materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire resistance ratings required.

F. Install joint forming/damming materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths of installed firestopping material relative to joint widths that allow optimum movement capability and achieve fire resistance ratings required.

G. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop materials as applicable within the system design.

H. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids, joints and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they fully contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

4. Tool non-sag firestop materials after their application and prior to the time skinning begins. Use tooling agents approved by the firestopping manufacturer.

I. On vertical pipe penetrations, lift riser clamps to permit the installation of firestopping around the entire pipe penetration. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Authorities Having Jurisdiction, the Owner, or Owner's Representative shall be allowed to perform random destructive testing during inspection of firestop systems to verify compliance per listings or manufacturer's installation instructions. All areas of work must be accessible until inspection by the applicable Authorities Having Jurisdiction and inspection agencies. The contractor shall be responsible to repair all tested assemblies with no cost to the owner.

B. Proceed with enclosing firestop systems with other construction only after inspections are complete.

C. Where deficiencies are found, repair or replace firestop systems so they comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings, as Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not damage materials in which openings occur. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.

B. Provide final protection and maintain conditions during and after installation that ensure firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce firestop systems complying with specified requirements.

FIRESTOP SCHEDULE

Project No:	Contractor Name and Address:	Date Submitted:
Project Title:	Supplier/Installer Name and Address:	Company Field Advisor Name and Address:
	Manufacturer Name and Address:	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						
Example No. 1 DCFSS-130	UL #130	Maximum 4" Steel Pipe Non-Insulated		P4	6" CMU	N.A.	1 Hour	1 Hour	N.A	.	
Example No. 2 5300-ICF88.01	UL #591	Maximum 4" PVC Pipe		N.A.	N.A.	UL # D916	3 Hour	1 Hour	2 Hour		
Exmple No. 3	CW-S-2006	Curtain Wall/Perimeter	6” to 12”	NA	NA	4 ½” Reinforced LW concrete	2 Hour	2 Hour	NA	1 CFM/ Lin Ft.	

Manufacturer's Product Reference Numbers and/or Drawing Numbers	U.L., FM, Warnock Hersey or Omega Point Lab Penetration Design Nos.	Penetrating Item: Material, Size, Insulated, Combustible, Joint, Perimeter, etc. Description:	Maximum Allowable Annular Space or Maximum Size Opening	Wall type Construction		Floor Type Construction	Fire Resistance Rating of Wall or Floor (Hourly)	F Rating	T Rating (floors Only)	L Rating (if available)	W Rating (if available)
				DES.	CONST.						

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Cement board.
3. Clay masonry.
4. Concrete masonry units (CMUs).
5. Wood.
6. Plastic.
7. Gypsum board.
8. Plaster.
9. Cotton or canvas insulation covering.
10. ASJ insulation covering.
11. Bituminous-coated surfaces.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Sustainable Design Submittals:

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide products indicated in “Interior Painting schedule from the following or equal as approved by the owner:

1. Benjamin Moore.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As indicated in a color schedule.

1. Ten percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Fiber-Cement Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent.
6. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

F. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

G. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

1. SSPC-SP 2.
2. SSPC-SP 3.
3. SSPC-SP 7/NACE No. 4.
4. SSPC-SP 11.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, and Communication Work:

1. Paint the following work where exposed in equipment rooms:

    a. Pipe hangers and supports.
    b. Metal conduit.
    c. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

    a. Pipe hangers and supports.
    b. Metal conduit.
    c. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply

additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board and Plaster Substrates:

1. Coordinate with owner to match existing color of wall where sensors are being replaced.

END OF SECTION 099123

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Flowmeters.

B. Related Requirements:

1. Section 232216 "Steam and Condensate Piping Specialties" for steam and condensate meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOWMETERS

A. Turbine Flowmeters:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Flexim.
   b. Spriax Sarco
   c. Rosemount.
   d. Vortex Instruments.

2. Description:
   a. Flowmeter with sensor and indicator.
   b. Flowmeter to be pressure compensated.
   c. Local display.
   d. Bacnet and pulse output connections.

3. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
   FM-1 range 517 #/hr to 8270 #/hr
   FM-2 range 72 #/hr to 1175 #/hr
4. Sensor: Inline type; for installing between pipe flanges and measuring flow directly in pounds of steam per hour.

   1. Design: Flow obstruction device, vortex-measurement type for steam.
   2. Construction: Stainless-steel body, with integral transmitter and direct-reading scale.
   3. Minimum Pressure Rating: 1000 psig.
   4. Minimum Temperature Rating: 500 deg F.
   5. Integral Transformer: For low-voltage power operation.

5. Indicator: Hand-held meter; either an integral part of sensor or a separate meter.
6. Accuracy:
   Mass Flowrate: Plus or minus 2 percent over a 30:1 range
   Temperature: Plus or minus 2 deg F
   Pressure: 0.3 percent of transducer full scale.

7. Display: Shows rate of flow.
8. Operating Instructions: Include complete instructions with each flowmeter.
9. Factory start-up and training is required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids (except steam).

J. Install test plugs in piping tees.

K. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

L. Install flowmeter elements in accessible positions in piping systems.

M. Install wafer-orifice flowmeter elements between pipe flanges.

N. Install permanent indicators on walls or brackets in accessible and readable positions.

O. Install connection fittings in accessible locations for attachment to portable indicators.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 FLOWMETER SCHEDULE

A. Flowmeters for Steam and Steam-Condensate Piping: Turbine type.

END OF SECTION 230519

SECTION 230523.12 - BALL VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.1 for power piping valves.
7. ASME B31.9 for building services piping valves.

C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

D. Refer to HVAC valve schedule articles for applications of valves.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

I. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but not limited to the following:

    a. Apollo
    b. Jamesbury
    c. Milwaukee
    d. NIBCO

2. Description:

    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psig.
    d. Body Design: Two piece.
    e. Body Material: Bronze.
    f. Ends: Threaded.
    g. Seats: PTFE.
    h. Stem: Stainless steel.
    i. Ball: Stainless steel, vented.
    j. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

F. Provide dielectric fitting between ball valves and steel piping. Alternatively, the contractor may provide a letter on manufacturer's letterhead stating their valves are suitable to be used as dielectric/installed directly on steel piping. Dielectric should be anticipated for this work.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Steel Piping, NPS 2-1/2 and Smaller: Threaded ends.

3.4 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Smaller:

1. Bronze ball valves, two piece, with stainless-steel trim, full port.

a. Bronze ball valves, NPS 2-1/2 and smaller. May be provided with threaded ends instead of flanged ends.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Smaller:

1. Bronze ball valves, two piece with stainless-steel trim, full port,

a. Bronze ball valves, NPS 2-1/2 and smaller: May be provided with threaded ends instead of flanged ends.

3.6 LOW-PRESSURE STEAM VALVE SCHEDULE (15 PSIG OR LESS)

A. Pipe NPS 2-1/2 and Smaller:

1. Bronze ball valves, two piece, with stainless-steel trim, and full port.

    a. Bronze ball valves, NPS 2-1/2 and smaller: May be provided with threaded ends instead of flanged ends.

END OF SECTION 230523.12

SECTION 230523.13 - BUTTERFLY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. High-performance butterfly valves.
2. Chainwheels.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set butterfly valves closed or slightly open.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.1 for flanges on iron valves.
2. ASME B16.5 for pipe flanges and flanged fittings, NPS 1/2 through NPS 24.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B31.1 for power piping valves.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

E. Valve Sizes: Same as upstream piping unless otherwise indicated.

F. Valve Actuator Types:

1. Gear Actuator: For valves.
2. Chainwheel: Device for attachment to gear, stem, or other actuator of size and with chain for mounting height, according to "Valve Installation" Article.

G. Valves in Insulated Piping: With 2-inch stem extensions with extended necks.

2.2 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Single-Flange, High-Performance Butterfly Valves, Class 150:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Jamesbury
b. NIBCO
c. Milwaukee Valve

2. Basis of Design

a. Jamesbury, Series 800

3. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 285 psig at 100 deg F.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

2.3 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.
3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to hand wheels.
1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
2. Chain: Hot-dip-galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for butterfly valves NPS 3 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Larger:

1. High-Performance Butterfly Valves: Single flange, Class 150.

3.5 LOW-PRESSURE STEAM VALVE SCHEDULE (15 PSIG OR LESS)

A. Pipe NPS 2-1/2 and Larger: High-performance butterfly valves, single flange, Class 150.

END OF SECTION 230523.13

SECTION 230523.15 - GATE VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze gate valves.
2. Iron gate valves.
3. Chainwheels.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. NRS: Nonrising stem.

C. OS&Y: Outside screw and yoke.

D. RS: Rising stem.

E. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set gate valves closed to prevent rattling.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.
5. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. RS Valves in Insulated Piping: With 2-inch stem extensions.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 PRESSURE CLASSES FOR LOW TEMPERATURE WATER SYSTEMS 40DEGF TO 220DEGF

A. Gate valves:

1. To two inches:

a. To 240 psig maximum system pressure: 150 pound WSP (300 pound WOG), bronze.

2. For 2-1/2 inches to 12 inches:

a. To 145 psig maximum system pressure: 125 pound WSP (200 pound WOG), cast iron.
b. 150 to 180 psig maximum pressure: 150 ANSI, cast steel.

2.2 BRONZE GATE VALVES

A. Bronze Gate Valves, RS, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Bronze Gate Valves, RS, Class 150:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

2.4 IRON GATE VALVES

A. Iron Gate Valves, OS&Y, Class 125:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Flo Fab Inc.
e. Hammond Valve.
f. Kitz Corporation.
g. Legend Valve.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell Valves.
k. Red-White Valve Corporation.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Material: ASTM A126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze or stainless steel.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

3. The contractor may provide class 150 ductile iron gate valve conforming to MSS SP-128, iron body bronze mounted, flanged ends for 2” valve size.

2.3 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.

3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to hand wheels.

1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.
2. Chain: Hot-dip-galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for gate valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Gate valves.

B. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends, except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends, except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends, except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

D. Provide dielectric fittings at all bronze valves installed in steel piping.

3.5 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Larger: Iron gate valves, OS&Y, Class 125.

3.6 LOW-PRESSURE STEAM VALVE SCHEDULE (15 PSIG OR LESS)

A. Pipe NPS 2-1/2 and Larger: Iron gate valves, OS&Y, Class 125.

END OF SECTION 230523.15

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment stands.
8. Equipment supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Welding Procedures

1.5 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7. Note: Building is a Seismic Design Category B.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe and Tube - Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of Steel

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psi (688-kPa) minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Steam Piping: Water-repellent-treated, ASTM C533, Type I calcium silicate with 100-psi (688-kPa)] minimum compressive strength.

C. Insulation-Insert Material for Hot Piping ASTM C552, Type II cellular glass with 100-psi (688-kPa) minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Not permitted.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
   1. Indoor Applications: Zinc-coated or stainless steel.
   2. Outdoor Applications: Stainless steel.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:
   1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
   2. Hardware: Galvanized steel.
   3. Accessories: Protection pads.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MATERIALS

A. Carbon Steel: ASTM A1011/A1011M.

B. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

C. Stainless Steel: ASTM A240/A240M.

D. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078400 " Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A36/A36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65**)** and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-inches

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780/A780M.

C. Comply with requirements in Section 099123 “Interior Painting”.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment. Where not specifically listed, comply with the NYS Mechanical Code.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports or metal trapeze pipe hangers] and attachments for general service applications.

F. Use copper-plated pipe hangers and or stainless steel attachments for copper piping and tubing.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if no insulation is required.
4. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
5. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 2 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
6. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
7. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
8. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
10. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
11. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. C-Clamps (MSS Type 23): For structural shapes.
5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
6. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that many be incorporated into the work include, but are not limited to the following:

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.

e. Craftmark Pipe Markers.
f. Marking Services, Inc.
g. Seton Identification Products.

2. Material and Thickness: aluminum, 0.032-inch minimum thickness and having predrilled or stamped holes for attachment hardware.
3. Letter Color: See schedule in Section 3 “Execution”
4. Background Color: See schedule in Section 3 “Execution”
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that many be incorporated into the work include, but are not limited to the following:

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. Marking Services, Inc.
g. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick and having predrilled holes for attachment hardware.
3. Letter Color: See schedule in Section 3 “Execution”
4. Background Color: See schedule in Section 3 “Execution”
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. Marking Services, Inc.
g. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.3 VALVE TAGS

a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. Seton Identification Products.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link chain or beaded chain.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

B. EMT is required for all control system wiring that is concealed in non-accessible building construction or exposed. This includes exposed in mechanical rooms where GRC or RMC is currently specified.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

C. Install equipment labels on BMS equipment: This includes but is not limited to control panels, controllers, enclosures, etc.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping: White letters on a safety-green background.
2. Heating Water Piping: Black letters on a safety-orange background.
3. Low-Pressure Steam Piping: Black letters on a safety-orange background.
4. Steam Condensate Piping: Black letters on a safety-orange background.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Chilled Water: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.
c. Low-Pressure Steam: 1-1/2 inches, round.
d. Steam Condensate: 1-1/2 inches, round.

2. Valve-Tag Colors:

a. Toxic and Corrosive Fluids: Black letters on a safety-orange background.
b. Flammable Fluids: Black letters on a safety-yellow background.
c. Combustible Fluids: White letters on a safety-brown background.
d. Potable and Other Water: White letters on a safety-green background.
e. Compressed Air: White letters on a safety-blue background.

f. Defined by User: White letters on a safety-purple background, black letters on a safety-white background, white letters on a safety-gray background, and white letters on a safety-black background

END OF SECTION 230553

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Related Sections:
1. Section 230719 "HVAC Piping Insulation."
2. Section 233113 "Metal Ducts"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C1290, [Factory-applied jacket requirements are specified in "Factory-Applied Jackets" For operating temperatures higher than 250 deg F (121 deg C), use board insulation in first paragraph below. The most common jacket for ductwork and plenum applications is FSK.

F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ] or with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. The maximum K factor, tested in accordance with ASTM 518 (blanket) or ASTM C612 (Board) at 75°F, shall be 0.25 BTU*in/(Hr*ft^2*°F) for both blanket and board insulation.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dow Corning Corporation.
b. Johns Manville; a Berkshire Hathaway company.
c. P.I.C. Plastics, Inc.
d. Speedline Corporation.

2.3 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic: Water based; suitable for indoor use on below ambient services.
1. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2, for insulation type and service conditions.
2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).

3. Comply with MIL-PRF-19565C, Type II, for permeance requirements

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Water-Vapor Permeance: ASTM E96, greater than 1.0 perm (0.66 metric perms) at manufacturer's recommended dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
2. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
3. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: Aluminum.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Childers Brand; H. B. Fuller Construction Products.

2.
3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Fire- and water-resistant, flexible, elastomeric sealant.
5. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E96/E96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Johns Manville; a Berkshire Hathaway company.
    b. P.I.C. Plastics, Inc.
    c. Proto Corporation.
    d. Speedline Corporation.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.
1. Width: 3 inches (75 mm).
2. Thickness: 11.5 mils (0.29 mm).
3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.
1. Width: 3 inches (75 mm).
2. Thickness: 6.5 mils (0.16 mm).
3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.

6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1.
2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

D. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Compac Corporation.
   b. Ideal Tape Co., Inc., an American Biltrite Company.

2. Width: 2 inches.

3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:
1. Stainless Steel: ASTM A167 or ASTM A240/A240M, Type 304 or Type 316 1/2 inch (13 mm)]wide with wing seal.
2. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm) diameter shank, length to suit depth of insulation indicated.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in

position indicated when self-locking washer is in place. Comply with the following requirements:

a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
b. Spindle: Stainless steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   a. Baseplate: Perforated, nylon sheet, 0.030 inch (0.76 mm) thick by 1-1/2 inches (38 mm) in diameter.
   b. Spindle: Nylon, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches (63 mm).
   c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

   d.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

2.11 2.9 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

    1. Install insulation continuously through hangers and around anchor attachments.
    2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
    3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

    1. Draw jacket tight and smooth.
    2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements in Section 078413 "Penetration Firestopping."

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for **100** percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Insulate duct access panels and doors to achieve same fire rating as duct.

B. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, rationally selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited five location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation: All ducts and air dampers effected by the work of the project. This is primarily duct reconfigurations for AHU and duct dampers. Insulate duct and dampers.

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Items Not Insulated:
1. Factory-insulated plenums and casings.
2. Factory-insulated access panels and doors.
3. Damper actuators.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply, Return, Exhaust (within 20 feet of building envelope penetration or if existing exhaust is insulated), and Outside Air Intake -air duct insulation shall be one of the following:
1. Mineral-Fiber Blanket: 3 inches thick and 0.75-lb/cu. ft. nominal density.
2. Mineral-Fiber Board: 3 inches thick and 2-lb/cu. ft. nominal density.

3.11 3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. None.
2. PVC: 20 mils thick.
3. Aluminum, Smooth: minimum 0.016 inch thick.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulation for HVAC piping systems:

1. Chilled water and ice water piping, indoors.
2. Heating hot water piping, indoors.
3. Steam piping, indoors.

B. Related Sections:

1. Section 230713 "Duct Insulation" for duct insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
3. Detail removable insulation at piping specialties.
4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Mineral-Fiber, Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

    a. Johns Manville; Microlite.
    b. Knauf Insulation; Friendly Feel Wrap.
    c. Owens Corning; SOFTR All-Service Wrap.

F. Mineral-Fiber, Performed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

    a. Johns Manville; Microlite.
    b. Knauf Insulation; Friendly Feel Wrap.
    c. Owens Corning; SOFTR All-Service Wrap.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber, Pipe Insulation Wicking System: Performed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory-applied to the entire inside surface of performed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

    a. Knauf Insulation; Friendly Feel Wrap.
    b. Owens Corning; SOFTR All-Service Wrap.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. The following material shall not be utilized:

1. Those containing chemicals that are known (IARC Group 1) or probable (IARC Group 2a) human carcinogens.
2. Hazardous substances listed in OSHA 1910 subpart Z.
3. Products containing volatile organic compounds (VOCs) in excess of 50 g/L.
4. Products whose Safety Data Sheet (SDS) rates health, fire and/or reactivity as exceeding "1" on a scale of 0 to 4.
5. Products emitting strong odors.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Benjamin Foster Company.
b. Elgen.
c. Venture Tape Corporation.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. ASJ Adhesive and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Benjamin Foster Company.
b. Elgen.
c. Venture Tape Corporation.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. The following material shall not be utilized:

1. Those containing chemicals that are known (IARC Group 1) or probable (IARC Group 2a) human carcinogens.
2. Hazardous substances listed in OSHA 1910 subpart Z.
3. Products containing volatile organic compounds (VOCs) in excess of 50 g/L.
4. Products whose Safety Data Sheet (SDS) rates health, fire and/or reactivity as exceeding "1" on a scale of 0 to 4.
5. Products emitting strong odors.

C. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corportation; 749.

2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Comply with MIL-PRF-19565C, Type II, for permeance requirements, with supplier listing on DOD QPD - Qualified Products Database.
6. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

a. Childers Brand, Specialty Construction Brans, Inc., a business of H. B. Fuller Company; CP-10.
b. Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corportation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

A. Adhesives shall comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

B. The following material shall not be utilized:

1. Those containing chemicals that are known (IARC Group 1) or probable (IARC Group 2a) human carcinogens.
2. Hazardous substances listed in OSHA 1910 subpart Z.
3. Products containing volatile organic compounds (VOCs) in excess of 50 g/L.
4. Products whose Safety Data Sheet (SDS) rates health, fire and/or reactivity as exceeding "1" on a scale of 0 to 4.
5. Products emitting strong odors.

D. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

a. Childers Brand, Specialty Construction Brans, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
c. Vimasco Corportation; 713 and 714.

2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
3. Service Temperature Range: 0 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

a. Childers Brand, Specialty Construction Brans, Inc., a business of H. B. Fuller Company; CP-76.
b. Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

C. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

   a. Childers Brand, Specialty Construction Brans, Inc., a business of H. B. Fuller Company; CP-76.
   b. Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Provide Johns Manville Zeston Series 2000 or approved equal.
2. Adhesive: As recommended by jacket material manufacturer.
3. Tape PVC jacket to pipe insulation ASJ or FSK. Tape any penetration of the PVC jacket.

4. Submit installation instructions from manufacturer.
5. Do not use on steam and steam condensate applications.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

   a. ABI, Ideal tape Division; 428 AWF ASJ.
   b. Venture Tape; 1540 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

   a. ABI, Ideal tape Division; 428 AWF ASJ.
   b. Venture Tape; 1540 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to the following:

   a. ABI, Ideal tape Division; 428 AWF ASJ.

b. Venture Tape; 1540 CW Plus, and 1542 CW Plus/SQ.

2. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal.
3. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel, with ends flat and slotted to accept metal bands. Spring size is determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4 inch wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. C&F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated and all chilled water applications, , seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
5. Seal or tape all fittings, elbows, valves, etc. in chilled water applications, including PVC field installed fittings.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 25 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit.

Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges, mechanical couplings, and unions using a section of oversized preformed pipe insulation to fit. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe

insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as that of straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.
5. Insulate strainers, including blow down of strainer. Insulate other pipe specialties.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. In the sole discretion of the Engineer, any suspect installation may be inspected.

B. All insulation applications will be considered defective if they do not pass tests and inspections.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Insulation conductivity and thickness per pipe size shall comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.

B. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

C. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Chilled Water , 40 Deg F and below:

1. NPS 3 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inches thick.

2. NPS 4 to NPS 12: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3. Systems include AHU cooling coils and air-cooled chillers.

B. Chilled Water and Ice Water, Above 40 Deg F:

1. NPS 3 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inches thick.

2. NPS 4 to NPS 12: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3. Systems include AHU cooling coils and air-cooled chillers.

C. Ice Water, 40 Deg F and below:

1. NPS 3 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inches thick.

2. NPS 4 to NPS 12: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3. Systems include AHU cooling coils, Ice water chillers and Ice storage tank.

D. Ice Water, Above 40 Deg F:

1. NPS 3 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inches thick.

2. NPS 4 to NPS 12: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3. Systems include AHU cooling coils, Ice water chillers and Ice storage tank.

E. Heating-Hot-Water Supply and Return, 200 Deg F and Below:

1. 1-1/4 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe, Type I: 1.5 inches thick.

2. 1-1/2 and Larger: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3. Systems include Space reheat coils and heat exchangers.

F. Steam and Steam Condensate, Boiler Blowdown, Vents, Drains 250 Deg F and Below:

1. NPS 3.5 and Smaller: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2-1/2 inches thick.

2. NPS 4 and Larger: Insulation shall be one of the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches thick.

3. Systems include AHU heating coils, domestic hot water tanks and heat exchangers.

G. Steam and Steam Condensate, Boiler Blowdown, Vents, Drains Above 250 Deg F: Mineral-Fiber, Preformed Pipe Insulation, Type I: 4-1/2 inches thick

END OF SECTION 230719

SECTION 230800 - COMMISSIONING OF MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1. DESCRIPTION

A. General provisions and other mechanical systems are specified in other Sections of Division 23.

B. Commissioning is an ongoing process and shall be performed throughout construction. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. Division 23 shall be familiar with the commissioning plan issued by the Commissioning Authority (CA) as it applies to the work of Division 23 and shall execute all commissioning responsibilities assigned to them in the Contract Documents. The Contractors should also review Specifications Section 019113 for additional information.

C. Commissioning shall conclude with the completion of all required deferred testing, training and system documentation as specified and required to ensure the proper operation of the mechanical equipment and systems provided by this Division.

D. This Section covers mechanical systems commissioning, as required to demonstrate that the equipment and systems of Division 23 are ready for safe and satisfactory operation, as defined by project documents. Commissioning shall include, but shall not be limited to, identification of piping and equipment, cleaning, lubrication, start-up, check-out, and testing, adjusting, and balancing of systems, preparation of equipment and systems documentation and of maintenance and operation manuals, Owner training, and preparation of record drawings.

E. This section does not alter the commissioning requirements indicated in Section 019113 of the General Commissioning Requirements. This section is to help define/supplement the requirements of Section 019113 where applicable.

1.2. QUALITY ASSURANCE

A. The mechanical contractor shall identify a mechanical commissioning supervisor. The mechanical commissioning supervisor should have a minimum of ten years of experience in mechanical contracting. The mechanical commissioning supervisor shall become familiar with the design intent and the requirements of the commissioning process as defined in this Section. The mechanical commissioning supervisor shall attend all commissioning meetings and coordinate the commissioning schedule as outlined by the CA. The mechanical commissioning supervisor shall assist the CA in coordinating and executing the required commissioning activities.

1.3. MECHANICAL, PLUMBING, AND FIRE PROTECTION CONTRACTOR RESPONSIBILITIES

A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.

B. The mechanical commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA.

Specific requirements of the mechanical contractor and associated subcontractors are identified in this Section and in other Sections of this Division.

C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as per section 019113.

D. Mechanical commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:

1. Construction Phase

a. The Contractor shall attend a Commissioning Scoping meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and may increase in frequency to weekly during the start-up, pre-functional and functional testing phases. The Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scoping meeting and other commissioning meetings, as appropriate, during the construction process.

b. The Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.

c. The Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.

d. The Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; fan and pump curves; full factory testing reports, if any; and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.

e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.

f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.

g. The Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.

h. The Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

i. The CA shall prepare the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

j. Contractor shall prepare a preliminary schedule for Division 23 commissioning activities, to include pipe and duct system testing, flushing and cleaning, equipment start-up, and TAB start and completion, for use by the CA and shall update the schedule as appropriate. CA will assist in providing expected time durations for Cx activities.

k. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction. Mechanical equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.

l. The Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.

m. The Contractor shall perform and clearly document all completed start-up and system operational checkout procedures, providing a copy to the CA.

n. The Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air or water related systems.

o. The CA shall generate the functional testing procedure and record to the mechanical contractor. The mechanical contractor shall review and provide support to the functional testing process. Contractor shall operate boilers, pumps, etc., and systems in accordance with the CA requirements, open and close disconnects and switch normal and emergency power requirements as directed by the CA and the functional testing procedures.

p. The Contractor shall report in writing to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.

2. Acceptance Phase. The Contractor shall assist and cooperate with the CA in the commissioning process by:

a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.

b. For a given area, have all required pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.

c. Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
d. Provide a TAB representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
e. Including cost of sheaves and belts that may be required to obtain required equipment performance, as measured by the test and balance effort.
f. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.
g. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
h. Installing a P/T plug at each water sensor that is an input point to the Control System.
i. Providing skilled technicians to execute starting and operation of equipment.
j. The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
k. The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, DX and hot water systems to generate loading strategies) during the functional testing.
l. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
m. Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
n. Maintain on site redline as built drawings and produce final “As-built” drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
o. Provide specified training of the Owner’s operating personnel in accordance with the CA’s overview and outline.
p. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
q. Provide updated diagrammatical logic for all TAB adjustments to the system.

3. Warranty Period. During the warranty period, the Contractor shall:

a. Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.
b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

1.4. TAB CONTRACTOR RESPONSIBILITIES

A. Six weeks prior to the starting of the T&B, submit to the CA, the qualifications of the site technician(s) for the project, including three (3) names of contractors and facility managers of recent projects on which the personnel were in charge. The Owner and CA will approve the site technician for this job.

B. Three months prior to the start of the TAB, submit a TAB plan and approach for each system. The plan shall be reviewed by the TAB and the CA for review and approval. The submitted plan shall include:

1. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and Contractors to sufficiently understand the design intent for each system.
2. An explanation of the intended use of the building control system.
3. All field check-out sheets and logs to be used that lists each piece of equipment to be tested adjusted and balanced with the data cells to be gathered for each.
4. Final test report forms to be used during this process:

    a. Detailed step by step procedures for TAB work for each system and issue: terminal flow calibration; diffuser proportioning; branch and submain proportioning; total flow calculations; and rechecking diversity issues.
    b. List all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of each of the test procedures, parameters and formulas to be used.
    c. Details of how total flow will be determined (Air: sum of terminal flows via BMS calibrated readings or via hood, pitot tube or flow stations). Details of how total water flow will be determined (Water: pump curves, circuit setters, flow station, ultrasonic, etc.).
    d. The identification and types of measurement instruments to be used and their most recent calibration date.
    e. Specific procedures that will ensure that both air and watersides will be operating at their lowest possible pressure at the point where the system will operate.
    f. Confirmation that the TAB contractor understands the outside air ventilation criteria under all conditions and how this will be measured during normal, economizer and unoccupied conditions.
    g. Details of how building static, room static and exhaust fan capacity will be checked.
    h. Proposed selection points for traverse measurement locations on the as-built documents. Review the placement of the HVAC measurement devices for proper straight runs and accuracy.
    i. Submit a plan for testing and checking the fume hood system exhaust requirements.
    j. Plan for formal progress reports including scope and frequency.
    k. Plan for formal deficiency reports including scope and frequency.

5. TAB contractor shall attend commissioning meetings as directed by the CA and the general contractor.
6. TAB contractor shall communicate in writing to the controls contractor and the CA all setpoint and parameter changes made or problems and discrepancies identified during the TAB process that would affect the control loop system set-up and operation.
7. Submit written report of discrepancies, deficit or uncompleted work by others, contract interpretation requests and list of completed tests to the CA at least once per week.
8. After the TAB plan is accepted and two-weeks prior to TAB work, the contractor shall conduct a pre-balancing conference. Prior to the pre-balancing conference, the TAB contractor shall inspect the system readiness for testing and balancing. The TAB contractor shall prepare a list of deficiencies and uncompleted work that will affect the TAB process. This list shall be submitted to the CA and the general contractor.

9. The TAB contractor shall review the projected schedule and provide, in writing, to the CA and CM any delays in the schedule and what items will require completion prior to the TAB work.
10. The CA agent shall conduct independent verification of 10% of air and water end-devices for acceptance after the TAB contractor states in writing that they are complete with Testing & Balancing. The TAB contractor shall provide a mechanic to assist the CA in this verification and shall include this in the scope and price of the Work.
11. The TAB agent shall submit the TAB report to the CA for his review and comment. All data contained shall be re-verified in the field by the CA. A minimum of ten percent of the airflow readings shall be verified by the CA using his own equipment. All selection points shall be random. Total airflow shall be verified on all mains in the supply and the exhaust ducts.

1.5. CONTROL CONTRACTOR RESPONSIBILITIES

A. Include and itemize the cost of commissioning in the contract price with an estimated breakdown of hours for meeting and functional testing requirements.

B. The controls commissioning supervisor shall be responsible for scheduling, supervising, and coordinating the startup, testing and commissioning activities as specified herein with the CA. Specific requirements of the controls contractor and associated subcontractors are identified in this Section and in other Sections of this Division.

C. The CA shall conduct independent verification of installation, pre-functional, start-up and functional testing as per section 019113.

D. Controls commissioning shall take place in three phases. Commissioning requirements for each phase are as follows:

1. Construction Phase

    a. Contractor shall attend a Commissioning Scope meeting and additional commissioning meetings as required throughout the commissioning process. These commissioning meetings will be monthly during early construction and increase in frequency to weekly during the start-up, pre-functional and functional testing phases. Contractor shall assure that all subcontractors who have commissioning responsibilities attend the Commissioning Scope meeting and other commissioning meetings, as appropriate, during the construction process.
    b. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are scheduled concerning the status of his activities as they affect the commissioning process, the status of each discrepancy identified, the pre-functional and functional testing process, explanations of any disagreements with the identified deficiencies, and proposed resolution and schedule.
    c. Contractor shall provide the CA with normal cut sheets and shop drawing submittals of equipment that is to be commissioned.
    d. Contractor shall provide documentation to the CA for development of pre-functional and functional performance testing procedures, prior to normal O&M manual submittals. This documentation shall include detailed manufacturer installation, start-up, operating, troubleshooting and maintenance procedures; full details of any owner-contracted tests; points listing; full factory testing reports, if any; and full

warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA. The CA may request further documentation necessary for the development of functional performance testing and the commissioning process. This data request may be made prior to normal submittals.

e. The Contractor shall develop and submit to CA, for review prior to equipment or system startup, a complete startup and initial checkout plan using manufacturer's start-up procedures.

f. The Contractor shall review and complete the CA's pre-functional check-sheets and sign-off on the appropriate areas when the Contractor and sub-contractors are complete. The pre-functional test sheets will be developed by the CA. The CA may conduct their own pre-functional testing check in parallel with the Contractors or verify the contractors completed pre-functional forms after submission.

g. Contractor shall provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review.

h. Contractor shall assist in clarifying the proposed operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

i. CA shall prepare for the specific functional test procedures as specified herein. The Contractors shall review the CA's proposed functional performance test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.

j. Controls contractor shall prepare a preliminary schedule for their commissioning activities, to include wiring, instrument installation, calibration, point-to-point verification, sequence of operation testing and emergency operating procedural testing for use by the CA and shall update the schedule as appropriate. The Contractor shall update the commissioning activities and notify any delays in the progress meetings. Contractor shall notify the CA during the commissioning meetings when commissioning activities not yet performed or not yet scheduled will delay construction.

k. Controls instrument and equipment start-up shall not be initiated until the complete sign-off of the pre-functional check-sheets as developed by the CA as specified in other Sections of Division 23.

l. Contractor shall provide startup testing for all HVAC equipment, including the building automation control system and shall execute the mechanical/controls-related portions of the pre-functional checklists for all commissioned equipment during the startup and initial checkout process. The CA shall conduct an independent start-up once the Contractor is complete with their requirements.

m. Contractor shall perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.

n. Contractor shall correct current A/E punch list and CA deficiency items before functional performance testing can begin. Point-to-point verification shall be completed with discrepancies and problems remedied before functional testing of the respective controls related systems.

o. The CA shall generate the functional testing procedure and record to the controls contractor. The controls contractor shall review and provide support to the functional testing process. Contractor shall aid in operating boilers, pumps, etc., and systems

in accordance with the CA requirements, turn on and off normal and emergency power requirements as directed by the CA and the functional testing procedures.

p. Contractor shall report, in writing, to the CA at least as often as commissioning meetings are being scheduled concerning the status of each outstanding discrepancy identified during commissioning, pre-functional and functional performance testing. Report shall include description of the identified discrepancy, explanations of any disagreements, and proposals and schedule for correction of the discrepancy.

2. Acceptance Phase. Contractor shall assist and cooperate with the CA in the commissioning process by:

a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of the test and balance and commissioning effort, as required.
b. For a given area, have all required, pre-functional checklists, calibrations, startup and selected functional tests of the mechanical system and associated controls completed and approved by the CA prior to beginning the test and balance process.
c. Provide a qualified technician to operate the controls as required to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
d. Provide a controls representative to assist the CA on conducting a random 10% check of the air and water distribution requirements.
e. Providing skilled technicians to execute starting and operation of equipment.
f. The CA will conduct functional performance testing. The Contractor may be required to have a skilled technician present during functional testing, although it is suggested that one be available to make adjustments or assist in problem-solving.
g. The CA will require full and part load performance verifications as well as seasonal and simulated testing requirements. The Contractor shall be prepared to operate different components of various systems (example, chilled water and hot water systems to generate loading strategies) during the functional testing.
h. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA and A/E.
i. Prepare O&M manuals according to the Contractor Documents, including clarifying and updating the original sequence of operation to as-built conditions.
j. Maintain on site redline as built drawings and produce final “As-built” drawings for all project drawings and contractor-generated coordination drawings. List and clearly identify on the as-built drawings the locations of all airflow stations and sensor installations that are not equipment mounted.
k. Provide specified training of the Owner’s operating personnel in accordance with the CA’s overview and outline.
l. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
m. Provide a detailed marked up drawings of all the instruments and their installed location (P&ID) for instruments and components.

3. Warranty Period. During the warranty period, the Contractor shall:

a. Be available during seasonal or deferred functional performance testing conducted by the CA, according to the specifications.

b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

PART 2 - PRODUCTS

2.1 SYSTEMS TO BE COMMISSIONED

A. The following are systems to be commissioned:

The BMS system, components and associated upgrade work to be commissioned includes as applicable, central processing/monitoring hardware and software, communications/alarm function, user interface with the BMS system, control functions required for facility operation, local control panels, equipment actuators and controls, and individual monitored points. **Twenty percent (20%)** of the equipment that is associated with the upgrade will be selected for commissioning. The following commissioning checks and tests include:

1. Verification checks of BMS interface with equipment, subsystems & systems
    a) Documentation checks: verify specifications, submittals, TAB report, pre-commissioning report, as-built drawings, and training implementation.
    b) Controls Hardware Installation & Set-up – Network, controllers, conduit and wiring checks: verify nameplate data and installed characteristics; verify system is operational.
    c) Sensors and Controlled Devices - Sensors, actuators, valves and dampers; verify I/O points set-up; verify nameplate data and installed characteristics; verify sensor calibrations; verify actuator, valve and damper functionality.
    d) Controls Software Installation & Programming: verify software installation and installed capabilities such as the operator graphical interface, scheduling set-up, trending set-up, alarm set-up and standard reports.

2. Functional tests of the BMS system control functions
    a) Software functionality tests (i.e. verify device/system responses through the user interface).
    b) Testing Sequences of Operation: Systems will be tested in all modes of operation. Possible tests include: start/stop (on/off); schedule (scheduled start/stop, optimum start/stop [includes warm-up and cool-down], unoccupied setback [includes night purge]; lead/lag (includes runtime and equipment failure); staging; reset (including setpoint change, control by flow and speed control); safeties; economizer; life safety interface; power failure. NOTE: Testing will verify sequences as programmed, but will NOT optimize sequences.

3. Any fire dampers, combination fire/smoke dampers and smoke dampers will be commissioned, if applicable.

2.2. TEST EQUIPMENT

A. All standard testing equipment required for the mechanical portion startup, initial checkout shall be provided by the Contractor responsible for the equipment or system being tested. This includes TAB and controls verification.

B. The CA shall perform their own system verification and performance check-out. The CA shall provide their own calibrated equipment as required for this testing.

C. All testing equipment associated with functional performance verification and point-to-point required by the CA shall be the responsibility of the CA. All testing equipment associated with the control's contractor point-to-point verification shall be the responsibility of the control's contractor.

D. Special equipment, tools and instruments (only available from vendor or specific to a piece of equipment) required for the functional testing of that equipment, according to the requirements of the contract documents and the functional test procedures shall be provided to the CA by the installing contractor and shall become the property of the Owner at project completion as indicated in the specification.

E. Proprietary test equipment and software required by any manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide test equipment, demonstrate its use and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon successful completion of the commissioning process as required in the specifications.

PART 3 - EXECUTION

3.1. SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1 and Section 019113.

3.2 STARTUP PLAN AND PRE-FUNCTIONAL TESTING

A. The mechanical contractor and associated subcontractors shall be responsible for the installation of complete systems and sub-systems, fully functional, meeting the design objectives of the Contract Documents. Contractor shall follow the approved start-up, initial checkout, and pre-functional testing procedures. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility to the CA or Owner.

B. Pre-functional testing as directed and performed by the contractor shall be required for each piece of equipment to ensure that the equipment and systems are properly installed and ready for operation, so that functional performance testing to may proceed without delays. Sampling strategies shall not be used for pre-functional testing. The pre-functional testing for all equipment and subsystems of a given system shall be successfully completed and documented prior to functional performance testing of the system. The mechanical contractor and sub-contractors shall sign off on the CA's pre-functional test sheets that they are complete and the system is ready. The CA will verify and conduct their own independent verification and start-up in parallel to the Contractor's verification. Any deficiencies identified during this process shall be noted and reviewed by the Contractors. Start-up and functional testing shall not proceed until all the deficiencies are corrected and verified by the CA.

C. The following procedures shall apply to all equipment and systems to be commissioned.

1. Start-up and Initial Checkout Plan. The contractor shall develop the detailed start-up and pre-functional testing plans for all equipment to be reviewed by the CA. The primary role of the CA in this process shall be to review the installation for construction completeness and ensure that all components have been installed as per the design documents. Only when pre-functional testing is complete and signed off by all Contractors, shall the Contractor start-up the equipment. Equipment and systems to be commissioned are identified in this Section Part 2.
2. The start-up and initial checkout plan shall consist of the following as a minimum:

    a. The manufacturer's standard written start-up and checkout procedures copied from the installation manuals and manufacturer's normally used field checkout sheets. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
    b. First-run checklist for equipment, to include:

        1) Equipment properly set.
        2) Alignment of shafts and couplings.
        3) Adjustment of vibration isolators.
        4) Piping and equipment properly connected.
        5) Completion of initial lubrication procedures.
        6) Clean filters in place, as appropriate.
        7) Wiring properly connected.
        8) Electrical overload relays appropriate for load.
        9) Electrical accessories properly installed and adjusted.
        10) Controls, safeties, and time switches properly calibrated and set-up.
        11) Verification of direction of motor rotation after final electrical connections by jogging motor.
        12) Measurements of ampere draw of electric motors and comparison with nameplate rating and with overload heater ratings.

3. The Contractor shall submit the start-up reports to the CA for review.

D. The CA shall review and approve the procedures and the format for documenting them, noting any procedures that need to be added.

E. Two weeks prior or startup, the Contractor shall schedule start-up and checkout with the Owner and CA. The execution of the start-up and checkout shall be directed and performed by the Contractor, in accordance with manufacturer's published procedures and with the approved procedures. The CA may be present for the Contractor's required startup and checkout of all systems and equipment to be commissioned.

F. Sensor Calibration. Calibration of all sensors shall be included as part of the pre-functional testing and listed on the appropriate test checklists and reports, according to the specified procedures and accuracies for the devices and systems being tested.

G. All contractor responsible start-up, checkout forms shall be completed and submitted to the CA for review.

3.3 FUNCTIONAL PERFORMANCE TESTS

A. Functional Performance Verification (FPV) is the dynamic testing of systems (rather than just individual components) under full, part and seasonal requirements. Systems are tested under various loads and control sequences, such as low cooling and heating loads, component failures, unoccupied modes, fire alarm, etc. The systems are run through all the control sequences of operation and components are verified to be responding as the design intent and documents. FPV shall include; testing all sequences of operations, verification of system capacity, generating simulated signals to simulate sensor values, conducting simulated conditions to tests all loads and verify system performance during all conditions of operation and verifying design intent. In addition, each system shall be tested through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part and full load). Proper responses such as power failures, freeze conditions, low-oil pressures, equipment failures, etc. shall also be tested. The CA develops the functional test sheets and procedures in sequential written form, coordinates the testing, conducts the testing and documents the testing. Each contractor is required is supply personnel to assist during the functional performance testing where applicable.

B. No system, equipment or component thereof shall be tested until the Contractor and the CM has certified, in writing, that the system, equipment and / or components are complete, have been tested, adjusted and balanced and are ready for validating and performance testing. FPV is scheduled by the CA after the pre-functional testing requirements are complete and signed-off by the CM and the CA. FPV will not be conducted until a written notice of completion by the CM confirming that the system is ready for FPV. The air balancing and water balancing must be complete and the controls must be debugged prior to the performance verification.

C. Functional testing shall be conducted by the CA. Functional testing may not proceed until the systems have been properly installed, started-up and all deficiencies have been corrected.

D. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion shall not relieve the Contractor from fully completing the system, including all pre-functional checklists.

E. The Contractor shall provide personnel to operate the systems while functional performance testing is commencing. This shall include but not be limited to; starting and stopping of systems, opening and closing valves to create false loads on the system (with the capabilities of the existing system) and allowing the CA to manipulate the building automation systems to modulate the system requirements.

F. The Contractor shall review the commissioning functional performance testing procedure supplied by the CA. After functional testing commences, the Contractor and the CA shall sign the functional test record and provide the owner and the CM a copy to review. All deficiencies either corrected in the field or outstanding shall be documented on the functional test forms for review by all parties.

G. All functional testing must be completed and approved by the CA and the owner before the project will be considered substantially complete.

H. If sampling strategies are utilized for functional performance testing of monitored terminal equipment, then trend logging must be employed post occupancy to demonstrate functional performance of all remaining non-sample group terminal equipment. Typical sampling

percentages for monitored and non-monitored terminal equipment is 20%-25%. If a functionality failure rate of greater than 15% occurs within the sampling group commissioned, then the CxA shall notify the responsible contractor(s) to reconfirm functionality of all terminal equipment, and notify Owner with recommendation to commission additional 20%-25% sampling group(s).

3.4 DEFERRED TESTING

A. Deferred Testing. The Contractor shall be available to assist in seasonal testing (Summer, Winter and Intermediate), tests delayed until weather or other conditions until building construction is completed, required building occupancy or loading, or other conditions are suitable for the demonstration of equipment or system's performance, as specified. These deferred tests shall be conducted in the same manner as the seasonal tests as soon as possible. Deferred testing shall be executed, documented and deficiencies corrected as specified herein for functional performance testing. Any adjustments or corrections to the O&M manuals and "As built" documents required by the results of the testing shall be made before the seasonal testing process is considered complete.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. The CA shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully. The testing form and any outstanding deficiencies shall be provided to the CM/Owner within two days of test completion. The CA shall review the Contractor's startup testing reports and shall submit either a non-compliance report or an approval form to the Contractor. The CA shall work with the Contractor and others as necessary, to correct and retest deficiencies or uncompleted items. The Contractor shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CA as soon as outstanding items have been corrected and resubmit an updated start-up report with a Statement of Correction on the original non-compliance report. When all requirements are satisfactorily completed, the CA shall recommend approval of the startup and pre-functional testing of each system and schedule the functional testing of the equipment or system.

B. As functional performance testing progresses and a deficiency is identified, the CA shall discuss the issue with the executing contractor and the commissioning team.

1. When there is no dispute of the deficiency and the Contractor accepts responsibility for correcting it, the CA shall document the deficiency and the Contractor's response and intentions and the testing shall proceed, if possible. Corrections of minor deficiencies identified may be made by the Contractor during the functional performance testing, at the discretion of the CA. Every effort shall be made or expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the commissioning effort.
2. When the identified deficiency is corrected, the Contractor shall sign the statement of correction at the bottom of the non-compliance form, certifying that the equipment is ready to be retested, and return the form to the CA. The CA shall schedule the retest of the equipment or system involved.
3. If there is a dispute about an identified deficiency, the CA shall document the deficiency and the Contractor's response, and provide a copy to the Contractor. Every attempt shall be made to resolve the dispute at the lowest management level possible. When the dispute resolution has been decided, the appropriate party corrects the deficiency, signs the

statement of correction on the non-compliance form and returns the form to the CA. The CA shall schedule the retest of the equipment or system involved. Final interpretive authority shall be the A/E. Final acceptance authority shall be the Owner.

C. During the functional performance testing of multiple units of similar equipment, the CA will test all of the installed equipment and components identified. If, under such a testing procedure, three or more identical pieces of equipment (size along does not constitute difference) fail to perform to the requirements of the Contract Documents (mechanically or substantively) due to manufacturing or installation defects not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CA. In such a case, the Contractor shall provide the CA with the following:

1. Within one week of notification from the CA, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CA within two weeks of the original notice.
2. Within two weeks of the original notification, the Contractor shall provide the CA and the A/E a signed and dated, written explanation of the problem, cause of failures, etc., and proposed solution, including full equipment submittals for corrective or replacement equipment, if appropriate. The proposed solution shall not be for less than the specification requirements of the original installation.
3. When approved, two examples of the proposed solution shall be installed by the Contractor and the CA shall schedule and conduct functional testing of the proposed solution. Upon completion of the functional testing of the proposed solution, the CA shall recommend the acceptance or disapproval of the proposed solution to the Owner.
4. Upon acceptance of the proposed solution by the Owner, the Contractor shall replace or repair all identical items, at their expenses and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week of approval of the proposed solution.

D. Cost of Retesting

1. The cost for CA and/or Owner personnel to conduct the retesting of a functional performance testing requirements necessitated because a specific pre-functional or start-up test item, reported to have been successfully completed, but found to be incomplete or faulty, shall be the responsibility of the Contractor.
2. For a deficiency identified during the functional testing, not related to any pre-functional checklist or start-up fault, the CA and Owner shall direct the retesting of the equipment once at "no charge" for their time. However, all costs for any subsequent retesting shall be the responsibility of the Contractor.
3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back-charges to the responsible party.

3.6 OPERATION AND MAINTENANCE MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications. A detailed listing of O&M requirements is listed in Section 019113.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the CM for inclusion in the O&M manuals, according to this section and Section 019113, prior to the training of owner personnel.

C. The CA shall receive a copy of the O&M manuals for review.

D. Operation and maintenance documentation, in hardback 3-ring loose-leaf binders except full size drawings and diskettes, shall cover all mechanical systems. Documentation shall include the following: operations and maintenance documentation directory; emergency information; operating manual; emergency information; maintenance manual; test reports; and construction documents.

E. The operation and maintenance documentation package shall be submitted as one comprehensive package to the Owner and CA before systems start-up and commissioning, and shall be updated, revised and completed during, and at completion of, commissioning.

3.7 TRAINING OF OWNER PERSONNEL

A. The mechanical commissioning supervisor shall be responsible for training coordination and scheduling of required training and for ensuring that all required training is completed. The CA shall oversee the content and adequacy of the training of Owner personnel.

B. Prepare and submit a syllabus describing an overview of the program, describing how the program will be conducted, when and where meetings are to be held, names and company affiliations of lecturers, description of contents and outline for each lecture, and recommended reference material and outside reading. Obtain direction from the Owner on which operating personnel shall be instructed in each system. Proposed training schedules, materials, and lesson plans shall be submitted to the CA for review of the content and adequacy of the training of Owner personnel for commissioned equipment or systems.

C. Mechanical Contractor. The mechanical contractor shall have the following training responsibilities:

1. Provide the CA with training plan one week before the planned training.
2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment.
3. Training shall normally start with classroom sessions followed by hands-on training on each piece of equipment.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer’s representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing contractor or manufacturer’s representative. Practical building operating expertise, as well as in-depth knowledge of all modes of operation of the specific piece of equipment, is required. More than one party may be required to execute the training.

6. The controls contractor shall attend sessions other than the controls training, for each type of equipment controlled by the BAS, to discuss the interaction of the BAS as it relates to the equipment being discussed.
7. The training sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

3.8 WRITTEN WORK PRODUCTS

A. Written work products of Contractors shall consist of the start-up and initial checkout plan and the filled out start-up, initial checkout and pre-functional checklists.

END OF SECTION 230800

SECTION 230923 - DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. DDC system for monitoring and controlling of HVAC systems.

B. Related Requirements:
1. Section 230923.17 "Level Instruments" for liquid-level switches, sensors, and transmitters that connect to DDC systems.
2. Section 230923.43 "Weather Stations" for weather stations that connect to DDC systems.
3. Section 230993 "Sequence of Operations for HVAC Controls" for control sequences in DDC systems.
4. Communications Cabling:
   a. Section 260519 “Low-Voltage Electrical Power Conductors and Cables” for balanced twisted pair communications cable.

1.3 DEFINITIONS

A. Algorithm: A logical procedure for solving a recurrent mathematical problem. A prescribed set of well-defined rules or processes for solving a problem in a finite number of steps.

B. Analog: A continuously varying signal value, such as current, flow, pressure, or temperature.

C. BACnet Specific Definitions:

1. BACnet: Building Automation Control Network Protocol, ASHRAE 135. A communications protocol allowing devices to communicate data over and services over a network.
2. BACnet Interoperability Building Blocks (BIBBs): BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBs are combined to build the BACnet functional requirements for a device.
3. BACnet/IP: Defines and allows using a reserved UDP socket to transmit BACnet messages over IP networks. A BACnet/IP network is a collection of one or more IP subnetworks that share the same BACnet network number.
4. BACnet Testing Laboratories (BTL): Organization responsible for testing products for compliance with ASHRAE 135, operated under direction of BACnet International.

5. PICS (Protocol Implementation Conformance Statement): Written document that identifies the particular options specified by BACnet that are implemented in a device.

D. Binary: Two-state signal where a high signal level represents ON" or "OPEN" condition and a low signal level represents "OFF" or "CLOSED" condition. "Digital" is sometimes used interchangeably with "Binary" to indicate a two-state signal.

E. Controller: Generic term for any standalone, microprocessor-based, digital controller residing on a network, used for local or global control. Three types of controllers are indicated: Network Controller, Programmable Application Controller, and Application-Specific Controller.

F. Control System Integrator: An entity that assists in expansion of existing enterprise system and support of additional operator interfaces to I/O being added to existing enterprise system.

G. CORBA: Common Object Request Broker Architecture

H. CSMA/CD: Carrier Sense Multiple Access/Collision Detect

I. COV: Changes of value.

J. DDC System Provider: Authorized representative of, and trained by, DDC system manufacturer and responsible for execution of DDC system Work indicated.

K. Distributed Control: Processing of system data is decentralized and control decisions are made at subsystem level. System operational programs and information are provided to remote subsystems and status is reported back. On loss of communication, subsystems shall be capable of operating in a standalone mode using the last best available data.

L. DOCSIS: Data-Over Cable Service Interface Specifications.

M. Gateway: Bidirectional protocol translator that connects control systems that use different communication protocols.

N. GUI: Graphical User Interface

O. HLC: Heavy load conditions.

P. I/O: System through which information is received and transmitted. I/O refers to analog input (AI), binary input (BI), analog output (AO) and binary output (BO). Analog signals are continuous and represent control influences such as flow, level, moisture, pressure, and temperature. Binary signals convert electronic signals to digital pulses (values) and generally represent two-position operating and alarm status. "Digital," (DI and (DO), is sometimes used interchangeably with "Binary," (BI) and (BO), respectively.

Q. IEEE: Institute Electrical Electronic Engineers

R. LAN: Local area network.

S. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

T. Modbus TCP/IP: An open protocol for exchange of process data.

U. MS/TP: Master-slave/token-passing, IEE 8802-3. Datalink protocol LAN option that uses twisted-pair wire for low-speed communication.

V. MTBF: Mean time between failures.

W. Network Controller: Digital controller, which supports a family of programmable application controllers and application-specific controllers, that communicates on peer-to-peer network for transmission of global data.

X. Network Repeater: Device that receives data packet from one network and rebroadcasts it to another network. No routing information is added to protocol.

Y. PDA: Personal digital assistant.

Z. Peer to Peer: Networking architecture that treats all network stations as equal partners.

AA. POT: Portable operator's terminal.

BB. PUE: Performance usage effectiveness.

CC. RAM: Random access memory.

DD. RF: Radio frequency.

EE. Router: Device connecting two or more networks at network layer.

FF. Server: Computer used to maintain system configuration, historical and programming database.

GG. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

HH. UPS: Uninterruptible power supply.

II. USB: Universal Serial Bus.

JJ. User Datagram Protocol (UDP): This protocol assumes that the IP is used as the underlying protocol.

KK. VAV: Variable air volume.

LL. WLED: White light emitting diode.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Multiple Submissions:

1. If multiple submissions are required to execute work within schedule, first submit a coordinated schedule clearly defining intent of multiple submissions. Include a proposed date of each submission with a detailed description of submittal content to be included in each submission.
2. Clearly identify each submittal requirement indicated and in which submission the information will be provided.
3. Include an updated schedule in each subsequent submission with changes highlighted to easily track the changes made to previous submitted schedule.

B. Product Data: For each type of product include the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation and maintenance instructions including factors effecting performance.
5. Bill of materials of indicating quantity, manufacturer, and extended model number for each unique product.
    a. Servers.
    b. Routers.
    c. DDC controllers.
    d. Enclosures.
    e. Electrical power devices.
    f. Control dampers and actuators.
    g. Control valves and actuators.
6. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate and highlight only applicable information.
7. Each submitted piece of product literature shall clearly cross reference specification and drawings that submittal is to cover.

C. Software Submittal:

1. Cross-referenced listing of software to be loaded on each operator workstation, server, gateway, and DDC controller.
2. Description and technical data of all software provided, and cross-referenced to products in which software will be installed.
3. Operating system software, operator interface and programming software, color graphic software, DDC controller software, maintenance management software, and third-party software.

4. Include a flow diagram and an outline of each subroutine that indicates each program variable name and units of measure.
5. Listing and description of each engineering equation used with reference source.
6. Listing and description of each constant used in engineering equations and a reference source to prove origin of each constant.
7. Description of operator interface to alphanumeric and graphic programming.
8. Description of each network communication protocol.
9. Description of system database, including all data included in database, database capacity and limitations to expand database.
10. Description of each application program and device drivers to be generated, including specific information on data acquisition and control strategies showing their relationship to system timing, speed, processing burden and system throughout.
11. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

D. Shop Drawings:

1. General Requirements:

    a. Include cover drawing with Project name, location, Owner, Architect, Contractor and issue date with each Shop Drawings submission.
    b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
    c. Prepare Drawings using CAD or Visio Professional.
    d. Drawings Size: 36” X 24”.

2. Include plans, elevations, sections, and mounting details where applicable.
3. Include details of product assemblies.
4. Plan Drawings indicating the following:

    a. Screened backgrounds of walls, structural grid lines, HVAC equipment, ductwork and piping.
    b. Room names and numbers with coordinated placement to avoid interference with control products indicated.
    c. Each desktop operator workstation, server, gateway, router, DDC controller, control panel instrument connecting to DDC controller, and damper and valve connecting to DDC controller, if included in Project.
    d. Exact placement of products in rooms, ducts, and piping to reflect proposed installed condition.
    e. Network communication cable and raceway routing.
    f. Information, drawn to scale, of 1/8” = 1’-0”.
    g. Proposed routing of wiring, cabling, conduit, and tubing, coordinated with building services for review before installation.

5. Schematic drawings for each controlled HVAC system indicating the following:

    a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.

b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
c. A graphic showing location of control I/O in proper relationship to HVAC system.
d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
g. Narrative sequence of operation.
h. Graphic sequence of operation, showing all inputs and output logical blocks.

6. Control panel drawings indicating the following:

a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.
c. Front, rear, and side elevations and nameplate legend.
d. Unique drawing for each panel.

7. DDC system network riser diagram indicating the following:

a. Each device connected to network with unique identification for each.
b. Interconnection of each different network in DDC system.
c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or fiber-optic cable type. Indicate raceway type and size for each.
d. Each network port for connection of an operator workstation or other type of operator interface with unique identification for each.

8. DDC system electrical power riser diagram indicating the following:

a. Each point of connection to field power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
c. Each product requiring power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
d. Power wiring type and size, race type, and size for each.

9. Monitoring and control signal diagrams indicating the following:

a. Control signal cable and wiring between controllers and I/O.
b. Point-to-point schematic wiring diagrams for each product.

10. Color graphics indicating the following:

a. Itemized list of color graphic displays to be provided.
b. For each display screen to be provided, a true color copy showing layout of pictures, graphics and data displayed.
c. Intended operator access between related hierarchical display screens.

E. System Description:

1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
2. Complete listing and description of each report, log and trend for format and timing and events which initiate generation.
3. System and product operation under each potential failure condition including, but not limited to, the following:

a. Loss of power.
b. Loss of network communication signal.
c. Loss of controller signals to inputs and outpoints.
d. Server failure.
e. Network failure
f. Controller failure.
g. Instrument failure.
h. Control damper and valve actuator failure.

4. Complete bibliography of documentation and media to be delivered to Owner.
5. Description of testing plans and procedures.
6. Description of Owner training.

F. Delegated-Design Submittal: For DDC system products and installation indicated as being delegated.

1. Supporting documentation showing DDC system design complies with performance requirements indicated, including calculations and other documentation necessary to prove compliance.
2. Schedule and design calculations for control dampers and actuators.

a. Flow at Project design and minimum flow conditions.
b. Face velocity at Project design and minimum airflow conditions.
c. Pressure drop across damper at Project design and minimum airflow conditions.
d. AMCA 500-D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
e. Maximum close-off pressure.
f. Leakage airflow at maximum system pressure differential (fan close-off pressure).
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.
i. Actuator signal to control damper (on, close or modulate).
j. Actuator position on loss of power.
k. Actuator position on loss of control signal.

3. Schedule and design calculations for control valves and actuators.

a. Flow at Project design and minimum flow conditions.
b. Pressure-differential drop across valve at Project design flow condition.
c. Maximum system pressure-differential drop (pump close-off pressure) across valve at Project minimum flow condition.
d. Design and minimum control valve coefficient with corresponding valve position.
e. Maximum close-off pressure.
f. Leakage flow at maximum system pressure differential.
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.
i. Actuator signal to control damper (on, close or modulate).
j. Actuator position on loss of power.
k. Actuator position on loss of control signal.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

a. Product installation location shown in relationship to room, duct, pipe and equipment.
b. Structural members to which products will be attached.
c. Wall-mounted instruments located in finished space showing relationship to light switches, fire-alarm devices and other installed devices.
d. Size and location of wall access panels for products installed behind walls and requiring access.

B. Qualification Data:

1. Systems Provider Qualification Data:

a. Resume of project manager assigned to Project.
b. Resumes of application engineering staff assigned to Project.
c. Resumes of installation and programming technicians assigned to Project.
d. Resumes of service technicians assigned to Project.
e. Brief description of past project including physical address, floor area, number of floors, building system cooling and heating capacity and building's primary function.
f. Description of past project DDC system, noting similarities to Project scope and complexity indicated.
g. Names of staff assigned to past project that will also be assigned to execute work of this Project.
h. Owner contact information for past project including name, phone number, and e-mail address.
i. Contractor contact information for past project including name, phone number, and e-mail address.

j. Engineer contact information for past project including name, phone number, and e-mail address.
k. Must have a minimum of 3 years of experience and be located within 100 miles of facility.
l. Vendor must have existing NYS Office of General Services contract in good standing.

2. Manufacturer's qualification data.
3. Testing agency's qualifications data.

C. Welding certificates.

D. Product Certificates:

1. Data Communications Protocol Certificates: Certifying that each proposed DDC system component complies with ASHRAE 135.

E. Product Test Reports: For each product that requires testing to be performed by manufacturer and witnessed by a qualified testing agency.

F. Preconstruction Test Reports: For each separate test performed.

G. Source quality-control reports.

H. Field quality-control reports.

I. Sample Warranty: For manufacturer's warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For DDC system to include in emergency, operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Project Record Drawings of as-built versions of submittal Shop Drawings provided in electronic PDF format.
b. Testing and commissioning reports and checklists of completed final versions of reports, checklists, and trend logs.
c. As-built versions of submittal Product Data.
d. Names, addresses, e-mail addresses and 24-hour telephone numbers of Installer and service representatives for DDC system and products.
e. Operator's manual with procedures for operating control systems including logging on and off, handling alarms, producing point reports, trending data, overriding computer control and changing set points and variables.
f. Programming manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.

g. Engineering, installation, and maintenance manuals that explain how to:

1) Design and install new points, panels, and other hardware.
2) Perform preventive maintenance and calibration.
3) Debug hardware problems.
4) Repair or replace hardware.

h. Documentation of all programs created using custom programming language including set points, tuning parameters, and object database.
i. Backup copy of graphic files, programs, and database on electronic media such as DVDs.
j. List of recommended spare parts with part numbers and suppliers.
k. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
l. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
m. Licenses, guarantees, and warranty documents.
n. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
o. Owner training materials.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Include product manufacturers' recommended parts lists for proper product operation over four-year period following warranty period. Parts list shall be indicated for each year.

C. Furnish parts, as indicated by manufacturer's recommended parts list, for product operation during one-year period following warranty period.

D. Furnish quantity indicated of matching product(s) in Project inventory for each unique size and type of following:

1. Network Controller: Two.
2. Transformer: One.
3. Supply of 20 percent spare fiber-optic cable splice organizer cabinets for several re-terminations.

1.9 QUALITY ASSURANCE

A. DDC System Manufacturer Qualifications:

1. Nationally recognized manufacturer of DDC systems and products.

2. DDC systems with similar requirements to those indicated for a continuous period of 10 years within time of bid.
3. DDC systems and products that have been successfully tested and in use on at least three past projects.
4. Having complete published catalog literature, installation, operation and maintenance manuals for all products intended for use.
5. Having full-time in-house employees for the following:

    a. Product research and development.
    b. Product and application engineering.
    c. Product manufacturing, testing and quality control.
    d. Technical support for DDC system installation training, commissioning and troubleshooting of installations.
    e. Owner operator training.

B. DDC System Provider Qualifications:

1. Authorized representative of, and trained by, DDC system manufacturer.
2. DDC system manufacturer is to be an approved vendor on the OGS Intelligent Facility and Security Systems and Solutions, Group 77201.
3. In-place facility located within 100 miles of Project.
4. Demonstrated past experience with installation of DDC system products being installed for period within three consecutive years before time of bid.
5. Demonstrated past experience on five projects of similar complexity, scope and value.
6. Each person assigned to Project shall have demonstrated past experience.
7. Staffing resources of competent and experienced full-time employees that are assigned to execute work according to schedule.
8. Service and maintenance staff assigned to support Project during warranty period.
9. Product parts inventory to support on-going DDC system operation for a period of not less than 5 years after Substantial Completion.
10. DDC system manufacturer's backing to take over execution of Work if necessary to comply with requirements indicated. Include Project-specific written letter, signed by manufacturer's corporate officer, if requested.

C. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
4. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

E. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.10 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner.
2. Include updates or upgrades to software and firmware if necessary to resolve deficiencies.

a. Install updates only after receiving Owner's written authorization.

3. Warranty service shall occur during normal business hours and commence within 16 hours of Owner's warranty service request.
4. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Automated Logic Corporation.
2. Distech Controls.
3. Johnson Controls, Inc. (Basis of Design)
4. Reliable Controls Corporation.
5. Schneider Electric USA, Inc.
6. Siemens Building Technologies, Inc.

2.2 DDC SYSTEM DESCRIPTION

A. Microprocessor-based monitoring and control including analog/digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices to achieve a set of predefined conditions.

1. DDC system shall consist of a high-speed, peer-to-peer network of distributed DDC controllers, other network devices, operator interfaces, and software.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 WEB ACCESS

A. DDC system shall be Web compatible.

1. Web-Compatible Access to DDC System:

    a. Operator workstation and or server shall perform overall system supervision and configuration, graphical user interface, management report generation, and alarm annunciation.
    b. DDC system shall support Web browser access to building data. Operator using a standard Web browser shall be able to access control graphics and change adjustable set points.
    c. Web access shall be password protected.

2.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design DDC system to satisfy requirements indicated.

B. Delegated Design: Engage a qualified professional to design DDC system to satisfy requirements indicated.

1. System Performance Objectives:

    a. DDC system shall manage HVAC systems.
    b. DDC system control shall operate HVAC systems to achieve optimum operating costs while using least possible energy and maintaining specified performance.
    c. DDC system shall respond to power failures, HVAC equipment failures, and adverse and emergency conditions encountered through connected I/O points.
    d. DDC system shall operate while unattended by an operator and through operator interaction.
    e. DDC system shall record trends and transaction of events and produce report information such as performance, energy, occupancies, and equipment operation.

C. Surface-Burning Characteristics: Products installed in ducts, equipment, and return-air paths shall comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

D. DDC System Speed:

1. Response Time of Connected I/O:

    a. AI point values connected to DDC system shall be updated at least every two seconds for use by DDC controllers. Points used globally shall also comply with this requirement.
    b. BI point values connected to DDC system shall be updated at least every two seconds for use by DDC controllers. Points used globally shall also comply with this requirement.

c. AO points connected to DDC system shall begin to respond to controller output commands within one second(s). Global commands shall also comply with this requirement.
d. BO point values connected to DDC system shall respond to controller output commands within one second(s). Global commands shall also comply with this requirement.

2. Display of Connected I/O:

a. Analog point COV connected to DDC system shall be updated and displayed at least every five seconds for use by operator.
b. Binary point COV connected to DDC system shall be updated and displayed at least every five seconds for use by operator.
c. Alarms of analog and digital points connected to DDC system shall be displayed within 15 seconds of activation or change of state.
d. Graphic display refresh shall update within four seconds.
e. Point change of values and alarms displayed from workstation to workstation when multiple operators are viewing from multiple workstations shall not exceed graphic refresh rate indicated.

E. Network Bandwidth: Design each network of DDC system to include at least 30 percent available spare bandwidth with DDC system operating under normal and heavy load conditions indicated. Calculate bandwidth usage, and apply a safety factor to ensure that requirement is satisfied when subjected to testing under worst case conditions.

F. DDC System Data Storage:

1. Include server(s) with disk drive data storage to archive not less than 60 consecutive months of historical data for all I/O points connected to system, including alarms, event histories, transaction logs, trends and other information indicated.
2. When logged onto a server, operator shall be able to also interact with any DDC controller connected to DDC system as required for functional operation of DDC system.
3. Server(s) shall be used for application configuration; for archiving, reporting and trending of data; for operator transaction archiving and reporting; for network information management; for alarm annunciation; and for operator interface tasks and controls application management.
4. Server(s) shall use IT industry-standard database platforms such as Microsoft SQL Server and Microsoft Data Engine (MSDE).

G. Future Expandability:

1. DDC system size shall be expandable to an ultimate capacity of at least three times total I/O points indicated.
2. Additional DDC controllers, I/O and associated wiring shall be all that is needed to achieve ultimate capacity. Initial network infrastructure shall be designed and installed to support ultimate capacity.
3. Operator interfaces installed initially shall not require hardware and software additions and revisions for ultimate capacity.

H. Input Point Displayed Accuracy: Input point displayed values shall meet following end-to-end overall system accuracy, including errors associated with meter, sensor, transmitter, lead wire or cable, and analog to digital conversion.

1. Flow:

   a. Air: Within 5 percent of design flow rate.
   b. Water: Within 5 percent of design flow rate.
   c. Steam: Within 5 percent of design flow rate.

2. Gas:

   a. Carbon Dioxide: Within 50 ppm.

3. Moisture (Relative Humidity):
   a. Outdoor: Within 2 percent RH.

4. Level: Within 5 percent of reading.
5. Pressure:

   a. Air, Ducts and Equipment: 1 percent of instrument range.
   b. Space: Within 1 percent of instrument range.
   c. Water: Within 1 percent of instrument range.
   d. Steam: Within 1 percent of instrument range.

6. Speed: Within 5 percent of reading.
7. Temperature, Dew Point:
   a. Outdoor: Within 2 deg F.

8. Temperature, Dry Bulb:

   a. Air: Within 1 deg F.
   b. Space: Within 1 deg F.
   c. Outdoor: Within 1 deg F.
   d. Chilled Water: Within 1 deg F.
   e. Condenser Water: Within 1 deg F.
   f. Heating Hot Water: Within 1 deg F.
   g. Temperature Difference: Within 0.25 deg F.
   h. Other Temperatures Not Indicated: Within 1 deg F.

9. Temperature, Wet Bulb:
   a. Outdoor: Within 1 deg F.

I. Precision of I/O Reported Values: Values reported in database and displayed shall have following precision:

1. Flow:

a. Air: Nearest 1/10th of a cfm through 100 cfm; nearest cfm between 100 and 1000 cfm; nearest 10 cfm between 1000 and 10,000 cfm; nearest 100 cfm above 10,000 cfm.
b. Water: Nearest 1/10th gpm through 100 gpm; nearest gpm between 100 and 1000 gpm; nearest 10 gpm between 1000 and 10,000 gpm; nearest 100 gpm above 10,000 gpm.
c. Steam: Nearest 1/10th lb/hr through 100 lbs/hr; nearest lbs/hr between 100 and 1000 lbs/hr; nearest 10 lbs/hr above 1000 lbs/hr.

2. Gas:

a. Carbon Dioxide (ppm): Nearest ppm.

3. Moisture (Relative Humidity):

a. Relative Humidity (Percentage): Nearest 1 percent.

4. Level: Nearest 1/100th of an inch through 10 inches; nearest 1/10 of an inch between 10 and 100 inches; nearest inch above 100 inches.
5. Speed:

a. Rotation (rpm): Nearest 1 rpm.
b. Velocity: Nearest 1/10th fpm through 100 fpm; nearest fpm between 100 and 1000 fpm; nearest 10 fpm above 1000 fpm.

6. Position, Dampers and Valves (Percentage Open): Nearest 1 percent.
7. Pressure:

a. Air, Ducts and Equipment: Nearest 1/10th in. w.c..
b. Space: Nearest 1/100th in. w.c..
c. Steam: Nearest 1/10th psig through 100 psig; nearest psig above 100 psig.
d. Water: Nearest 1/10 psig through 100 psig; nearest psig above 100 psig.

8. Temperature:
a. Outdoor: Nearest degree.
b. Space: Nearest 1/10th of a degree.

J. Environmental Conditions for Controllers, Gateways, and Routers:

1. Products shall operate without performance degradation under ambient environmental temperature, pressure and humidity conditions encountered for installed location.

a. If product alone cannot comply with requirement, install product in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, cooled and ventilated as required by product and application.

2. Products shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Products not available with integral enclosures complying with requirements indicated shall be housed in

protective secondary enclosures. Installed location shall dictate the following NEMA 250 enclosure requirements:

a. Outdoors, Protected: Type 3.
b. Mechanical Equipment Rooms:

1) Chiller and Boiler Rooms: Type 4.
2) Air-Moving Equipment Rooms: Type 1.

c. Localized Areas Exposed to Washdown: Type 4.

K. Electric Power Quality:

1. Power-Line Surges:

a. Protect DDC system products connected to ac power circuits from power-line surges to comply with requirements of IEEE C62.41.
b. Do not use fuses for surge protection.
c. Test protection in the normal mode and in the common mode, using the following two waveforms:

1) 10-by-1000-mic.sec. waveform with a peak voltage of 1500 V and a peak current of 60 A.
2) 8-by-20-mic.sec. waveform with a peak voltage of 1000 V and a peak current of 500 A.

2. Power Conditioning:

a. Protect DDC system products connected to ac power circuits from irregularities and noise rejection. Characteristics of power-line conditioner shall be as follows:

1) At 85 percent load, output voltage shall not deviate by more than plus or minus 1 percent of nominal when input voltage fluctuates between minus 20 percent to plus 10 percent of nominal.
2) During load changes from zero to full load, output voltage shall not deviate by more than plus or minus 3 percent of nominal.
3) Accomplish full correction of load switching disturbances within five cycles, and 95 percent correction within two cycles of onset of disturbance.
4) Total harmonic distortion shall not exceed 3-1/2 percent at full load.

3. Ground Fault: Protect products from ground fault by providing suitable grounding. Products shall not fail due to ground fault condition.

L. Continuity of Operation after Electric Power Interruption:

1. Equipment and associated factory-installed controls, field-installed controls, electrical equipment, and power supply connected to building normal and backup power systems shall automatically return equipment and associated controls to operating state occurring immediately before loss of normal power, without need for manual intervention by

operator when power is restored either through backup power source or through normal power if restored before backup power is brought online.

2.5 SYSTEM ARCHITECTURE

A. System architecture shall consist of no more than two or three levels of LANs.

1. Level one LAN shall connect network controllers and operator workstations.
2. Level one or Level two LAN shall connect programmable application controllers to other programmable application controllers, and to network controllers.
3. Level two or Level three LAN shall connect application-specific controllers to programmable application controllers and network controllers.
4. Level two or Level three LAN shall connect application-specific controllers to application-specific controllers.

B. Minimum Data Transfer and Communication Speed:

1. LAN Connecting Operator Workstations and Network Controllers: 100 Mbps.
2. LAN Connecting Programmable Application Controllers: 1000 kbps.
3. LAN Connecting Application-Specific Controllers: 76,800 bps.

C. DDC system shall consist of dedicated LANs that are not shared with other building systems and tenant data and communication networks.

D. System architecture shall be modular and have inherent ability to expand to not less than three times system size indicated with no impact to performance indicated.

E. System architecture shall perform modifications without having to remove and replace existing network equipment.

F. Number of LANs and associated communication shall be transparent to operator. All I/O points residing on any LAN shall be capable of global sharing between all system LANs.

G. System design shall eliminate dependence on any single device for system alarm reporting and control execution. Each controller shall operate independently by performing its' own control, alarm management and historical data collection.

2.6 DDC SYSTEM OPERATOR INTERFACES

A. Operator Means of System Access: Operator shall be able to access entire DDC system through any of multiple means, including, but not limited to, the following:

1. Operator workstation with hardwired connection through LAN port.
2. PDA with wireless connection through LAN router.
3. Remote connection using outside of system personal computer or PDA through Web access.

B. Access to system, regardless of operator means used, shall be transparent to operator.

C. Network Ports: For hardwired connection of operator workstation. Network port shall be easily accessible, properly protected, clearly labeled, and installed at the following locations:

1. Each mechanical equipment room.
2. Each chiller room.
3. Each cooling tower location.

D. Mobile Device:

1. Connect to system through a wireless router connected to LAN and cellular data service.
2. Able to communicate with any DDC controller connected to DDC system using a dedicated application.

E. Cellular Communications:

1. Have cellular communications to allow desktop and portable workstations and DDC controllers to communicate with remote workstations and remote DDC controllers via cellular communication network.

a. Desktop and Portable Operator Workstation Computers with Modems:

1) Operators shall be able to perform all control functions, report functions, and database generation and modification functions as if directly connected to system LAN.
2) Communications taking place over cellular networks shall be completely transparent to operator.

b. DDC Controllers:

1) JACE controller shall have cellular modems unless specifically indicated for a unique controller.
2) Controllers with modems shall automatically connect to report critical alarms, or to upload trend and historical information for archiving.
3) Analyze and prioritize alarms to minimize communications.
4) Buffer noncritical alarms in memory and report them as a group of alarms, or until an operator manually requests an upload.
5) Make provisions for handling incomplete data transfers.
6) Basis of design: DIGI router.

F. Critical Alarm Reporting:

1. Operator-selected critical alarms shall be sent by DDC system to notify operator of critical alarms that require immediate attention.
2. DDC system shall send alarm notification to multiple recipients that are assigned for each alarm.
3. DDC system shall notify recipients by any or all means, including e-mail, text message and prerecorded phone message to mobile and landline phone numbers.

G. Simultaneous Operator Use: Capable of accommodating up to 10 simultaneous operators that are accessing DDC system through any one of operator interfaces indicated.

2.7 NETWORKS

A. Acceptable networks for connecting operator workstations and network controllers include the following:

1. ATA 878.1, ARCNET.
2. IP.
3. IEEE 8802-3, Ethernet.

B. Acceptable networks for connecting programmable application controllers include the following:

1. ATA 878.1, ARCNET.
2. IP.
3. IEEE 8802-3, Ethernet.

C. Acceptable networks for connecting application-specific controllers include the following:

1. ATA 878.1, ARCNET.
2. EIA-485A.
3. IP.
4. IEEE 8802-3, Ethernet.

2.8 NETWORK COMMUNICATION PROTOCOL

A. Network communication protocol(s) used throughout entire DDC system shall be open to public and available to other companies for use in making future modifications to DDC system.

B. ASHRAE 135 Protocol:

1. ASHRAE 135 communication protocol shall be sole and native protocol used throughout entire DDC system.
2. DDC system shall not require use of gateways except to integrate HVAC equipment and other building systems and equipment, not required to use ASHRAE 135 communication protocol.
3. If used, gateways shall connect to DDC system using ASHRAE 135 communication protocol and Project object properties and read/write services indicated by interoperability schedule.
4. Operator workstations, controllers and other network devices shall be tested and listed by BACnet Testing Laboratories.

C. Industry Standard Protocols:

1. DDC system shall use any one or a combination of the following industry standard protocols for network communication while complying with other DDC system requirements indicated:

a. ASHRAE 135.

2. Operator workstations and network controllers shall communicate through ASHRAE 135 protocol.
3. Portions of DDC system networks using ASHRAE 135 communication protocol shall be an open implementation of network devices complying with ASHRAE 135. Network devices shall be tested and listed by BACnet Testing Laboratories.
4. Gateways shall be used to connect networks and network devices using different protocols.

2.9 SERVERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Dell Inc.

B. Performance Requirements:

1. Performance requirements may dictate equipment exceeding minimum requirements indicated.
2. Energy Star compliant.
3. Drive Bays: Eight at 2.5 inches or eight at 3.5 inches.
4. Network Interface: Dual port Ethernet.
5. DVD +RW Drive.
6. Keyboard and mouse.
7. Next-day on-site warranty for two-year period following Substantial Completion.

C. Servers shall include the following:

1. Full-feature backup server (server and backup minimum requirement).
2. Software licenses.
3. CAT-5e or CAT-6 cable installation between server(s) and network.

D. Web Server:

1. If required to be separate, include Web server hardware and software to match, except backup server is not required.
2. Firewalls between server Web and networks.
3. Password protection for access to server from Web server.
4. CAT-5e or CAT 6 cable installation between the server(s) and building Ethernet network.

E. Power each server through a dedicated UPS unit.

2.10 SYSTEM SOFTWARE

A. System Software Minimum Requirements:

1. Real-time multitasking and multiuser 64-bit operating system that allows concurrent multiple operator workstations operating and concurrent execution of multiple real-time programs and custom program development.

2. Operating system shall be capable of operating DOS and Microsoft Windows applications.
3. Database management software shall manage all data on an integrated and non-redundant basis. Additions and deletions to database shall be without detriment to existing data. Include cross linkages so no data required by a program can be deleted by an operator until that data have been deleted from respective programs.
4. Network communications software shall manage and control multiple network communications to provide exchange of global information and execution of global programs.
5. Operator interface software shall include day-to-day operator transaction processing, alarm and report handling, operator privilege level and data segregation control, custom programming, and online data modification capability.
6. Scheduling software shall schedule centrally based time and event, temporary, and exception day programs.

B. Operator Interface Software:

1. Minimize operator training through use of English language prorating and English language point identification.
2. Minimize use of a typewriter-style keyboard through use of a pointing device similar to a mouse.
3. Operator sign-off shall be a manual operation or, if no keyboard or mouse activity takes place, an automatic sign-off.
4. Automatic sign-off period shall be programmable from one to 60 minutes in one-minute increments on a per operator basis.
5. Operator sign-on and sign-off activity shall be recorded and sent to printer.
6. Security Access:

    a. Operator access to DDC system shall be under password control.
    b. An alphanumeric password shall be field assignable to each operator.
    c. Operators shall be able to access DDC system by entry of proper password.
    d. Operator password shall be same regardless of which computer or other interface means is used.
    e. Additions or changes made to passwords shall be updated automatically.
    f. Each operator shall be assigned an access level to restrict access to data and functions the operator is cable of performing.
    g. Software shall have at least five access levels.
    h. Each menu item shall be assigned an access level so that a one-for-one correspondence between operator assigned access level(s) and menu item access level(s) is required to gain access to menu item.
    i. Display menu items to operator with those capable of access highlighted. Menu and operator access level assignments shall be online programmable and under password control.

7. Data Segregation:

    a. Include data segregation for control of specific data routed to a workstation, to an operator or to a specific output device, such as a printer.
    b. Include at least 32 segregation groups.

c. Segregation groups shall be selectable such as "fire points," "fire points on second floor," "space temperature points," "HVAC points," and so on.
d. Points shall be assignable to multiple segregation groups. Display and output of data to printer or monitor shall occur where there is a match of operator or peripheral segregation group assignment and point segregations.
e. Alarms shall be displayed and printed at each peripheral to which segregation allows, but only those operators assigned to peripheral and having proper authorization level will be allowed to acknowledge alarms.
f. Operators and peripherals shall be assignable to multiple segregation groups and all assignments are to be online programmable and under password control.

8. Operators shall be able to perform commands including, but not limited to, the following:

a. Start or stop selected equipment.
b. Adjust set points.
c. Add, modify, and delete time programming.
d. Enable and disable process execution.
e. Lock and unlock alarm reporting for each point.
f. Enable and disable totalization for each point.
g. Enable and disable trending for each point.
h. Override control loop set points.
i. Enter temporary override schedules.
j. Define holiday schedules.
k. Change time and date.
l. Enter and modify analog alarm limits.
m. Enter and modify analog warning limits.
n. View limits.
o. Enable and disable demand limiting.
p. Enable and disable duty cycle.
q. Display logic programming for each control sequence.

9. Reporting:

a. Generated automatically and manually.
b. Sent to displays, printers and disk files.
c. Types of Reporting:

1) General listing of points.
2) List points currently in alarm.
3) List of off-line points.
4) List points currently in override status.
5) List of disabled points.
6) List points currently locked out.
7) List of items defined in a "Follow-Up" file.
8) List weekly schedules.
9) List holiday programming.
10) List of limits and deadbands.

10. Summaries: For specific points, for a logical point group, for an operator selected group(s), or for entire system without restriction due to hardware configuration.

C. Graphic Interface Software:

1. Include a full interactive graphical selection means of accessing and displaying system data to operator. Include at least five levels with the penetration path operator assignable (for example, site, building, floor, air-handling unit, and supply temperature loop). Native language descriptors assigned to menu items are to be operator defined and modifiable under password control.
2. Include a hierarchical-linked dynamic graphic operator interface for accessing and displaying system data and commanding and modifying equipment operation. Interface shall use a pointing device with pull-down or penetrating menus, color and animation to facilitate operator understanding of system.
3. Include at least 10 levels of graphic penetration with the hierarchy operator assignable.
4. Descriptors for graphics, points, alarms and such shall be modified through operator's workstation under password control.
5. Graphic displays shall be online user definable and modifiable using the hardware and software provided.
6. Data to be displayed within a graphic shall be assignable regardless of physical hardware address, communication or point type.
7. Graphics are to be online programmable and under password control.
8. Points may be assignable to multiple graphics where necessary to facilitate operator understanding of system operation.
9. Graphics shall also contain software points.
10. Penetration within a graphic hierarchy shall display each graphic name as graphics are selected to facilitate operator understanding.
11. Back-trace feature shall permit operator to move upward in the hierarchy using a pointing device. Back trace shall show all previous penetration levels. Include operator with option of showing each graphic full screen size with back trace as horizontal header or by showing a "stack" of graphics, each with a back trace.
12. Display operator accessed data on the monitor.
13. Operator shall select further penetration using pointing device to click on a site, building, floor, area, equipment, and so on. Defined and linked graphic below that selection shall then be displayed.
14. Include operator with means to directly access graphics without going through penetration path.
15. Dynamic data shall be assignable to graphics.
16. Display points (physical and software) with dynamic data provided by DDC system with appropriate text descriptors, status or value, and engineering unit.
17. Use color, rotation, or other highly visible means, to denote status and alarm states. Color shall be variable for each class of points, as chosen by operator.
18. Points shall be dynamic with operator adjustable update rates on a per point basis from one second to over a minute.
19. For operators with appropriate privilege, points shall be commanded directly from display using pointing device.

    a. For an analog command point such as set point, current conditions and limits shall be displayed and operator can position new set point using pointing device.
    b. For a digital command point such as valve position, valve shall show its current state such as open or closed and operator could select alternative position using pointing device.
    c. Keyboard equivalent shall be available for those operators with that preference.

20. Operator shall be able to split or resize viewing screen into quadrants to show one graphic on one quadrant of screen and other graphics or spreadsheet, bar chart, word processing, curve plot and other information on other quadrants on screen. This feature shall allow real-time monitoring of one part of system while displaying other parts of system or data to better facilitate overall system operation.
21. Help Features:

    a. On-line context-sensitive help utility to facilitate operator training and understanding.
    b. Bridge to further explanation of selected keywords. Document shall contain text and graphics to clarify system operation.

        1) If help feature does not have ability to bridge on keywords for more information, a complete set of user manuals shall be provided in an indexed word-processing program, which shall run concurrently with operating system software.

    c. Available for Every Menu Item:

        1) Index items for each system menu item.

22. Graphic generation software shall allow operator to add, modify, or delete system graphic displays.

    a. Include libraries of symbols depicting HVAC symbols such as fans, coils, filters, dampers, valves pumps, and electrical symbols.
    b. Graphic development package shall use a pointing device in conjunction with a drawing program to allow operator to perform the following:

        1) Define background screens.
        2) Define connecting lines and curves.
        3) Locate, orient and size descriptive text.
        4) Define and display colors for all elements.
        5) Establish correlation between symbols or text and associated system points or other displays.

D. Project-Specific Graphics: Graphics documentation including, but not limited to, the following:

1. Site plan showing each building, and additional site elements, which are being controlled or monitored by DDC system.
2. Plan for each building floor, including interstitial floors, and each roof level of each building, showing the following:

    a. Room layouts with room identification and name.
    b. Locations and identification of all monitored and controlled HVAC equipment and other equipment being monitored and controlled by DDC system.
    c. Location and identification of each hardware point being controlled or monitored by DDC system.

3. Control schematic for each of following, including a graphic system schematic representation, similar to that indicated on Drawings, with point identification, set point and dynamic value indication, sequence of operation and control logic diagram.
4. Graphic display for each piece of equipment connected to DDC system through a data communications link. Include dynamic indication of all points associated with equipment.
5. DDC system network riser diagram that shows schematic layout for entire system including all networks and all controllers, gateways operator workstations and other network devices.

E. Customizing Software:

1. Software to modify and tailor DDC system to specific and unique requirements of equipment installed, to programs implemented and to staffing and operational practices planned.
2. Online modification of DDC system configuration, program parameters, and database using menu selection and keyboard entry of data into preformatted display templates.
3. As a minimum, include the following modification capability:

    a. Operator assignment shall include designation of operator passwords, access levels, point segregation and auto sign-off.
    b. Peripheral assignment capability shall include assignment of segregation groups and operators to consoles and printers, designation of backup workstations and printers, designation of workstation header points and enabling and disabling of print-out of operator changes.
    c. System configuration and diagnostic capability shall include communications and peripheral port assignments, DDC controller assignments to network, DDC controller enable and disable, assignment of command trace to points and application programs and initiation of diagnostics.
    d. System text addition and change capability shall include English or native language descriptors for points, segregation groups and access levels and action messages for alarms, run time and trouble condition.
    e. Time and schedule change capability shall include time and date set, time and occupancy schedules, exception and holiday schedules and daylight savings time schedules.
    f. Point related change capability shall include the following:

        1) System and point enable and disable.
        2) Run-time enable and disable.
        3) Assignment of points to segregation groups, calibration tables, lockout, and run time and to a fixed I/O value.
        4) Assignment of alarm and warning limits.

    g. Application program change capability shall include the following:

        1) Enable and disable of software programs.
        2) Programming changes.
        3) Assignment of comfort limits, global points, time and event initiators, time and event schedules and enable and disable time and event programs.

4. Software shall allow operator to add points, or groups of points, to DDC system and to link them to energy optimization and management programs. Additions and modifications shall be online programmable using operator workstation, downloaded to other network devices and entered into their databases. After verification of point additions and associated program operation, database shall be uploaded and recorded on hard drive and disk for archived record.
5. Include high-level language programming software capability for implementation of custom DDC programs. Software shall include a compiler, linker, and up- and down-load capability.
6. Include a library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences. Also include, as a minimum, the following:

    a. Proportional control (P).
    b. Proportional plus integral (PI).
    c. Proportional plus integral plus derivative (PID).
    d. Adaptive and intelligent self-learning control.

        1) Algorithm shall monitor loop response to output corrections and adjust loop response characteristics according to time constant changes imposed.
        2) Algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of system dynamics so that on system shut down and restart, learning process starts from where it left off.

7. Fully implemented intrinsic control operators including sequence, reversing, ratio, time delay, time of day, highest select AO, lowest select AO, analog controlled digital output, analog control AO, and digitally controlled AO.
8. Logic operators such as "And," "Or," "Not," and others that are part of a standard set available with a high-level language.
9. Arithmetic operators such as "Add," "Subtract," "Multiply," "Divide," and others that are part of a standard set available with a high-level language.
10. Relational operators such as "Equal To," "Not Equal To," "Less Than," "Greater Than," and others that are part of a standard set available with a high-level language.

F. Alarm Handling Software:

1. Include alarm handling software to report all alarm conditions monitored and transmitted through DDC controllers, gateways and other network devices.
2. Include first in, first out handling of alarms according to alarm priority ranking, with most critical alarms first, and with buffer storage in case of simultaneous and multiple alarms.
3. Alarm handling shall be active at all times to ensure that alarms are processed even if an operator is not currently signed on to DDC system.
4. Alarms display shall include the following:

    a. Indication of alarm condition such as "Abnormal Off," "Hi Alarm," and "Low Alarm."
    b. "Analog Value" or "Status" group and point identification with native language point descriptor such as "Space Temperature, Building 110, 2nd Floor, Room 212."

c. Discrete per point alarm action message, such as "Call Maintenance Dept. Ext-5561."
d. Include extended message capability to allow assignment and printing of extended action messages. Capability shall be operator programmable and assignable on a per point basis.

5. Alarms shall be directed to appropriate operator workstations, printers, and individual operators by privilege level and segregation assignments.
6. Send e-mail alarm messages to designated operators.
7. Send e-mail, page, text and voice messages to designated operators for critical alarms.
8. Alarms shall be categorized and processed by class.

a. Class 1:

1) Associated with fire, security and other extremely critical equipment monitoring functions; have alarm, trouble, return to normal, and acknowledge conditions printed and displayed.
2) Unacknowledged alarms to be placed in unacknowledged alarm buffer.
3) All conditions shall cause an audible sound and shall require individual acknowledgment to silence audible sound.

b. Class 2:

1) Critical, but not life-safety related, and processed same as Class 1 alarms, except do not require individual acknowledgment.
2) Acknowledgement may be through a multiple alarm acknowledgment.

c. Class 3:

1) General alarms; printed, displayed and placed in unacknowledged alarm buffer queues.
2) Each new alarm received shall cause an audible sound. Audible sound shall be silenced by "acknowledging" alarm or by pressing a "silence" key.
3) Acknowledgement of queued alarms shall be either on an individual basis or through a multiple alarm acknowledgement.
4) Alarms returning to normal condition shall be printed and not cause an audible sound or require acknowledgment.

d. Class 4:

1) Routine maintenance or other types of warning alarms.
2) Alarms to be printed only, with no display, no audible sound and no acknowledgment required.

9. Include an unacknowledged alarm indicator on display to alert operator that there are unacknowledged alarms in system. Operator shall be able to acknowledge alarms on an individual basis or through a multiple alarm acknowledge key, depending on alarm class.
10. To ensure that no alarm records are lost, it shall be possible to assign a backup printer to accept alarms in case of failure of primary printer.

G. Reports and Logs:

1. Include reporting software package that allows operator to select, modify, or create reports using DDC system I/O point data available.
2. Each report shall be definable as to data content, format, interval and date.
3. Report data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on server for historical reporting.
4. Operator shall be able to obtain real-time logs of all I/O points by type or status, such as alarm, point lockout, or normal.
5. Reports and logs shall be stored on workstation and server hard drives in a format that is readily accessible by other standard software applications, including spreadsheets and word processing.
6. Reports and logs shall be readily printed and set to be printed either on operator command or at a specific time each day.

H. Standard Reports: Standard DDC system reports shall be provided and operator shall be able to customize reports later.

1. All I/O: With current status and values.
2. Alarm: All current alarms, except those in alarm lockout.
3. Disabled I/O: All I/O points that are disabled.
4. Alarm Lockout I/O: All I/O points in alarm lockout, whether manual or automatic.
5. Alarm Lockout I/O in Alarm: All I/O in alarm lockout that are currently in alarm.
6. Logs:

    a. Alarm history.
    b. System messages.
    c. System events.
    d. Trends.

I. Custom Reports: Operator shall be able to easily define any system data into a daily, weekly, monthly, or annual report. Reports shall be time and date stamped and shall contain a report title.

J. HVAC Equipment Reports: Prepare Project-specific reports.

1. Chiller Report: Daily report showing operating conditions of each chiller according to ASHRAE 147, including, but not limited to, the following:

    a. Chilled-water entering temperature.
    b. Chilled-water leaving temperature.
    c. Chilled-water inlet and outlet pressures.
    d. Evaporator refrigerant pressure and temperature.
    e. Condenser-water entering temperature.
    f. Condenser-water leaving temperature.
    g. Ambient temperature (dry bulb and wet bulb).
    h. Date and time logged.

    Other Reports to include:
    a. AHUs

b. Pumps
c. Exhaust Fans
d. Return Fans
e. Weather
f. Heat Exchangers
g. Boilers
h. Domestic Hot water System
i. Chillers
j. Cooling Towers
k. Generators
l. Space Temperature/Humidity Sensors
m. Differential Pressure
n. Refrigerated boxes
o. Reheat coils
p. Ice Water System
q. Paratemp System
r. Test Kitchen System

K. Standard Trends:

1. Trend all I/O point present values, set points, and other parameters indicated for trending.
2. Trends shall be associated into groups, and a trend report shall be set up for each group.
3. Trends shall be stored within DDC controller and uploaded to hard drives automatically on reaching 75 of DDC controller buffer limit, or by operator request, or by archiving time schedule.
4. Preset trend intervals for each I/O point after review with Owner.
5. Trend intervals shall be operator selectable from 10 seconds up to 60 minutes. Minimum number of consecutive trend values stored at one time shall be 100 per variable.
6. When drive storage memory is full, most recent data shall overwrite oldest data.
7. Archived and real-time trend data shall be available for viewing numerically and graphically by operators.

L. Custom Trends: Operator shall be able to define a custom trend log for any I/O point in DDC system.

1. Each trend shall include interval, start time, and stop time.
2. Data shall be sampled and stored on DDC controller, within storage limits of DDC controller, and then uploaded to archive on server hard drives.
3. Data shall be retrievable for use in spreadsheets and standard database programs.

M. Programming Software:

1. Include programming software to execute sequences of operation indicated.
2. Include programming routines in simple and easy to follow logic with detailed text comments describing what the logic does and how it corresponds to sequence of operation.
3. Programming software shall be as follows:

a. Graphic Based: Programming shall use a library of function blocks made from preprogrammed code designed for DDC control systems.

1) Function blocks shall be assembled with interconnection lines that represent to control sequence in a flowchart.
2) Programming tools shall be viewable in real time to show present values and logical results of each function block.

4. Include means for detecting programming errors and testing software control strategies with a simulation tool before implementing in actual control. Simulation tool may be inherent with programming software or as a separate product.

N. Database Management Software:

1. Where a separate SQL database is used for information storage, DDC system shall include database management software that separates database monitoring and managing functions by supporting multiple separate windows.
2. Database secure access shall be accomplished using standard SQL authentication including ability to access data for use outside of DDC system applications.
3. Database management function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

a. Backup.
b. Purge.
c. Restore.

4. Database management software shall support the following:

a. Statistics: Display database server information and trend, alarm, event, and audit information on database.
b. Maintenance: Include method of purging records from trend, alarm, event and audit databases by supporting separate screens for creating a backup before purging, selecting database, and allowing for retention of a selected number of day's data.
c. Backup: Include means to create a database backup file and select a storage location.
d. Restore: Include a restricted means of restoring a database by requiring operator to have proper security level.

5. Database management software shall include information of current database activity, including the following:

a. Ready.
b. Purging record from a database.
c. Action failed.
d. Refreshing statistics.
e. Restoring database.
f. Shrinking a database.
g. Backing up a database.
h. Resetting Internet information services.

i. Starting network device manager.
j. Shutting down the network device manager.
k. Action successful.

6. Database management software monitoring functions shall continuously read database information once operator has logged on.
7. Include operator notification through on-screen pop-up display and e-mail message when database value has exceeded a warning or alarm limit.
8. Monitoring settings window shall have the following sections:

a. Allow operator to set and review scan intervals and start times.
b. E-mail: Allow operator to create and review e-mail and phone text messages to be delivered when a warning or an alarm is generated.
c. Warning: Allow operator to define warning limit parameters, set reminder frequency and link e-mail message.
d. Alarm: Allow operator to define alarm limit parameters, set reminder frequency and link e-mail message.
e. Database Login: Protect system from unauthorized database manipulation by creating a read access and a write access for each of trend, alarm, event and audit databases as well as operator proper security access to restore a database.

9. Monitoring settings taskbar shall include the following informational icons:

a. Normal: Indicates by color and size, or other easily identifiable means that all databases are within their limits.
b. Warning: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their warning limit.
c. Alarm: Indicates by color and size, or other easily identifiable means that one or more databases have exceeded their alarm limit.

2.11 ASHRAE 135 GATEWAYS

A. Include BACnet communication ports, whenever available as an equipment OEM standard option, for integration via a single communication cable. BACnet-controlled plant equipment includes, but is not limited to, boilers, chillers, and variable-speed drives.

B. Include gateways to connect BACnet to legacy systems, existing non-BACnet devices, and existing non-BACnet DDC-controlled equipment, only when specifically requested and approved by Owner.

C. Include with each gateway an interoperability schedule showing each point or event on legacy side that BACnet "client" will read, and each parameter that BACnet network will write to. Describe this interoperability of BACnet services, or BIBBs, defined in ASHRAE 135, Annex K.

D. Gateway Minimum Requirements:

1. Read and view all readable object properties on non-BACnet network to BACnet network and vice versa where applicable.

2. Write to all writeable object properties on non-BACnet network from BACnet network and vice versa where applicable.
3. Include single-pass (only one protocol to BACnet without intermediary protocols) translation from non-BACnet protocol to BACnet and vice versa.
4. Comply with requirements of Data Sharing Read Property, Data Sharing Write Property, Device Management Dynamic Device Binding-B, and Device Management Communication Control BIBBs according to ASHRAE 135.
5. Hardware, software, software licenses, and configuration tools for operator-to-gateway communications.
6. Backup programming and parameters on CD media and the ability to modify, download, backup, and restore gateway configuration.

2.12 ASHRAE 135 PROTOCOL ANALYZER

A. Analyzer and required cables and fittings for connection to ASHRAE 135 network.

B. Analyzer shall include the following minimum capabilities:

1. Capture and store to a file data traffic on all network levels.
2. Measure bandwidth usage.
3. Filtering options with ability to ignore select traffic.

2.13 DDC CONTROLLERS

A. DDC system shall consist of a combination of network controllers, programmable application controllers and application-specific controllers to satisfy performance requirements indicated.

B. DDC controllers shall perform monitoring, control, energy optimization and other requirements indicated.

C. DDC controllers shall use a multitasking, multiuser, real-time digital control microprocessor with a distributed network database and intelligence.

D. Each DDC controller shall be capable of full and complete operation as a completely independent unit and as a part of a DDC system wide distributed network.

E. Environment Requirements:

1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers located in conditioned space shall be rated for operation at 32 to 120 deg F.
3. Controllers located outdoors shall be rated for operation at 40 to 150 deg F.

F. Power and Noise Immunity:

1. Controller shall operate at 90 to 110 percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent of nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios with up to 5 W of power located within36 inches of enclosure.

G. DDC Controller Spare Processing Capacity:

1. Include spare processing memory for each controller. RAM, PROM, or EEPROM will implement requirements indicated with the following spare memory:

   a. Network Controllers: 60 percent.
   b. Programmable Application Controllers: Not less than 60 percent.
   c. Application-Specific Controllers: Not less than 60 percent.

2. Memory shall support DDC controller's operating system and database and shall include the following:

   a. Monitoring and control.
   b. Energy management, operation and optimization applications.
   c. Alarm management.
   d. Historical trend data of all connected I/O points.
   e. Maintenance applications.
   f. Operator interfaces.
   g. Monitoring of manual overrides.

H. DDC Controller Spare I/O Point Capacity: Include spare I/O point capacity for each controller as follows:

1. Network Controllers:

   a. 10 percent of each AI, AO, BI, and BO point connected to controller.
   b. Minimum Spare I/O Points per Controller:

      1) AIs: Two.
      2) AOs: Two.
      3) BIs: Three.
      4) BOs: Three.

2. Programmable Application Controllers:

   a. 10 percent of each AI, AO, BI, and BO point connected to controller.
   b. Minimum Spare I/O Points per Controller:

      1) AIs: Two.
      2) AOs: Two.
      3) BIs: Three.
      4) BOs: Three.

3. Application-Specific Controllers:

   a. 10 percent of each AI, AO, BI, and BO point connected to controller.
   b. Minimum Spare I/O Points per Controller:

      1) AIs: One.
      2) AOs: One.

3) BIs: One.
4) BOs: One.

I. Maintenance and Support: Include the following features to facilitate maintenance and support:

1. Mount microprocessor components on circuit cards for ease of removal and replacement.
2. Means to quickly and easily disconnect controller from network.
3. Means to quickly and easily access connect to field test equipment.
4. Visual indication that controller electric power is on, of communication fault or trouble, and that controller is receiving and sending signals to network.

J. Input and Output Point Interface:

1. Hardwired input and output points shall connect to network, programmable application and application-specific controllers.
2. Input and output points shall be protected so shorting of point to itself, to another point, or to ground will not damage controller.
3. Input and output points shall be protected from voltage up to 24 V of any duration so that contact will not damage controller.
4. AIs:

a. AIs shall include monitoring of low-voltage (zero- to 10-V dc), current (4 to 20 mA) and resistance signals from thermistor and RTD sensors.
b. AIs shall be compatible with, and field configurable to, sensor and transmitters installed.
c. Controller AIs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 8 bits or better to comply with accuracy requirements indicated.
d. Signal conditioning including transient rejection shall be provided for each AI.
e. Capable of being individually calibrated for zero and span.
f. Incorporate common-mode noise rejection of at least 50 dB from zero to 100 Hz for differential inputs, and normal-mode noise rejection of at least 20 dB at 60 Hz from a source impedance of 10000 ohms.

5. AOs:

a. Controller AOs shall perform analog-to-digital (A-to-D) conversion with a minimum resolution of 8 bits or better to comply with accuracy requirements indicated.
b. Output signals shall have a range of 4 to 20 mA dc or zero- to 10-V dc as required to include proper control of output device.
c. Capable of being individually calibrated for zero and span.
d. AOs shall not exhibit a drift of greater than 0.4 percent of range per year.

6. BIs:

a. Controller BIs shall accept contact closures and shall ignore transients of less than 5-ms duration.
b. Isolation and protection against an applied steady-state voltage of up to 180-V ac peak.

c. BIs shall include a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against effects of contact bounce and noise.
d. BIs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
e. Pulse accumulation input points shall comply with all requirements of BIs and accept up to 10 pulses per second for pulse accumulation. Buffer shall be provided to totalize pulses. Pulse accumulator shall accept rates of at least 20 pulses per second. The totalized value shall be reset to zero on operator's command.

7. BOs:

a. Controller BOs shall include relay contact closures or triac outputs for momentary and maintained operation of output devices.

1) Relay contact closures shall have a minimum duration of 0.1 second. Relays shall include at least 180 V of isolation. Electromagnetic interference suppression shall be provided on all output lines to limit transients to non-damaging levels. Minimum contact rating shall be 1 A at 24-V ac.
2) Triac outputs shall include at least 180 V of isolation. Minimum contact rating shall be 1 A at 24-V ac.

b. BOs shall include for two-state operation or a pulsed low-voltage signal for pulse-width modulation control.
c. BOs shall be selectable for either normally open or normally closed operation.
d. Include tristate outputs (two coordinated BOs) for control of three-point floating-type electronic actuators without feedback.
e. Limit use of three-point floating devices to VAV terminal unit control applications,. Control algorithms shall operate actuator to one end of its stroke once every 24 hours for verification of operator tracking.

2.14 NETWORK CONTROLLERS

A. General Network Controller Requirements:

1. Include adequate number of controllers to achieve performance indicated.
2. System shall consist of one or more independent, standalone, microprocessor-based network controllers to manage global strategies indicated.
3. Controller shall have enough memory to support its operating system, database, and programming requirements.
4. Data shall be shared between networked controllers and other network devices.
5. Operating system of controller shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and allow for central monitoring and alarms.
6. Controllers shall have a real-time clock.
7. Controller shall continually check status of its processor and memory circuits. If an abnormal operation is detected, controller shall assume a predetermined failure mode and generate an alarm notification.
8. Controllers shall be fully programmable.

B. Communication:

1. Network controllers shall communicate with other devices on DDC system Level one network.
2. Network controller also shall perform routing if connected to a network of programmable application and application-specific controllers.

C. Operator Interface:

1. Controller shall be equipped with a service communications port for connection to a portable operator's workstation.
2. Local Keypad and Display:

   a. Equip controller with local keypad and digital display for interrogating and editing data.
   b. Use of keypad and display shall require security password.

D. Serviceability:

1. Controller shall be equipped with diagnostic LEDs or other form of local visual indication of power, communication, and processor.
2. Wiring and cable connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
3. Controller shall maintain BIOS and programming information in event of a power loss for at least 72 hours.

2.15 CONTROLLER SOFTWARE

A. General Controller Software Requirements:

1. Software applications shall reside and operate in controllers. Editing of applications shall occur at operator workstations.
2. I/O points shall be identified by up to 30-character point name and up to 16-character point descriptor. Same names shall be used at operator workstations.
3. Control functions shall be executed within controllers using DDC algorithms.
4. Controllers shall be configured to use stored default values to ensure fail-safe operation. Default values shall be used when there is a failure of a connected input instrument or loss of communication of a global point value.

B. Security:

1. Operator access shall be secured using individual security passwords and user names.
2. Passwords shall restrict operator to points, applications, and system functions as assigned by system manager.
3. Operator log-on and log-off attempts shall be recorded.
4. System shall protect itself from unauthorized use by automatically logging off after last keystroke. The delay time shall be operator-definable.

C. Scheduling: Include capability to schedule each point or group of points in system. Each schedule shall consist of the following:

1. Weekly Schedule:

a. Include separate schedules for each day of week.
b. Each schedule should include the capability for start, stop, optimal start, optimal stop, and night economizer.
c. Each schedule may consist of up to 10 events.
d. When a group of objects are scheduled together, include capability to adjust start and stop times for each member.

2. Exception Schedules:

a. Include ability for operator to designate any day of the year as an exception schedule.
b. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by regular schedule for that day of week.

3. Holiday Schedules:

a. Include capability for operator to define up to 99 special or holiday schedules.
b. Schedules may be placed on scheduling calendar and will be repeated each year.
c. Operator shall be able to define length of each holiday period.

D. System Coordination:

1. Include standard application for proper coordination of equipment.
2. Application shall include operator with a method of grouping together equipment based on function and location.
3. Group may then be used for scheduling and other applications.

E. Binary Alarms:

1. Each binary point shall be set to alarm based on operator-specified state.
2. Include capability to automatically and manually disable alarming.

F. Analog Alarms:

1. Each analog object shall have both high and low alarm limits.
2. Alarming shall be able to be automatically and manually disabled.

G. Alarm Reporting:

1. Operator shall be able to determine action to be taken in event of an alarm.
2. Alarms shall be routed to appropriate operator workstations based on time and other conditions.
3. Alarm shall be able to start programs, print, be logged in event log, generate custom messages, and display graphics.

H. Remote Communication:

1. System shall have ability to dial out in the event of an alarm.

I. Sequencing: Include application software based on sequences of operation indicated to properly sequence chillers, boilers, and other applicable HVAC equipment.

J. Control Loops:

1. Support any of the following control loops, as applicable to control required:

a. Two-position (on/off, open/close, slow/fast) control.
b. Proportional control.
c. Proportional plus integral (PI) control.
d. Proportional plus integral plus derivative (PID) control.

1) Include PID algorithms with direct or reverse action and anti-windup.
2) Algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs.
3) Controlled variable, set point, and PID gains shall be operator-selectable.

e. Adaptive (automatic tuning).

K. Staggered Start: Application shall prevent all controlled equipment from simultaneously restarting after a power outage. Order which equipment (or groups of equipment) is started, along with the time delay between starts, shall be operator-selectable.

L. Anti-Short Cycling:

1. BO points shall be protected from short cycling.
2. Feature shall allow minimum on-time and off-time to be selected.

M. On and Off Control with Differential:

1. Include an algorithm that allows a BO to be cycled based on a controlled variable and set point.
2. Algorithm shall be direct- or reverse-acting and incorporate an adjustable differential.

N. Run-Time Totalization:

1. Include software to totalize run-times for all BI and BO points.
2. A high run-time alarm shall be assigned, if required, by operator.

2.16 ENCLOSURES

A. General Enclosure Requirements:

1. House each controller and associated control accessories in an enclosure. Enclosure shall serve as central tie-in point for control devices such as switches, transmitters, transducers, power supplies and transformers.
2. Do not house more than one controller in a single enclosure.
3. Include enclosure door with key locking mechanism. Key locks alike for all enclosures and include one pair of keys per enclosure.
4. Equip doors of enclosures housing controllers and components with analog or digital displays with windows to allow visual observation of displays without opening enclosure door.
5. Individual wall-mounted single-door enclosures shall not exceed 36 inches wide and 48 inches high.
6. Individual wall-mounted double-door enclosures shall not exceed 60 inches wide and 36 inches high.
7. Freestanding enclosures shall not exceed 48 inches wide and 72 inches high.
8. Include wall-mounted enclosures with brackets suitable for mounting enclosures to wall or freestanding support stand as indicated.
9. Supply each enclosure with a complete set of as-built schematics, tubing, and wiring diagrams and product literature located in a pocket on inside of door. For enclosures with windows, include pocket on bottom of enclosure.

B. Internal Arrangement:

1. Internal layout of enclosure shall group and protect pneumatic, electric, and electronic components associated with a controller, but not an integral part of controller.
2. Arrange layout to group similar products together.
3. Include a barrier between line-voltage and low-voltage electrical and electronic products.
4. Factory or shop install products, tubing, cabling and wiring complying with requirements and standards indicated.
5. Terminate field cable and wire using heavy-duty terminal blocks.
6. Include spare terminals, equal to not less than 10 percent of used terminals.
7. Include spade lugs for stranded cable and wire.
8. Install a maximum of two wires on each side of a terminal.
9. Include enclosure field power supply with a toggle-type switch located at entrance inside enclosure to disconnect power.
10. Include enclosure with a line-voltage nominal 20-A GFCI duplex receptacle for service and testing tools. Wire receptacle on hot side of enclosure disconnect switch and include with a 5-A circuit breaker.
11. Mount products within enclosure on removable internal panel(s).
12. Include products mounted in enclosures with engraved, laminated phenolic nameplates (black letters on a white background). The nameplates shall have at least 1/4-inch-high lettering.
13. Route tubing cable and wire located inside enclosure within a raceway with a continuous removable cover.
14. Label each end of cable, wire and tubing in enclosure following an approved identification system that extends from field I/O connection and all intermediate connections throughout length to controller connection.
15. Size enclosure internal panel to include at least 25 percent spare area on face of panel.

C. Environmental Requirements:

1. Evaluate temperature and humidity requirements of each product to be installed within each enclosure.
2. Calculate enclosure internal operating temperature considering heat dissipation of all products installed within enclosure and ambient effects (solar, conduction and wind) on enclosure.
3. Where required by application, include temperature-controlled electrical heat to maintain inside of enclosure above minimum operating temperature of product with most stringent requirement.
4. Where required by application, include temperature-controlled ventilation fans with filtered louver(s) to maintain inside of enclosure below maximum operating temperature of product with most stringent requirement.
5. Include temperature-controlled cooling within the enclosure for applications where ventilation fans cannot maintain inside temperature of enclosure below maximum operating temperature of product with most stringent requirement.
6. Where required by application, include humidity-controlled electric dehumidifier or cooling to maintain inside of enclosure below maximum relative humidity of product with most stringent requirement and to prevent surface condensation within enclosure.

D. Wall-Mounted, NEMA 250, Type 1:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Hoffman; a brand of Pentair Equipment Protection.

2. Enclosure shall be NRTL listed according to UL 50 or UL 50E.

3. Construct enclosure of steel, not less than:

    a. Enclosure size less than 24 in.: 0.053 in. thick.
    b. Enclosure size 24 in. and larger: 0.067 in. thick.

4. Finish enclosure inside and out with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Exterior color shall be manufacturer's standard.
    b. Interior color shall be manufacturer's standard.

5. Hinged door full size of front face of enclosure and supported using:

    a. Enclosures sizes less than 36 in. tall: Multiple butt hinges.
    b. Enclosures sizes 36 in. tall and larger: Continuous piano hinges.

6. Removable internal panel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Size less than 24 in.: Solid or Perforated steel, 0.053 in. thick.
    b. Size 24 in. and larger: Solid aluminum, 0.10 in. or steel, 0.093 in. thick.

7. Internal panel mounting hardware, grounding hardware and sealing washers.

8. Grounding stud on enclosure body.
9. Thermoplastic pocket on inside of door for record Drawings and Product Data.

E. Wall Mounted NEMA 250, Types 4 and 12:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Hoffman; a brand of Pentair Equipment Protection.

2. Enclosure shall be NRTL listed according to UL 508A.

3. Seam and joints are continuously welded and ground smooth.
4. Where recessed enclosures are indicated, include enclosures with face flange for flush mounting.
5. Externally formed body flange around perimeter of enclosure face for continuous perimeter seamless gasket door seal.
6. Single-door enclosure sizes up to 60 inches tall by 36 inches wide.
7. Double-door enclosure sizes up to 36 inches tall by 60 inches wide.
8. Construct enclosure of steel, not less than the following:

    a. Size Less Than 24 Inches: 0.053 inch thick.
    b. Size 24 Inches and Larger: 0.067 inch thick.

9. Finish enclosure with polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Exterior color shall be manufacturer's standard.
    b. Interior color shall be manufacturer's standard.

10. Corner-formed door, full size of enclosure face, supported using multiple concealed hinges with easily removable hinge pins.

    a. Sizes through 24 Inches Tall: Two hinges.
    b. Sizes between 24 Inches through 48 Inches Tall: Three hinges.
    c. Sizes Larger 48 Inches Tall: Four hinges.

11. Double-door enclosures with overlapping door design to include unobstructed full-width access.

    a. Single-door enclosures 48 inches and taller, and all double-door enclosures, with three-point (top, middle and bottom) latch system.

12. Removable internal panel with a white polyester powder coating that is electrostatically applied and then baked to bond to substrate.

    a. Size Less Than 24 Inches: Solid or perforated steel, 0.053 inch thick.
    b. Size 24 Inches and Larger: Solid aluminum, 0.10 inch or steel, 0.093 inch thick.

13. Internal panel mounting studs with hardware, grounding hardware, and sealing washers.

14. Grounding stud on enclosure body.
15. Thermoplastic pocket on inside of door for record Drawings and Product Data.

2.17 RELAYS

A. General-Purpose Relays:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Siemens Building Technologies, Inc.

2. Relays shall be heavy duty and rated for at least 10 A at 250-V ac and 60 Hz.

3. Relays shall be either double pole double throw (DPDT) or three-pole double throw, depending on the control application.
4. Use a plug-in-style relay with an eight-pin octal plug for DPDT relays and an 11-pin octal plug for three-pole double-throw relays.
5. Construct the contacts of either silver cadmium oxide or gold.
6. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
7. Relays shall have LED indication and a manual reset and push-to-test button.
8. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

9. Equip relays with coil transient suppression to limit transients to non-damaging levels.
10. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
11. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

B. Multifunction Time-Delay Relays:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Siemens Building Technologies, Inc.

2. Relays shall be continuous duty and rated for at least 10 A at 240-V ac and 60 Hz.

3. Relays shall be DPDT relay with up to eight programmable functions to provide on/off delay, interval and recycle timing functions.

4. Use a plug-in-style relay with either an 8- or 11-pin octal plug.
5. Construct the contacts of either silver cadmium oxide or gold.
6. Enclose the relay in a dust-tight cover.
7. Include knob and dial scale for setting delay time.
8. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Timing Ranges: Multiple ranges from 0.1 seconds to 100 minutes.
    d. Repeatability: Within 2 percent.
    e. Recycle Time: 45 ms.
    f. Minimum Pulse Width Control: 50 ms.
    g. Power Consumption: 5 VA or less at 120-V ac.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

9. Equip relays with coil transient suppression to limit transients to non-damaging levels.
10. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.
11. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

C. Latching Relays:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

    a. Siemens Building Technologies, Inc.

2. Relays shall be continuous duty and rated for at least 10 A at 250-V ac and 60 Hz.

3. Relays shall be either DPDT or three-pole double throw, depending on the control application.
4. Use a plug-in-style relay with a multibladed plug.
5. Construct the contacts of either silver cadmium oxide or gold.
6. Enclose the relay in a clear transparent polycarbonate dust-tight cover.
7. Performance:

    a. Mechanical Life: At least 10 million cycles.
    b. Electrical Life: At least 100,000 cycles at rated load.
    c. Pickup Time: 15 ms or less.
    d. Dropout Time: 10 ms or less.
    e. Pull-in Voltage: 85 percent of rated voltage.
    f. Dropout Voltage: 50 percent of nominal rated voltage.
    g. Power Consumption: 2 VA.
    h. Ambient Operating Temperatures: Minus 40 to 115 deg F.

8. Equip relays with coil transient suppression to limit transients to non-damaging levels.
9. Plug each relay into an industry-standard, 35-mm DIN rail socket. Plug all relays located in control panels into sockets that are mounted on a DIN rail.

10. Relay socket shall have screw terminals. Mold into the socket the coincident screw terminal numbers and associated octal pin numbers.

D. Current Sensing Relay:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Square D; by Schneider Electric.

2. Monitors ac current.

3. Independent adjustable controls for pickup and dropout current.
4. Energized when supply voltage is present and current is above pickup setting.
5. De-energizes when monitored current is below dropout current.
6. Dropout current is adjustable from 50 to 95 percent of pickup current.
7. Include a current transformer, if required for application.
8. House current sensing relay and current transformer in its own enclosure. Use NEMA 250, Type 12 enclosure for indoors and NEMA 250, Type 4 for outdoors.

E. Combination On-Off Status Sensor and On-Off Relay:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

   a. Functional Devices Inc.

2. Description:

   a. On-off control and status indication in a single device.
   b. LED status indication of activated relay and current trigger.
   c. Closed-Open-Auto override switch located on the load side of the relay.

3. Performance:

   a. Ambient Temperature: Minus 30 to 140 deg F.
   b. Voltage Rating: Single-phase loads rated for 300-V ac. Three-phase loads rated for 600-V ac.

4. Status Indication:

   a. Current Sensor: Integral sensing for single-phase loads up to 20 A and external solid or split sensing ring for three-phase loads up to 150 A.
   b. Current Sensor Range: As required by application.
   c. Current Set Point: Fixed or adjustable as required by application.
   d. Current Sensor Output:

      1) Solid-state, single-pole double-throw contact rated for 30-V ac and dc and for 0.4 A.
      2) Solid-state, single-pole double-throw contact rated for 120-V ac and 1.0 A.

3) Analog, zero- to 5- or 10-V dc.
4) Analog, 4 to 20 mA, loop powered.

5. Relay: Single-pole double-throw, continuous-duty coil; rated for 10-million mechanical cycles.
6. Enclosure: NEMA 250, Type 1 enclosure.

2.18 ELECTRICAL POWER DEVICES

A. Transformers:

1. Transformer shall be sized for the total connected load, plus an additional 25 percent of connected load.
2. Transformer shall be at least 40 VA.
3. Transformer shall have both primary and secondary fuses.

2.19 CONTROL WIRE AND CABLE

A. Wire: Single conductor control wiring above 24 V.

1. Wire size shall be at least No. 18 AWG.
2. Conductor shall be 7/24 soft annealed copper strand with 2- to 2.5-inch lay.
3. Conductor insulation shall be 600 V, Type THWN or Type THHN, and 90 deg C according to UL 83.
4. Conductor colors shall be black (hot), white (neutral), and green (ground).
5. Furnish wire on spools.
6. Wire to be plenum rated.

B. Single Twisted Shielded Instrumentation Cable above 24 V:

1. Wire size shall be a minimum No. 18 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper strand with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a Type THHN/THWN or Type TFN rating.
4. Shielding shall be 100 percent type, 0.35/0.5-mil aluminum/Mylar tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 600-V, 90-deg C rating and shall be Type TC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.
8. Wire to be plenum rated.

C. Single Twisted Shielded Instrumentation Cable 24 V and Less:

1. Wire size shall be a minimum No. 22 AWG.
2. Conductors shall be a twisted, 7/24 soft annealed copper stranding with a 2- to 2.5-inch lay.
3. Conductor insulation shall have a nominal 15-mil thickness, constructed from flame-retardant PVC.

4. Shielding shall be 100 percent type, 1.35-mil aluminum/polymer tape, helically applied with 25 percent overlap, and aluminum side in with tinned copper drain wire.
5. Outer jacket insulation shall have a 300-V, 105-deg C rating and shall be Type PLTC cable.
6. For twisted pair, conductor colors shall be black and white. For twisted triad, conductor colors shall be black, red and white.
7. Furnish wire on spools.
8. Wire to be plenum rated.

D. LAN and Communication Cable: Comply with DDC system manufacturer requirements for network being installed.

1. Cable shall be plenum rated.
2. Cable shall comply with NFPA 70.
3. Cable shall have a unique color that is different from other cables used on Project.

2.20 RACEWAYS FOR CONTROL WIRING, CABLING, AND TUBING

A. Comply with requirements in Section 260533 “Raceways and Boxes for Electrical Systems” for electrical power raceways and boxes.

B. Plenum rated cables to be installed in all spaces with accessible ceilings.

2.21 CONTROL POWER WIRING AND RACEWAYS

A. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" electrical power conductors and cables.

B. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

2.22 IDENTIFICATION

A. Control Equipment, Instruments, and Control Devices:

1. Letter size shall be as follows:
   a. Servers: Minimum of 0.5 inch high.
   b. DDC Controllers: Minimum of 0.5 inch high.
   c. Gateways: Minimum of 0.5 inch high.
   d. Repeaters: Minimum of 0.5 inch high.
   e. Enclosures: Minimum of 0.5 inch high.
   f. Electrical Power Devices: Minimum of 0.25 inch high.
   g. UPS units: Minimum of 0.5 inch high.
   h. Accessories: Minimum of 0.25 inch high.
   i. Instruments: Minimum of 0.25 inch high.
   j. Control Damper and Valve Actuators: Minimum of 0.25 inch high.

2. Tag shall consist of white lettering on black background.
3. Tag shall be fastened with drive pins.
4. Instruments, control devices and actuators with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require an additional tag.

B. Valve Tags:

1. Brass tags and brass chains attached to valve.
2. Tags shall be at least 1.5 inches in diameter.
3. Include tag with unique valve identification indicating control influence such as flow, level, pressure, or temperature; followed by location of valve, and followed by three-digit sequential number. For example: TV-1.001.
4. Valves with Project-specific identification tags having unique identification numbers following requirements indicated and provided by original manufacturer do not require an additional tag.

C. Raceway and Boxes:

1. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
2. Paint cover plates on junction boxes and conduit same color as the tape banding for conduits. After painting, label cover plate "HVAC Controls," using an engraved phenolic tag.

2.23 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate the following according to industry standards for each product, and to verify DDC system reliability specified in performance requirements:

1. DDC controllers.
2. Gateways.
3. Routers.

B. Product(s) and material(s) will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates.

B. Examine roughing-in for products to verify actual locations of connections before installation.

1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 DDC SYSTEM INTERFACE WITH OTHER SYSTEMS AND EQUIPMENT

A. Communication Interface to Equipment with Integral Controls:

1. DDC system shall have communication interface with equipment having integral controls and having a communication interface for remote monitoring or control.

3.3 DDC SYSTEM INTERFACE WITH EXISTING SYSTEMS

A. Integration of Existing Control System into DDC System:
1. Existing control system performance requirements shall be satisfied when monitoring and controlling existing control system through DDC system.
2. Operator shall be able to upload, download, monitor, alarm, report, trend, control and program every input and output point in existing system from DDC system using operator workstations and software provided. The combined systems shall share one database.
3. Interface of existing control system I/O points into DDC system shall be transparent to operators. All operational capabilities shall be identical regardless of whether I/O already exists, or I/O is being installed.

B. Equipment to Be Connected:
1. Air Handling Units
2. Exhaust Fans
3. Heat Exchangers
4. Boilers
5. Domestic Hot water System
6. Chillers
7. Cooling Towers
8. Generators
9. Space Temperature/Humidity Sensors
10. Differential Pressure Sensors

11. Refrigerated boxes
12. Reheat coils
13. Ice Water System
14. Paratemp System
15. Test Kitchen System

3.4 GENERAL INSTALLATION REQUIREMENTS

A. Install products to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. If codes and referenced standards are more stringent than requirements indicated, comply with requirements in codes and referenced standards.

D. Firestop penetrations made in fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

E. Welding Requirements:

1. Restrict welding and burning to supports and bracing.
2. No equipment shall be cut or welded without approval. Welding or cutting will not be approved if there is risk of damage to adjacent Work.
3. Welding, where approved, shall be by inert-gas electric arc process and shall be performed by qualified welders according to applicable welding codes.
4. If requested on-site, show satisfactory evidence of welder certificates indicating ability to perform welding work intended.

F. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that damage surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening fasteners.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts and screws with graphite and oil before assembly.

3.5 SERVER INSTALLATION

A. Install number of servers required to suit requirements indicated. Review Project requirements and indicate layout of proposed location in Shop Drawings.

B. Install software indicated on server(s) and verify that software functions properly.

C. Develop Project-specific graphics, trends, reports, logs, and historical database.

D. Power servers through dedicated UPS unit. Locate UPS adjacent to server.

3.6 ROUTER INSTALLATION

A. Install routers if required for DDC system communication interface requirements indicated.

B. Test router to verify that communication interface functions properly.

3.7 CONTROLLER INSTALLATION

A. Install controllers in enclosures to comply with indicated requirements.

B. Connect controllers to field power supply.

C. Install controller with latest version of applicable software and configure to execute requirements indicated.

D. Test and adjust controllers to verify operation of connected I/O to achieve performance indicated requirements while executing sequences of operation.

E. Installation of Network Controllers:

1. Quantity and location of network controllers shall be determined by DDC system manufacturer to satisfy requirements indicated.
2. Install controllers in a protected location that is easily accessible by operators.
3. Top of controller shall be within 72 inches of finished floor.

3.8 ENCLOSURES INSTALLATION

A. Install the following items in enclosures, to comply with indicated requirements:
1. Routers.
2. Controllers.
3. Electrical power devices.
4. Relays.

B. Attach wall-mounted enclosures to wall using the following types of steel struts:

1. For NEMA 250, Type 1 Enclosures: Use corrosion-resistant-coated steel strut and hardware.
2. For NEMA 250, Type 4 Enclosures and Enclosures Located Outdoors: Use stainless-steel strut and hardware.
3. Install plastic caps on exposed cut edges of strut.

C. Align top of adjacent enclosures.

D. Install continuous and fully accessible wireways to connect conduit, wire, and cable to multiple adjacent enclosures. Wireway used for application shall have protection equal to NEMA 250 rating of connected enclosures.

3.9 ELECTRIC POWER CONNECTIONS

A. Connect electrical power to DDC system products requiring electrical power connections.

B. Design of electrical power to products not indicated with electric power is delegated to DDC system provider and installing trade. Work shall comply with NFPA 70 and other requirements indicated.

C. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers" for electrical power circuit breakers.

D. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical power conductors and cables.

E. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for electrical power raceways and boxes.

3.10 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements in Section 260553 "Identification for Electrical Systems" for identification products and installation.

B. Install self-adhesive labels with unique identification on face for each of the following:
   1. Server.
   2. Router.
   3. DDC controller.
   4. Enclosure.
   5. Electrical power device.

C. Warning Labels:

   1. Shall be permanently attached to equipment that can be automatically started by DDC control system.
   2. Shall be located in highly visible location near power service entry points.

3.11 CONTROL WIRE, CABLE AND RACEWAYS INSTALLATION

A. Comply with NECA 1.
   1. Terminate wiring in a junction box.
      a. Clamp cable over jacket in junction box.
      b. Individual conductors in the stripped section of the cable shall be slack between the clamping point and terminal block.
   2. Terminate field wiring and cable not directly connected to instruments and control devices having integral wiring terminals using terminal blocks.
   3. Install signal transmission components according to IEEE C2, REA Form 511a, NFPA 70, and as indicated.
   4. Use shielded cable to transmitters.

5. Use shielded cable to temperature sensors.
6. Perform continuity and meager testing on wire and cable after installation.

B. Conduit Installation:

1. Comply with Section “260533- Raceways and Boxes for Electrical Systems” for control-voltage conductors.”

C. Wire and Cable Installation:

1. Comply with Section “260523- Control-Voltage Electrical Power Cables

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.13 DDC SYSTEM I/O CHECKOUT PROCEDURES

A. Check installed products before continuity tests, leak tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.

D. Control Damper Checkout:
1. Verify that control dampers are installed correctly for flow direction.
2. Verify that proper blade alignment, either parallel or opposed, has been provided.
3. Verify that damper frame attachment is properly secured and sealed.
4. Verify that damper actuator and linkage attachment is secure.
5. Verify that actuator wiring is complete, enclosed and connected to correct power source.
6. Verify that damper blade travel is unobstructed.

E. Control Valve Checkout:
1. Verify that control valves are installed correctly for flow direction.
2. Verify that valve body attachment is properly secured and sealed.
3. Verify that valve actuator and linkage attachment is secure.
4. Verify that actuator wiring is complete, enclosed and connected to correct power source.

5. Verify that valve ball, disc or plug travel is unobstructed.
6. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

F. Instrument Checkout:

1. Verify that instrument is correctly installed for location, orientation, direction and operating clearances.
2. Verify that attachment is properly secured and sealed.
3. Verify that conduit connections are properly secured and sealed.
4. Verify that wiring is properly labeled with unique identification, correct type and size and is securely attached to proper terminals.
5. Inspect instrument tag against approved submittal.
6. For instruments with tubing connections, verify that tubing attachment is secure and isolation valves have been provided.
7. For flow instruments, verify that recommended upstream and downstream distances have been maintained.
8. For temperature instruments:

a. Verify sensing element type and proper material.
b. Verify length and insertion.

3.14 DDC SYSTEM I/O ADJUSTMENT, CALIBRATION AND TESTING:

A. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.

B. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.

C. Provide diagnostic and test equipment for calibration and adjustment.

D. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. An installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.

E. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

F. Comply with field testing requirements and procedures indicated by ASHRAE's Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

G. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.

3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

H. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact making or breaking.

I. Control Dampers:

1. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed and 100 percent open at proper air pressure.
3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

J. Control Valves:

1. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed and back to 100 percent open.
2. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed and 100 percent open at proper air pressures.
3. Check and document open and close cycle times for applications with a cycle time less than 30 seconds.
4. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

K. Meters: Check sensors at zero, 50, and 100 percent of Project design values.

L. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

M. Switches: Calibrate switches to make or break contact at set points indicated.

N. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistant source.

3.15 DDC SYSTEM CONTROLLER CHECKOUT

A. Verify power supply.

1. Verify voltage, phase and hertz.

2. Verify that protection from power surges is installed and functioning.
3. Verify that ground fault protection is installed.
4. If applicable, verify if connected to UPS unit.
5. If applicable, verify if connected to a backup power source.
6. If applicable, verify that power conditioning units, transient voltage suppression and high-frequency noise filter units are installed.

B. Verify that wire and cabling is properly secured to terminals and labeled with unique identification.

C. Verify that spare I/O capacity is provided.

3.16 DDC CONTROLLER I/O CONTROL LOOP TESTS

A. Testing:

1. Test every I/O point connected to DDC controller to verify that safety and operating control set points are as indicated and as required to operate controlled system safely and at optimum performance.
2. Test every I/O point throughout its full operating range.
3. Test every control loop to verify operation is stable and accurate.
4. Adjust control loop proportional, integral and derivative settings to achieve optimum performance while complying with performance requirements indicated. Document testing of each control loop's precision and stability via trend logs.
5. Test and adjust every control loop for proper operation according to sequence of operation.
6. Test software and hardware interlocks for proper operation. Correct deficiencies.
7. Operate each analog point at the following:

    a. Upper quarter of range.
    b. Lower quarter of range.
    c. At midpoint of range.

8. Exercise each binary point.
9. For every I/O point in DDC system, read and record each value at operator workstation, at DDC controller and at field instrument simultaneously. Value displayed at operator workstation, at DDC controller and at field instrument shall match.
10. Prepare and submit a report documenting results for each I/O point in DDC system and include in each I/O point a description of corrective measures and adjustments made to achieve desire results.

3.17 DDC SYSTEM VALIDATION TESTS

A. Perform validation tests before requesting final review of system. Before beginning testing, first submit Pretest Checklist and Test Plan.

B. After approval of Test Plan, execute all tests and procedures indicated in plan.

C. After testing is complete, submit completed test checklist.

D. Pretest Checklist: Submit the following list with items checked off once verified:

1. Detailed explanation for any items that are not completed or verified.
2. Required mechanical installation work is successfully completed and HVAC equipment is working correctly.
3. Required DDC system components, wiring, and accessories are installed.
4. Installed DDC system architecture matches approved Drawings.
5. Control electric power circuits operate at proper voltage and are free from faults.
6. Required surge protection is installed.
7. DDC system network communications function properly, including uploading and downloading programming changes.
8. Using BACnet protocol analyzer, verify that communications are error free.
9. Each controller's programming is backed up.
10. Equipment, products, tubing, wiring cable and conduits are properly labeled.
11. All I/O points are programmed into controllers.
12. Dampers and actuators zero and span adjustments are set properly.
13. Each control damper and actuator goes to failed position on loss of power.
14. Valves and actuators zero and span adjustments are set properly.
15. Each control valve and actuator goes to failed position on loss of power.
16. Meter, sensor and transmitter readings are accurate and calibrated.
17. Control loops are tuned for smooth and stable operation.
18. View trend data where applicable.
19. Each controller works properly in standalone mode.
20. Safety controls and devices function properly.
21. Electrical interlocks function properly.
22. Record Drawings are completed.

E. Test Plan:

1. Prepare and submit a validation test plan including test procedures for performance validation tests.
2. Test plan shall address all specified functions of DDC system and sequences of operation.
3. Explain detailed actions and expected results to demonstrate compliance with requirements indicated.
4. Explain method for simulating necessary conditions of operation used to demonstrate performance.
5. Include a test checklist to be used to check and initial that each test has been successfully completed.
6. Submit test plan documentation 20 business days before start of tests.

F. Validation Test:

1. Verify operating performance of each I/O point in DDC system.

    a. Verify analog I/O points at operating value.
    b. Make adjustments to out-of-tolerance I/O points.

        1) Identify I/O points for future reference.

2) Simulate abnormal conditions to demonstrate proper function of safety devices.
3) Replace instruments and controllers that cannot maintain performance indicated after adjustments.

2. Simulate conditions to demonstrate proper sequence of control.
3. Readjust settings to design values and observe ability of DDC system to establish desired conditions.
4. After 24 Hours following Initial Validation Test:

   a. Re-check I/O points that required corrections during initial test.
   b. Identify I/O points that still require additional correction and make corrections necessary to achieve desired results.

5. After 24 Hours of Second Validation Test:

   a. Re-check I/O points that required corrections during second test.
   b. Continue validation testing until I/O point is normal on two consecutive tests.

6. Completely check out, calibrate, and test all connected hardware and software to ensure that DDC system performs according to requirements indicated.
7. After validation testing is complete, prepare and submit a report indicating all I/O points that required correction and how many validation re-tests it took to pass. Identify adjustments made for each test and indicate instruments that were replaced.

G. DDC System Response Time Test:

1. Simulate HLC.

   a. Heavy load shall be an occurrence of 50 percent of total connected binary COV, one-half of which represent an "alarm" condition, and 50 percent of total connected analog COV, one-half of which represent an "alarm" condition, that are initiated simultaneously on a one-time basis.

2. Initiate 10 successive occurrences of HLC and measure response time to typical alarms and status changes.
3. Measure with a timer having at least 0.1-second resolution and 0.01 percent accuracy.
4. Purpose of test is to demonstrate DDC system, as follows:

   a. Reaction to COV and alarm conditions during HLC.
   b. Ability to update DDC system database during HLC.

5. Passing test is contingent on the following:

   a. Alarm reporting at printer beginning no more than two seconds after the initiation (time zero) of HLC.
   b. All alarms, both binary and analog, are reported and printed; none are lost.
   c. Compliance with response times specified.

6. Prepare and submit a report documenting HLC tested and results of test including time stamp and print out of all alarms.

H. DDC System Network Bandwidth Test:

1. Test network bandwidth usage on all DDC system networks to demonstrate bandwidth usage under DDC system normal operating conditions and under simulated HLC.
2. To pass, none of DDC system networks shall use more than 70 percent of available bandwidth under normal and HLC operation.

3.18 FINAL REVIEW

A. Submit written request to Engineer and Construction Manager when DDC system is ready for final review. Written request shall state the following:

1. DDC system has been thoroughly inspected for compliance with contract documents and found to be in full compliance.
2. DDC system has been calibrated, adjusted and tested and found to comply with requirements of operational stability, accuracy, speed and other performance requirements indicated.
3. DDC system monitoring and control of HVAC systems results in operation according to sequences of operation indicated.
4. DDC system is complete and ready for final review.

B. Review by Engineer and Construction Manager shall be made after receipt of written request. A field report shall be issued to document observations and deficiencies.

C. Take prompt action to remedy deficiencies indicated in field report and submit a second written request when all deficiencies have been corrected. Repeat process until no deficiencies are reported.

D. Should more than two reviews be required, DDC system manufacturer and Installer shall compensate entity performing review for total costs, labor and expenses, associated with third and subsequent reviews. Estimated cost of each review shall be submitted and approved by DDC system manufacturer and Installer before making the review.

E. Prepare and submit closeout submittals when no deficiencies are reported.

F. A part of DDC system final review shall include a demonstration to parties participating in final review.

1. Provide staff familiar with DDC system installed to demonstrate operation of DDC system during final review.
2. Provide testing equipment to demonstrate accuracy and other performance requirements of DDC system that is requested by reviewers during final review.
3. Demonstration shall include, but not be limited to, the following:

a. Accuracy and calibration of 20 I/O points randomly selected by reviewers. If review finds that some I/O points are not properly calibrated and not satisfying

performance requirements indicated, additional I/O points may be selected by reviewers until total I/O points being reviewed that satisfy requirements equals quantity indicated.

b. HVAC equipment and system hardwired and software safeties and life-safety functions are operating according to sequence of operation. Up to 20 I/O points shall be randomly selected by reviewers. Additional I/O points may be selected by reviewers to discover problems with operation.
c. Correct sequence of operation after electrical power interruption and resumption after electrical power is restored for randomly selected HVAC systems.
d. Operation of randomly selected dampers and valves in normal-on, normal-off and failed positions.
e. Reporting of alarm conditions for randomly selected alarms, including different classes of alarms, to ensure that alarms are properly received by operators and operator workstations.
f. Trends, summaries, logs and reports set-up for Project.
g. For up to three HVAC systems randomly selected by reviewers, use graph trends to show that sequence of operation is executed in correct manner and that HVAC systems operate properly through complete sequence of operation including different modes of operations indicated. Show that control loops are stable and operating at set points and respond to changes in set point of 20 percent or more.
h. Software's ability to communicate with controllers, operator workstations, uploading and downloading of control programs.
i. Software's ability to edit control programs off-line.
j. Data entry to show Project-specific customizing capability including parameter changes.
k. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
l. Execution of digital and analog commands in graphic mode.
m. Spreadsheet and curve plot software and its integration with database.
n. Online user guide and help functions.
o. Multitasking by showing different operations occurring simultaneously on four quadrants of split screen.
p. System speed of response compared to requirements indicated.
q. For Each Network and Programmable Application Controller:

    1) Memory: Programmed data, parameters, trend and alarm history collected during normal operation is not lost during power failure.
    2) Operator Interface: Ability to connect directly to each type of digital controller with a portable operator workstation and PDA. Show that maintenance personnel interface tools perform as indicated in manufacturer's technical literature.
    3) Standalone Ability: Demonstrate that controllers provide stable and reliable standalone operation using default values or other method for values normally read over network.
    4) Electric Power: Ability to disconnect any controller safely from its power source.
    5) Wiring Labels: Match control drawings.
    6) Network Communication: Ability to locate a controller's location on network and communication architecture matches Shop Drawings.

7) Nameplates and Tags: Accurate and permanently attached to control panel doors, instrument, actuators and devices.

r. For Each Operator Workstation:

1) I/O points lists agree with naming conventions.
2) Graphics are complete.
3) UPS unit, if applicable, operates.

s. Communications and Interoperability: Demonstrate proper interoperability of data sharing, alarm and event management, trending, scheduling, and device and network management. Use ASHRAE 135 protocol analyzer to help identify devices, view network traffic, and verify interoperability. Requirements must be met even if only one manufacturer's equipment is installed.

1) Data Presentation: On each operator workstation, demonstrate graphic display capabilities.
2) Reading of Any Property: Demonstrate ability to read and display any used readable object property of any device on network.
3) Set Point and Parameter Modifications: Show ability to modify set points and tuning parameters indicated.
4) Peer-to-Peer Data Exchange: Network devices are installed and configured to perform without need for operator intervention to implement Project sequence of operation and to share global data.
5) Alarm and Event Management: Alarms and events are installed and prioritized according to Owner. Demonstrate that time delays and other logic are set up to avoid nuisance tripping. Show that operators with sufficient privileges are permitted.
6) Schedule Lists: Schedules are configured for start and stop, mode change, occupant overrides, and night setback as defined in sequence of operations.
7) Schedule Display and Modification: Ability to display any schedule with start and stop times for calendar year. Show that all calendar entries and schedules are modifiable from any connected operator workstation by an operator with sufficient privilege.
8) Archival Storage of Data: Data archiving is handled by operator workstation and server and local trend archiving and display is accomplished.
9) Modification of Trend Log Object Parameters: Operator with sufficient privilege can change logged data points, sampling rate, and trend duration.
10) Device and Network Management:

a) Display of network device status.
b) Display of BACnet Object Information.
c) Silencing devices transmitting erroneous data.
d) Time synchronization.
e) Remote device re-initialization.
f) Backup and restore network device programming and master database(s).
g) Configuration management of routers.

3.19 EXTENDED OPERATION TEST

A. Extended operation test is intended to simulate normal operation of DDC system by Owner.

B. Operate DDC system for an operating period of 28 consecutive calendar days following Substantial Completion. Coordinate exact start date of testing with Owner.

C. During operating period, DDC system shall demonstrate correct operation and accuracy of monitored and controlled points as well as operation capabilities of sequences, logs, trends, reports, specialized control algorithms, diagnostics, and other software indicated.

1. Correct defects of hardware and software when it occurs.

D. Definition of Failures and Downtime during Operating Period:

1. Failed I/O point constituting downtime is an I/O point failing to perform its intended function consistently and a point physically failed due to hardware and software.
2. Downtime is when any I/O point in DDC system is unable to fulfill its' required function.
3. Downtime shall be calculated as elapsed time between a detected point failure as confirmed by an operator and time point is restored to service.
4. Maximum time interval allowed between DDC system detection of failure occurrence and operator confirmation shall be 0.5 hours.
5. Downtime shall be logged in hours to nearest 0.1 hour.
6. Power outages shall not count as downtime, but shall suspend test hours unless systems are provided with UPS and served through a backup power source.
7. Hardware or software failures caused by power outages shall count as downtime.

E. During operating period, log downtime and operational problems are encountered.

1. Identify source of problem.
2. Provide written description of corrective action taken.
3. Record duration of downtime.
4. Maintain log showing the following:

a. Time of occurrence.
b. Description of each occurrence and pertinent written comments for reviewer to understand scope and extent of occurrence.
c. Downtime for each failed I/O point.
d. Running total of downtime and total time of I/O point after each problem has been restored.

5. Log shall be available to Owner for review at any time.

F. For DDC system to pass extended operation test, total downtime shall not exceed 1 percent of total point-hours during operating period.

1. Failure to comply with minimum requirements of passing at end of operating period indicated shall require that operating period be extended one consecutive day at a time until DDC system passes requirement.

G. Evaluation of DDC system passing test shall be based on the following calculation:

1. Downtime shall be counted on a point-hour basis where total number of DDC system point-hours is equal to total number of I/O points in DDC system multiplied by total number of hours during operating period.
2. One point-hour of downtime is one I/O point down for one hour. Three points down for five hours is a total of 15 point-hours of downtime. Four points down for one-half hour is 2 point-hours of downtime.
3. Example Calculation: Maximum allowable downtime for 30-day test when DDC system has 1000 total I/O points (combined analog and binary) and has passing score of 1 percent downtime is computed by 30 days x 24 h/day x 1000 points x 1 percent equals 7200 point-hours of maximum allowable downtime.

H. Prepare test and inspection reports.

3.20 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.21 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include three months' full maintenance by DDC system manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, cleaning, calibration and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.22 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for one year(s).

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two year(s) from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 30 days to allow Owner to schedule and access system and to upgrade computer equipment if necessary.

C. Comply with requirements of Quality Assurance in Section 3.24.

3.23 DEMONSTRATION

A. Engage a factory-authorized service representative with complete knowledge of Project-specific system installed to train Owner's maintenance personnel to adjust, operate, and maintain DDC system.

B. Extent of Training:

1. Base extent of training on scope and complexity of DDC system indicated and training requirements indicated. Provide extent of training required to satisfy requirements indicated even if more than minimum training requirements are indicated.
2. Inform Owner of anticipated training requirements if more than minimum training requirements are indicated.
3. Minimum Training Requirements:

    a. Provide not less than 10 days of training total.
    b. Stagger training over multiple training classes to accommodate Owner's requirements. All training shall occur before end of warranty period.
    c. Total days of training shall be broken into not more than four separate training classes.
    d. Each training class shall be not less than one consecutive day(s).

C. Training Schedule:

1. Schedule training with Owner 20 business days before expected Substantial Completion.
2. Schedule training to provide Owner with at least 20 business days of notice in advance of training.
3. Training shall occur within normal business hours at a mutually agreed on time. Unless otherwise agreed to, training shall occur Monday through Friday, except on U.S. Federal holidays, with two morning sessions and two afternoon sessions. Each morning session and afternoon session shall be split in half with 15-minute break between sessions. Morning and afternoon sessions shall be separated by 60-minute lunch period. Training, including breaks and excluding lunch period, shall not exceed eight hours per day.
4. Provide staggered training schedule as requested by Owner.

D. Training Attendee List and Sign-in Sheet:

1. Request from Owner in advance of training a proposed attendee list with name, phone number and e-mail address.
2. Provide a preprinted sign-in sheet for each training session with proposed attendees listed and no fewer than six blank spaces to add additional attendees.
3. Preprinted sign-in sheet shall include training session number, date and time, instructor name, phone number and e-mail address, and brief description of content to be covered during session. List attendees with columns for name, phone number, e-mail address and a column for attendee signature or initials.
4. Circulate sign-in sheet at beginning of each session and solicit attendees to sign or initial in applicable location.
5. At end of each training day, send Owner an e-mail with an attachment of scanned copy (PDF) of circulated sign-in sheet for each session.

E. Training Attendee Headcount:

1. Plan in advance of training for five attendees.
2. Make allowance for Owner to add up to two attendee(s) at time of training.
3. Headcount may vary depending on training content covered in session. Attendee access may be restricted to some training content for purposes of maintaining system security.

F. Training Attendee Prior Knowledge: For guidance in planning required training and instruction, assume attendees have the following:

1. High school education.
2. Intermediate user knowledge of computers and office applications.
3. Intermediate knowledge of HVAC systems.
4. Intermediate knowledge of DDC systems.
5. Basic knowledge of DDC system and products installed.

G. Attendee Training Manuals:

1. Provide each attendee with a color hard copy of all training materials and visual presentations.
2. Hard-copy materials shall be organized in a three-ring binder with table of contents and individual divider tabs marked for each logical grouping of subject matter. Organize material to provide space for attendees to take handwritten notes within training manuals.
3. In addition to hard-copy materials included in training manual, provide each binder with a sleeve or pocket that includes a DVD or flash drive with PDF copy of all hard-copy materials.

H. Instructor Requirements:

1. One or multiple qualified instructors, as required, to provide training.
2. Instructors shall have not less than five years of providing instructional training on not less than five past projects with similar DDC system scope and complexity to DDC system installed.

I. Organization of Training Sessions:

1. Organize training sessions into logical groupings of technical content and to reflect different levels of operators having access to system. Plan training sessions to accommodate the following three levels of operators:

    a. Daily operators.
    b. Advanced operators.
    c. System managers and administrators.

2. Plan and organize training sessions to group training content to protect DDC system security. Some attendees may be restricted to some training sessions that cover restricted content for purposes of maintaining DDC system security.

J. Training Outline:

1. Submit training outline for Owner review at least 10 business day before scheduling training.
2. Outline shall include a detailed agenda for each training day that is broken down into each of four training sessions that day, training objectives for each training session and synopses for each lesson planned.

K. On-Site Training:

1. Owner will provide conditioned classroom or workspace with ample desks or tables, chairs, power and data connectivity for instructor and each attendee.
2. Instructor shall provide training materials, projector and other audiovisual equipment used in training.
3. Provide as much of training located on-site as deemed feasible and practical by Owner.
4. On-site training shall include regular walk-through tours, as required, to observe each unique product type installed with hands-on review of operation, calibration and service requirements.
5. Operator workstation provided with DDC system shall be used in training. If operator workstation is not indicated, provide a temporary workstation to convey training content.

L. Training Content for Daily Operators:

1. Basic operation of system.
2. Understanding DDC system architecture and configuration.
3. Understanding each unique product type installed including performance and service requirements for each.
4. Understanding operation of each system and equipment controlled by DDC system including sequences of operation, each unique control algorithm and each unique optimization routine.
5. Operating operator workstations, printers and other peripherals.
6. Logging on and off system.
7. Accessing graphics, reports and alarms.
8. Adjusting and changing set points and time schedules.
9. Recognizing DDC system malfunctions.
10. Understanding content of operation and maintenance manuals including control drawings.
11. Understanding physical location and placement of DDC controllers and I/O hardware.
12. Accessing data from DDC controllers.
13. Operating portable operator workstations.
14. Review of DDC testing results to establish basic understanding of DDC system operating performance and HVAC system limitations as of Substantial Completion.
15. Running each specified report and log.
16. Displaying and demonstrating each data entry to show Project-specific customizing capability. Demonstrating parameter changes.
17. Stepping through graphics penetration tree, displaying all graphics, demonstrating dynamic updating, and direct access to graphics.
18. Executing digital and analog commands in graphic mode.
19. Demonstrating control loop precision and stability via trend logs of I/O for not less than 10 percent of I/O installed.
20. Demonstrating DDC system performance through trend logs and command tracing.
21. Demonstrating scan, update, and alarm responsiveness.

22. Demonstrating spreadsheet and curve plot software, and its integration with database.
23. Demonstrating on-line user guide, and help function and mail facility.
24. Demonstrating multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
25. Demonstrating the following for HVAC systems and equipment controlled by DDC system:

    a. Operation of HVAC equipment in normal-off, -on and failed conditions while observing individual equipment, dampers and valves for correct position under each condition.
    b. For HVAC equipment with factory-installed software, show that integration into DDC system is able to communicate with DDC controllers or gateways, as applicable.
    c. Using graphed trends, show that sequence of operation is executed in correct manner, and HVAC systems operate properly through complete sequence of operation including seasonal change, occupied and unoccupied modes, warm-up and cool-down cycles and other modes of operation indicated.
    d. Hardware interlocks and safeties function properly and DDC system performs correct sequence of operation after electrical power interruption and resumption after power is restored.
    e. Reporting of alarm conditions for each alarm, and confirm that alarms are received at assigned locations, including operator workstations.
    f. Each control loop responds to set point adjustment and stabilizes within time period indicated.
    g. Sharing of previously graphed trends of all control loops to demonstrate that each control loop is stable and set points are being maintained.

M. Training Content for Advanced Operators:

1. Making and changing workstation graphics.
2. Creating, deleting and modifying alarms including annunciation and routing.
3. Creating, deleting and modifying point trend logs including graphing and printing on an ad-hoc basis and operator-defined time intervals.
4. Creating, deleting and modifying reports.
5. Creating, deleting and modifying points.
6. Creating, deleting and modifying programming including ability to edit control programs off-line.
7. Creating, deleting and modifying system graphics and other types of displays.
8. Adding DDC controllers and other network communication devices such as gateways and routers.
9. Adding operator workstations.
10. Performing DDC system checkout and diagnostic procedures.
11. Performing DDC controllers operation and maintenance procedures.
12. Performing operator workstation operation and maintenance procedures.
13. Configuring DDC system hardware including controllers, workstations, communication devices and I/O points.
14. Maintaining, calibrating, troubleshooting, diagnosing and repairing hardware.
15. Adjusting, calibrating and replacing DDC system components.

N. Training Content for System Managers and Administrators:

1. DDC system software maintenance and backups.
2. Uploading, downloading and off-line archiving of all DDC system software and databases.
3. Interface with Project-specific, third-party operator software.
4. Understanding password and security procedures.
5. Adding new operators and making modifications to existing operators.
6. Operator password assignments and modification.
7. Operator authority assignment and modification.
8. Workstation data segregation and modification.

O. Video of Training Sessions:

1. Provide a digital video and audio recording of each training session. Create a separate recording file for each session.
2. Stamp each recording file with training session number, session name and date.
3. Provide Owner with two copies of digital files on DVDs or flash drives for later reference and for use in future training.
4. Owner retains right to make additional copies for intended training purposes without having to pay royalties.

3.24 **QUALITY ASSURANCE**

A. Contractor shall be responsible for the complete installation of a fully functional building management system (BMS) that meets the design intent and the Owner's project requirements, which responsibility includes ensuring a viable strategy to fully support the BMS system functionality for a minimum 10-year period from the date of system submittal approval.

B. The systems, platforms, and all controllers and associated technologies are to be the latest up-to-date available at the time of system submittal approval. The selected firm shall provide a commitment in writing from the manufacturer guaranteeing support and availability of components. software, technical expertise and other appurtenances to ensure BMS system operability for a period of at least ten (10) years from the date of system submittal approval. The written commitment shall be issued on company letterhead by a corporate officer/employee of the BMS vendor who is duly authorized to bind the company to this commitment and of the level of Regional Director or similar title. This written commitment shall be provided as part of the submittal process, prior to the start of any BMS installation work.

C. BMS Upgrades: Costs for software and firmware upgrades subsequent to system submittal approval shall be the responsibility of the Owner and require prior written approval before any such upgrade implementation. Any required hardware upgrades and associated labor for such hardware upgrades that are necessary due to software or firmware upgrades during this period (10 years) are to be provided at no cost to the Owner. When work is done to accommodate software/firmware upgrades, the Contractor shall ensure complete BMS functionality per the original design intent, including hardware integration and functionality testing. Upgrades are entirely new products which supersede old products.

D. BMS Updates: All factory or sub-vendor updates to BMS software, firmware and/or hardware shall be added to the systems when they become available at no cost to Owner, unless otherwise directed by Owner. Such updates shall not render any portion of the BMS obsolete or non-functional as compared to the original approved installation and design intent. Updates are gen-

erally small and often frequent improvements which build upon existing systems. Updates are not entirely new products.

E. Any software or firmware updates and upgrades provided by the manufacturer must be backward-compatible with all installed hardware.

F. Reports: Where the Contractor provides updates or upgrades, the Contractor shall then furnish a report describing the scope of work performed, the justification for the update or upgrade, and clearly certify all software, firmware, and hardware are functioning correctly post installation.

G. DASNY has sole discretion to reasonably determine whether a proposed alteration or modification is an update or an upgrade.

H. The Contractor shall have a full service BMS service office within 200 miles of the Project Site unless otherwise directed by Owner. This office shall be staffed with applications engineers, software engineers and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support the BMS Work, as well as staff trained in the use of the BMS equipment.

END OF SECTION 230923

SECTION 230923.11 - CONTROL VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes control valves and actuators for DDC systems.

B. Related Requirements:

1. Section 230923 "Direct Digital Control (DDC) System for HVAC" control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993.11 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.11.

1.3 DEFINITIONS

A. Cv: Design valve coefficient.

B. DDC: Direct-digital control.

C. NBR: Nitrile butadiene rubber.

D. PTFE: Polytetrafluoroethylene

E. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.

3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation, operation, and maintenance instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal:

1. Schedule and design calculations for control valves and actuators, including the following:

a. Flow at project design and minimum flow conditions.
b. Pressure differential drop across valve at project design flow condition.
c. Maximum system pressure differential drop (pump close-off pressure) across valve at project minimum flow condition.
d. Design and minimum control valve coefficient with corresponding valve position.
e. Maximum close-off pressure.
f. Leakage flow at maximum system pressure differential.
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Control valve installation location shown in relationship to room, duct, pipe, and equipment.
2. Size and location of wall access panels for control valves installed behind walls.
3. Size and location of ceiling access panels for control valves installed above inaccessible ceilings.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control valve actuators served from a backup power source.

F. Environmental Conditions:

1. Provide electric control valve actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control valve actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

    a. Hazardous Locations: Explosion-proof rating for condition.

G. Determine control valve sizes and flow coefficients by ISA 75.01.01.

H. Control valve characteristics and rangeability shall comply with ISA 75.11.01.

I. Selection Criteria:

1. Control valves shall be suitable for operation at following conditions:

    a. Chilled Water
    b. Heating Hot Water:
    c. LP Steam: 249.8 degrees (15 psig)
    d. HP Steam Greater than 15 psig (250 degrees).

2. Valve pattern, three-way or straight through, shall be as indicated on Drawings.
3. Modulating straight-through pattern control valves shall have equal percentage flow-throttling characteristics unless otherwise indicated.
4. Modulating three-way pattern water valves shall have linear flow-throttling characteristics. The total flow through the valve shall remain constant regardless of the valve's position.
5. Modulating butterfly valves shall have linear flow-throttling characteristics.
6. Fail positions unless otherwise indicated:

a. Chilled Water: Close.
b. Heating Hot Water: Open.
c. Steam: Open.

7. Globe-type control valves shall pass the design flow required with not more than 95 percent of stem lift unless otherwise indicated.
8. Selection shall consider viscosity, flashing, and cavitation corrections.
9. Valves shall have stable operation throughout full range of operation, from design to minimum Cv.
10. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
11. In water systems, select modulating control valves at terminal equipment for a design Cv based on a pressure drop of 5 psig at design flow unless otherwise indicated.
12. Modulating valve sizes for steam service shall provide a pressure drop at design flow equal to lesser of the following:

    a. 50 percent of the valve inlet pressure.

13. In water systems, use ball- or globe-style control valves for two-position control for valves NPS 2 and smaller and butterfly style for valves larger than NPS 2.

2.2 GLOBE-STYLE CONTROL VALVES

A. General Globe-Style Valve Requirements:

1. Globe-style control valve body dimensions shall comply with ISA 75.08.01.
2. Construct the valves to be serviceable from the top.
3. For cage guided valves, trim shall be field interchangeable for different valve flow characteristics, such as equal percentage, linear, and quick opening.
4. Reduced trim for one nominal size smaller shall be available for industrial valves NPS 1 and larger.
5. Replaceable seats and plugs.
6. Furnish each control valve with a corrosion-resistant nameplate indicating the following:

    a. Manufacturer's name, model number, and serial number.
    b. Body and trim size.
    c. Arrow indicating direction of flow.

B. Two-Way Globe Valves NPS 2 and Smaller:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

    a. Johnson Controls, Inc (Basis of Design).

2. Globe Style: Single port.
3. Body: Cast bronze or forged brass with ASME B16.5, Class 250 rating.

4. End Connections: Threaded.
5. Bonnet: Screwed.
6. Packing: PTFE V-ring.
7. Plug: Top guided.
8. Plug, Seat, and Stem: Brass or stainless steel.
9. Process Temperature Range: 35 to 248 deg F.
10. Ambient Operating Temperature: 35 to 150 deg F.
11. Leakage: FCI 70-2, Class IV.
12. Rangeability: 25 to 1.
13. Equal percentage flow characteristic.

C. Two-Way Globe Valves NPS 2-1/2 to NPS 6:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

   a. Johnson Controls, Inc (Basis of Design).

2. Globe Style: Single port.
3. Body: Cast iron complying with ASME B61.1, Class 125.
4. End Connections: Flanged, suitable for mating to ASME B16.5, Class 150 flanges.
5. Bonnet: Bolted.
6. Packing: PTFE cone-ring.
7. Plug: Top or bottom guided.
8. Plug, Seat, and Stem: Brass or stainless steel.
9. Process Temperature Rating: 35 to 281 deg F.
10. Leakage: 0.1 percent of maximum flow.
11. Rangeability: Varies with valve size between 6 and 10 to 1.
12. Modified linear flow characteristic.

2.3 ELECTRIC AND ELECTRONIC CONTROL VALVE ACTUATORS

A. Actuators for Hydronic Control Valves: Capable of closing valve against system pump shutoff head.

B. Actuators for Steam Control Valves: Shutoff against 1.5 times steam design pressure.

C. Position indicator and graduated scale on each actuator.

D. Type: Motor operated, with or without gears, electric and electronic.

E. Voltage: Voltage selection delegated to professional designing control system

F. Deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

G. Function properly within a range of 85 to 120 percent of nameplate voltage.

H. Construction:

1. For Actuators Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. For Actuators from 100 to 400 W: Gears ground steel, oil immersed, shaft hardened steel running in bronze, copper alloy or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel or cast-aluminum housing.
3. For Actuators Larger Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

I. Field Adjustment:

1. Spring Return Actuators: Easily switchable from fail open to fail closed in the field without replacement.

J. Position Feedback:

1. Where indicated, equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring.
2. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

K. Fail-Safe:

1. Provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

L. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

M. Valve Attachment:

1. Unless otherwise required for valve interface, provide an actuator designed to be directly coupled to valve shaft without the need for connecting linkages.
2. Attach actuator to valve drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

N. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.

2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

O. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with heater and control where required by application.

P. Stroke Time:

1. Operate valve from fully closed to fully open within 60 seconds.
2. Operate valve from fully open to fully closed within 60 seconds.
3. Move valve to failed position within 30 seconds.
4. Select operating speed to be compatible with equipment and system operation.

Q. Sound:

1. Spring Return: 62 dBA maximum.
2. Non-Spring Return: 45 dBA maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for valves installed in piping to verify actual locations of piping connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONTROL VALVE APPLICATIONS

A. Control Valves:

1. Select from valves specified in "Control Valves" Article to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

3.3 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Properly support instruments, tubing, piping, wiring, and conduits to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a code specified force.

D. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

E. Firestop penetrations made in fire-rated assemblies and seal penetrations made in acoustically rated assemblies.

F. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

G. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

H. Corrosive Environments:

1. Use products that are suitable for environment to which they will be subjected.
2. If possible, avoid or limit use of materials in corrosive environments, including. but not limited to, the following:

    a. Laboratory exhaust airstreams.
    b. Process exhaust airstreams.

3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
5. Where control devices are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 CONTROL VALVES

A. Install pipe reducers for valves smaller than line size. Position reducers as close to valve as possible but at distance to avoid interference and impact to performance. Install with manufacturer-recommended clearance.

B. Install flanges or unions to allow drop-in and -out valve installation.

C. Where indicated, install control valve with three-valve bypass manifold to allow for control valve isolation and removal without interrupting system flow by providing manual throttling valve in bypass pipe.

D. Install drain valves in piping upstream and downstream of each control valve installed in a three-valve manifold and for each control valve larger than NPS 2.

E. Valve Orientation:

1. Where possible, install globe and ball valves installed in horizontal piping with stems upright and not more than 15 degrees off of vertical, not inverted.
2. Install valves in a position to allow full stem movement.
3. Where possible, install butterfly valves that are installed in horizontal piping with stems in horizontal position and with low point of disc opening with direction of flow.

F. Clearance:

1. Locate valves for easy access and provide separate support of valves that cannot be handled by service personnel without hoisting mechanism.
2. Install valves with at least 12 inches of clear space around valve and between valves and adjacent surfaces.

G. Threaded Valves:

1. Note internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
2. Align threads at point of assembly.
3. Apply thread compound to external pipe threads, except where dry seal threading is specified.
4. Assemble joint, wrench tight. Apply wrench on valve end as pipe is being threaded.

H. Flanged Valves:

1. Align flange surfaces parallel.
2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

3.6 CONNECTIONS

A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with valve identification on valve and on face of ceiling directly below valves concealed above ceilings.

3.8 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.9 CHECKOUT PROCEDURES

A. Control Valve Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check valves for proper location and accessibility.
3. Check valves for proper installation for direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. Verify that control valves are installed correctly for flow direction.
5. Verify that valve body attachment is properly secured and sealed.
6. Verify that valve actuator and linkage attachment are secure.
7. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
8. Verify that valve ball, disc, and plug travel are unobstructed.
9. After piping systems have been tested and put into service, but before insulating and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks. Replace the valve if leaks persist.

3.10 ADJUSTMENT, CALIBRATION, AND TESTING

A. Stroke and adjust control valves following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control valves with pilot positioners. Adjust valve and positioner following manufacturer's recommended procedure, so valve is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressures.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control valves equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.11

SECTION 230923.12 - CONTROL DAMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes the following types of control dampers and actuators for DDC systems:

1. Rectangular control dampers.
2. Round control dampers.
3. General control-damper actuator requirements.
4. Electric and electronic actuators.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.12.

1.3 DEFINITIONS

A. DDC: Direct-digital control.

B. RMS: Root-mean-square value of alternating voltage, which is the square root of the mean value of the square of the voltage values during a complete cycle.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.

3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include diagrams for air and process signal tubing.
5. Include diagrams for pneumatic signal and main air tubing.

C. Delegated-Design Submittal:

1. Schedule and design calculations for control dampers and actuators, including the following.

a. Flow at project design and minimum flow conditions.
b. Face velocity at project design and minimum airflow conditions.
c. Pressure drop across damper at project design and minimum airflow conditions.
d. AMCA 500D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
e. Maximum close-off pressure.
f. Leakage airflow at maximum system pressure differential (fan close-off pressure).
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Product installation location shown in relationship to room, duct, and equipment.
2. Size and location of wall access panels for control dampers and actuators installed behind walls.
3. Size and location of ceiling access panels for control dampers and actuators installed above inaccessible ceilings.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For control dampers to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASME Compliance: Fabricate and label products to comply with ASME Boiler and Pressure Vessel Code where required by authorities having jurisdiction.

C. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

D. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

E. Backup Power Source: Systems and equipment served by a backup power source shall have associated control damper actuators served from a backup power source.

F. Environmental Conditions:

1. Provide electric control-damper actuators, with protective enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Electric control-damper actuators not available with integral enclosures, complying with requirements indicated, shall be housed in protective secondary enclosures.

G. Provide insulation stand-off bracket for actuator mounting.

H. Selection Criteria:

1. Fail positions unless otherwise indicated:

a. Supply Air: Open.
b. Return Air: Open.
c. Outdoor Air: Close.
d. Mixed Air: Open.
e. Exhaust Air: Close.

2. Dampers shall have stable operation throughout full range of operation, from design to minimum airflow over varying pressures and temperatures encountered.
3. Select modulating dampers for a pressure drop of 2 percent of fan total static pressure unless otherwise indicated.
4. Two-position dampers shall be full size of duct or equipment connection unless otherwise indicated.

2.2 RECTANGULAR CONTROL DAMPERS

A. General Requirements:

1. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.
2. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.
3. Damper actuator shall be factory installed by damper manufacturer as integral part of damper assembly. Coordinate actuator location and mounting requirements with damper manufacturer.

B. Rectangular Dampers with Aluminum Airfoil Blades (For applications within 10 feet of exterior openings):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

    a. Ruskin Company (Basis of Design)

2. Performance:

    a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
    b. Pressure Drop: 0.05-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
    c. Velocity: Up to 6000 fpm.
    d. Temperature: Minus 40 to plus 185 deg F.
    e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
    f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

    a. Frame:

        1) Material: ASTM B211, Alloy 6063 T5 extruded-aluminum profiles, 0.07 inch thick.
        2) Hat-shaped channel with integral flange(s). Mating face shall be a minimum of 1 inch.
        3) Width not less than 5 inches.

    b. Blades:

        1) Hollow, airfoil, extruded aluminum.
        2) Parallel or opposed blade configuration as required by application.
        3) Material: ASTM B211, Alloy 6063 T5 aluminum, 0.07 inch thick.
        4) Width not to exceed 6 inches.
        5) Length as required by close-off pressure, not to exceed 48 inches.

    c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter stainless steel, mechanically attached to blades.
e. Bearings:

1) Molded synthetic or stainless-steel sleeve mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch thick.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

C. Rectangular Dampers with Steel Airfoil Blades (For all dampers not within 10 feet of exterior openings):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Ruskin Company (Basis of Design)

2. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.06-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.

d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM A653/A653M galvanized-steel profiles, 0.06 inch thick.
2) Hat-shaped channel with integral flanges. Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, galvanized steel.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM A653/A653M galvanized steel, 0.05 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter stainless steel, mechanically attached to blades.
e. Bearings:

1) Stainless steel mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide epoxy finish for surfaces in contact with airstream.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

2.3 ROUND CONTROL DAMPERS

A. Round Dampers, Sleeve Type:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Ruskin Company (Basis of Design)

2. Performance:

a. Leakage: Leakage shall not exceed 0.15 cfm/in. of perimeter blade at 4-in. wg differential static pressure.
b. Pressure Drop: 0.02-in. wg at 1500 fpm across a 12-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 4000 fpm.
d. Temperature: Minus 25 to plus 200 deg F.
e. Pressure Rating: 8-in. wg for sizes through 12 inches, 6-in. wg for larger sizes.

3. Construction:

a. Frame:

1) Material: Galvanized steel, 0.04 in thick.
2) Outward rolled stiffener beads positioned approximately 1 inch inboard of each end.
3) Sleeve-type connection for mating to adjacent ductwork.
4) Size Range: 4 to 24 inches.
5) Length not less than 7 inches.
6) Provide 2-inch sheet metal stand-off for mounting actuator.

b. Blade: Double-thickness circular flat blades sandwiched together and constructed of galvanized steel.
c. Blade Seal: Polyethylene foam seal sandwiched between two sides of blades and fully encompassing blade edge.
d. Axle: 0.5-inch-diameter stainless steel, mechanically attached to blade.
e. Bearings: Stainless-steel sleeve pressed into frame.

B. Round Dampers, Flanged Type:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

    a. Ruskin Company (Basis of Design)

2. Performance:

    a. Leakage: Leakage shall not exceed 0.15 cfm/in. of perimeter blade at 4-in. wg differential static pressure.
    b. Pressure Drop: 0.03-in. wg at 1500 fpm across a 12-inch damper when tested according to AMCA 500-D, figure 5.3.
    c. Velocity: Up to 4000 fpm.
    d. Temperature: Minus 25 to plus 250 deg F.
    e. Pressure Rating: 8-in. wg for sizes through 36 inches in diameter, 6-in. wg for larger sizes.

3. Construction:

    a. Frame:

        1) Size Range: 4 to 60 inches.
        2) Material: Galvanized steel.

            a) Sizes through 24 Inches in Diameter: 0.15 inch thick.
            b) Sizes 26 through 48 Inches in Diameter: 0.25 inch thick.
            c) Larger Sizes: 0.31 inch thick.

        3) Flanges:

            a) Outward rolled with bolt holes on each end of frame for mating to adjacent ductwork.
            b) Face: Not less than 1.25 inch for damper sizes through 12 inches in diameter, 1.5 inch for damper sizes 14 through 24 inches in diameter, and 2 inches for larger sizes.

        4) Length (Flange Face to Face): Not less than 8 inches.
        5) Provide 3-inch sheet metal stand-off for mounting actuator.

    b. Blade: Reinforced circular flat blade constructed of galvanized steel.

        1) Sizes through 24 Inches: 0.15 inch thick.
        2) Sizes 26 through 48 Inches: 0.19 inch thick.
        3) Larger Sizes: 0.25 inch thick.

    c. Blade Stop: Full circumference, located in airstream, minimum 0.5 by 0.25 inch stainless- steel bar.
    d. Blade Seal: Neoprene, mechanically attached to blade and fully encompassing blade edge.
    e. Axle: stainless steel, mechanically attached to blade.

1) Sizes through 14 Inches: 0.5 inch in diameter.
2) Sizes 16 through 42 Inches: 0.75 inch in diameter.
3) Larger Sizes: 1 inch in diameter.

f. Bearings: Stainless-steel sleeve pressed into frame.

2.4 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

A. Actuators shall operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.

B. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the fan shutoff pressure as a minimum requirement.

C. The total damper area operated by an actuator shall not exceed 80 percent of manufacturer's maximum area rating.

D. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison.

E. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.

F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.

G. Provide mounting hardware and linkages for connecting actuator to damper.

H. Select actuators to fail in desired position in the event of a power failure.

I. Actuator Fail Positions: As indicated below:

1. Exhaust Air: Close.
2. Outdoor Air: Close.
3. Supply Air: Open.
4. Return Air: Open.

2.5 ELECTRIC AND ELECTRONIC ACTUATORS

A. Type: Motor operated, with or without gears, electric and electronic.

B. Voltage:

1. 24 V.
2. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.

3. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.

C. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

D. Field Adjustment:

1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
2. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

E. Two-Position Actuators: Single direction, spring return or reversing type.

F. Modulating Actuators:

1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for 2- to 10-V dc or 4- to 20-mA signals.
c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to a pulse duration (length) of signal from a dry-contact closure, triac sink or source controller.
d. Programmable Multi-Function:

1) Control input, position feedback, and running time shall be factory or field programmable.
2) Diagnostic feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
3) Service data, including at a minimum, number of hours powered and number of hours in motion.

G. Position Feedback:

1. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.

2. Equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

H. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

I. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

J. Damper Attachment:

1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

K. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

L. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with a heater and controller where required by application.

M. Stroke Time:

1. Operate damper from fully closed to fully open within 90 seconds.
2. Operate damper from fully open to fully closed within 90 seconds.
3. Move damper to failed position within 15 seconds.
4. Select operating speed to be compatible with equipment and system operation.
5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.

N. Sound:

1. Spring Return: 62 dBA maximum.
2. Non-Spring Return: 45 dBA maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for dampers and instruments installed in duct systems to verify actual locations of connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a force.

C. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

D. Seal penetrations made in fire-rated and acoustically rated assemblies.

E. Fastening Hardware:

1. Stillson wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

3.3 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 CONTROL DAMPERS

A. Install smooth transitions, not exceeding 30 degrees, to dampers smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.

B. Clearance:

1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
2. Install dampers with at least 24 inches of clear space on sides of dampers requiring service access.

C. Service Access:

1. Dampers and actuators shall be accessible for visual inspection and service.
2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."

D. Install dampers straight and true, level in all planes, and square in all dimensions. Install supplementary structural steel reinforcement for large multiple-section dampers if factory support alone cannot handle loading.

E. Attach actuator(s) to damper drive shaft.

F. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

3.5 CONNECTIONS

A. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with damper identification on damper.

3.7 CHECKOUT PROCEDURES

A. Control-Damper Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check dampers for proper location and accessibility.
3. Verify that control dampers are installed correctly for flow direction.
4. Verify that proper blade alignment, either parallel or opposed, has been provided.
5. Verify that damper frame attachment is properly secured and sealed.
6. Verify that damper actuator and linkage attachment are secure.
7. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
8. Verify that damper blade travel is unobstructed.

3.8 ADJUSTMENT, CALIBRATION, AND TESTING:

A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Stroke control dampers with pilot positioners. Adjust damper and positioner following manufacturer's recommended procedure, so damper is 100 percent closed, 50 percent closed, and 100 percent open at proper air pressure.

C. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

D. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.12

SECTION 230923.14 - FLOW INSTRUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Airflow transmitters.
2. Liquid flow switches.
3. Liquid flow transmitters.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.14.

1.3 DEFINITIONS

A. Ethernet: Local area network based on IEEE 802.3 standards.

B. FEP: Fluorinated ethylene propylene.

C. HART: Highway addressable remote transducer protocol is the global standard for sending and receiving digital information across analog wires between smart devices and control or monitoring systems through bi-directional communication that provides data access between intelligent field instruments and host systems. A host can be any software application from technician's hand-held device or laptop to a plant's process control, asset management, safety, or other system using any control platform.

D. PEEK: Polyetheretherketone.

E. PTFE: Polytetrafluoroethylene.

F. PPS: Polyphenylene sulfide.

G. RS-485: A TIA standard for multipoint communications using two twisted pairs.

H. RTD: Resistance temperature detector.

I. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics; electrical characteristics; and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation instructions, including factors affecting performance.
5. Product certificates.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include diagrams for air and process signal tubing.
5. Number-coded identification system for unique identification of wiring, cable, and tubing ends.

C. Delegated-Design Submittal:

1. Schedule and design calculations for flow instruments, including the following.

    a. Flow at Project design and minimum flow conditions.
    b. Pressure drop at Project design and minimum flow conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each product requiring a certificate.

B. Product Test Reports: For each product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For instruments to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Provide parts, as indicated by manufacturer's recommended parts list, for product operation during one-year period following warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Select and size products to achieve specified performance requirements.

B. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 GENERAL REQUIREMENTS FOR FLOW INSTRUMENTS

A. Air sensors and transmitters shall have an extended range of 10 percent above Project design flow and 10 percent below minimum Project flow to signal abnormal flow conditions and to provide flexibility for changes in operation.

B. Liquid and steam sensors, meters, and transmitters shall have an extended range of 10 percent above Project design flow and 10 percent below Project minimum flow to signal abnormal flow conditions and to provide flexibility for changes in operation.

2.3 LIQUID FLOW SWITCHES

A. Liquid Flow Switch (Magnetic Type):

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. W.E. Anderson; Dwyer Instruments, Inc.

2. Description:

a. Field-adjustable five-vane combinations.
b. Suitable for pipe sizes NPS 1-1/2 through NPS 20.

c. Mounting Suitable for Application: Switch vertically mounted in horizontal pipe, or switch horizontally mounted in vertical pipe with flow up.
d. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for hazardous-environment Class I, Groups C and D; Class II, Groups E, F, and G.

3. Performance:

a. Flow Rate Actuation and De-actuation: Varies with vane combination.
b. Pressure Limit: 1000 psig for brass body, 2000 psig for Type 316 stainless steel body.
c. Temperature Range: Minus 4 to plus 275 deg F.
d. Electrical Rating: 10 A at 125/250-V ac.
e. Switch Type: DPDT snap switch.

4. Wetted Parts Construction:

a. Vanes: Type 316 stainless steel.
b. Body: Type 316 stainless steel.
c. Magnetic Keeper: Type 316 stainless steel.
d. Process Connection: NPS 1-1/2.

5. Enclosure:

a. Die-cast aluminum alloy.
b. Threaded cover.
c. NEMA 250, Type 4.
d. Electrical Connection: Terminal block.
e. Conduit Connection:3/4-inch trade size.

B. Liquid Flow Switch (Magnetic Type) for Small-Diameter Pipe:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. W.E. Anderson; Dwyer Instruments, Inc.

2. Description:

a. Suitable for pipe sizes NPS 1/2 through NPS 2.
b. Mounting Suitable for Application: Switch vertically mounted in horizontal pipe, or switch horizontally mounted in vertical pipe with flow up.
c. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for hazardous-environment Class I, Groups A, B, C, and D; Class II, Groups E, F, and G.

3. Performance:

a. Flow Rate Actuation and De-actuation: Not adjustable.

b. Pressure Limit of Body: 1000 psig for brass, 2000 psig for Type 303 stainless steel body.
c. Pressure Limit of Tee: 250 psig for brass, 1000 psig for malleable iron, and 2000 psig for forged carbon steel and stainless steel.
d. Temperature Range: Minus 4 to plus 220 deg F.
e. Electrical Rating: 5 A at 125/250-V ac.
f. Switch Type: DPDT snap switch.

4. Wetted Parts Construction (Lower Body):

a. Vanes: Type 301 stainless steel.
b. Body: Type 303 stainless steel.
c. Magnet: Ceramic.
d. Process Connection: NPS 1/2.

5. Enclosure (Upper Body):

a. Type 303 stainless steel.
b. NEMA 250, Type 4.
c. Electrical Connection: Terminal block.
d. Conduit Connection: 3/4-inch trade size.

6. Integral Mounting Tee Furnished with Switch:

a. Stainless steel.
b. Size: Match adjacent pipe.
c. Connection: Threaded pipe.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.

C. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

D. Provide the services of an independent inspection agency to confirm that proposed mounting locations comply with requirements indicated and approved submittals.

1. Indicate dimensioned locations with mounting height for all surface-mounted products to walls and ceilings on shop drawings.
2. Do not begin installation without submittal approval of mounting location.

E. Complete installation rough-in only after confirmation by independent inspection is complete and approval of location is documented for review by Owner and Architect on request.

F. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

G. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTRUMENT APPLICATIONS

A. Select from instrument types to achieve performance requirements and characteristics indicated while subjected to full range of system operation encountered.

B. Airflow Transmitters:

1. Exhaust Air Airflow: Pressure differential transmitter for airflow measurement.
2. Outdoor Air Airflow: Pressure differential transmitter for airflow measurement.
3. Return Air Airflow: Pressure differential transmitter for airflow measurement.
4. Supply Air Airflow: Pressure differential transmitter for airflow measurement.

C. Liquid Flow Switches:

1. Hydronic System, as indicated: Magnetic type.

D. Liquid Flow Transmitters:

1. Hydronic System,: Pressure differential transmitter with 0.07 percent accuracy for flow measurement.

3.3 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy more stringent of all requirements indicated.

B. Install products level, plumb, parallel, and perpendicular with building construction.

C. Properly support instruments, tubing, piping wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a reasonable force.

D. Install ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

E. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 INSTRUMENTS, GENERAL INSTALLATION REQUIREMENTS

A. Mounting Location:

1. Rough-in: Outline instrument-mounting locations before setting instruments and routing cable, wiring, tubing, and conduit to final location.
2. Install switches and transmitters for air and liquid flow associated with individual air-handling units and connected ductwork and piping near air-handlings units co-located in air-handling unit system control panel, to provide service personnel a single and convenient location for inspection and service.
3. Install liquid and steam flow switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
4. Install airflow switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
5. Mount switches and transmitters not required to be mounted within system control panels on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.
6. Install instruments in steam, liquid, and liquid-sealed-piped services below their process connection point. Slope tubing down to instrument with a slope of 2 percent.

B. Mounting Height:

1. Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
2. Mount switches and transmitters, located in mechanical equipment rooms and other similar space not subject to code, state, and federal accessibility requirements, within a range of 42 to 72 inches above the adjacent floor, grade, or service catwalk or platform.

    a. Make every effort to mount at 60 inches.

C. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

3.6 FLOW INSTRUMENTS INSTALLATION

A. Airflow Sensors:

1. Install sensors in straight sections of duct with manufacturer-recommended straight duct upstream and downstream of sensor.
2. Installed sensors shall be accessible for visual inspection and service. Install access door(s) in duct or equipment located upstream of sensor, to allow service personnel to hand clean sensors.

B. Liquid and Steam Sensors:

1. Install sensors in straight sections of piping with manufacturer-recommended straight piping upstream and downstream of sensor.
2. Alert manufacturer where installation cannot accommodate recommended clearance, and solicit recommendations for field modifications to installation, such as flow straighteners, to improve condition.
3. Install pipe reducers for in-line sensors smaller than line size. Position reducers at distance from sensor to avoid interference and impact on accuracy.
4. Install in-line sensors with flanges or unions to provide drop-in and -out installation.

C. Liquid Switches:

1. Install system process connection full size of switch connection, but not less than NPS 1. Install stainless steel bushing if required to mate switch to system connection.
2. Install switch in top dead center of horizontal pipe positioned in an accessible location to allow for inspection and replacement.
3. In applications where top-dead-center location is not possible due to field constraints, install switch at location along top half of pipe if switch is acceptable by manufacturer for mounting orientation.

D. Transmitters:

1. Install airflow transmitters serving an air system in a single location adjacent to or within system control panel.
2. Install liquid flow transmitters, not integral to sensors, in vicinity of sensor. Where multiple flow transmitters serving same system are located in same room, co-locate transmitters by system to provide service personnel a single and convenient location for inspection and service.

3.7 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification and on face of ceiling directly below instruments concealed above ceilings.

3.8 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.9 CHECKOUT PROCEDURES

A. Description:

1. Check out installed products before continuity tests, leak tests, and calibration.
2. Check instruments for proper location and accessibility.
3. Check instruments for proper installation with respect to direction of flow, elevation, orientation, insertion depth, or other applicable considerations that will impact performance.
4. Check instrument tubing for proper isolation, fittings, slope, dirt legs, drains, material, and support.

B. Flow Instrument Checkout:

1. Verify that sensors are installed correctly with respect to flow direction.
2. Verify that sensor attachment is properly secured and sealed.
3. Verify that processing tubing attachment is secure and isolation valves have been provided.
4. Inspect instrument tag against approved submittal.
5. Verify that recommended upstream and downstream distances have been maintained.

3.10 ADJUSTMENT, CALIBRATION, AND TESTING

A. Description:

1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
3. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
4. Equipment and procedures used for calibration shall meet instrument manufacturer's recommendations.
5. Provide diagnostic and test equipment for calibration and adjustment.
6. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.

7. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
8. If after-calibration-indicated performance cannot be achieved, replace out-of-tolerance instruments.
9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

B. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistant source.

C. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact.

D. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

E. Switches: Calibrate switches to make or break contact at set points indicated.

F. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistance source.

3.11 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.12 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain instrumentation and control devices.

B. Coordinate video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.

C. Record videos on DVD disks.

D. Owner shall have right to make additional copies of video for internal use without paying royalties.

END OF SECTION 230923.14

SECTION 230923.19 - MOISTURE INSTRUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes moisture switches, sensors, and transmitters.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.19.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
2. Product description with complete technical data, performance curves, and product specification sheets.

B. Shop Drawings:

1. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.
3. Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: To include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MOISTURE SENSORS AND TRANSMITTERS

A. Combination Humidity and Temperature Sensor and Transmitter without Display:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Johnson Controls; NS8000 Series

2. Description:

a. Factory package consisting of humidity and temperature sensor, digital display, keypad user interface, installation hardware, interconnecting sensor cabling, installation instructions, and operating manual.
b. Each transmitter shall be individually calibrated and provided with NIST traceable calibration certifications.
c. Provide a service cable for connecting to a notebook computer and Microsoft Windows compatible software.

3. Electronics Enclosure:

a. Integral to sensors for wall- (room-)mounted applications and remote from temperature and humidity sensors for duct and equipment applications.
b. NEMA 250, Type 4 or 4X.
c. Labeled terminal strip for field wiring connections.
d. ?-inchtrade size threaded conduit connection.

4. Programming:

a. Transmitter parameters shall be field programmable through keypad on the face of the enclosure.
b. Programmed parameters shall be stored in nonvolatile EEPROM.

5. Output Signals:

a. Three Analog Outputs: 4 to 20 mA or zero to 10-V dc for each output.

6. Temperature Sensor:

a. Temperature range matched to application, but not less than minus 40 to 140 deg F.
b. Within 0.5 deg F accuracy over the temperature range of 50 to 100 deg F and within 1 deg F over the remainder of the range.
c. Provide duct installation kit for duct applications.

7. Humidity Sensor:

a. Relative Humidity Measurement Range: Zero to 100 percent.
b. Response time in still air within 40 seconds.
c. Accuracy including non-linearity, hysteresis, and repeatability:

1) For Temperature Between 59 and 77 Deg F and Relative Humidity between Zero and 90 Percent: Within 1 percent.
2) For Temperature between 59 and 77 Deg F and Relative Humidity between 90 and 100 Percent: Within 1.7 percent.
3) For Temperature between Minus 4 and 104 Deg F: Within 1 percent plus 0.008 times relative humidity reading.
4) For Temperature between Minus 40 and 356 Deg F: Within 1.5 percent plus 0.015 times the relative humidity reading.

d. Sintered, stainless-steel filter, protecting sensor.
e. Provide duct installation kit for duct applications.

8. Power Supply:

a. Field Power: 120-V ac, 60 Hz unless otherwise required by the application.
b. Internal Power: As required by transmitter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 MOISTURE INSTRUMENT APPLICATIONS

A. Space: Combination humidity and temperature sensor and transmitter without display.

3.3 INSTALLATION, GENERAL

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support instruments, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a reasonable force.

C. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

E. Corrosive Environments:

1. Use products that are suitable for environment to which they are subjected.
2. If possible, avoid or limit use of materials in corrosive environments.
3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where instruments are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 MOISTURE INSTRUMENTS INSTALLATION

A. Mounting Location: Rough-in instrument-mounting locations before setting instruments and routing, cable, wiring, tubing, and conduit to final location.

B. Mounting Height:

1. Mount instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.

2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code, state, and Federal accessibility requirements within a range of 42 to 72 inchesabove the adjacent floor, grade, or service catwalk or platform.

    a. Make every effort to mount at 60 inches.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification on face of ceiling directly below instruments concealed above ceilings.

3.7 CHECKOUT PROCEDURES

A. Check installed products before continuity tests and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation on direction of flow, elevation, orientation, insertion depth, or other applicable considerations that impact performance.

3.8 ADJUSTMENT, CALIBRATION, AND TESTING

A. Description:

1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
3. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
4. Equipment and procedures used for calibration shall meet instrument manufacturer's written instructions.
5. Provide diagnostic and test equipment for calibration and adjustment.
6. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
7. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
8. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.

9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

B. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistance source.

C. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact.

D. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

E. Switches: Calibrate switches to make or break contact at set points indicated.

F. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistance source.

3.9 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain instrumentation and control devices.

B. Coordinate video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.

C. Record videos on DVD disks.

D. Owner shall have right to make additional copies of video for internal use without paying royalties.

END OF SECTION 230923.19

SECTION 230923.23 - PRESSURE INSTRUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Air-pressure sensors.
2. Air-pressure switches.
3. Air-pressure transmitters.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.23.

1.3 DEFINITIONS

A. HART: Highway addressable remote transducer protocol is the global standard for sending and receiving digital information across analog wires between smart devices and control or monitoring systems through bi-directional communication that provides data access between intelligent field instruments and host systems. A host can be any software application from technician's hand-held device or laptop to a control, asset management, safety, or other system using any control platform.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics; electrical characteristics; and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.

3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Number-coded identification system for unique identification of wiring, cable, and tubing ends.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Product installation location shown in relationship to room, duct, pipe, and equipment.
2. Wall-mounted instruments located in finished space, showing relationship to light switches, fire alarm devices, and other installed devices.
3. Size and location of wall access panels for instruments installed behind walls.
4. Size and location of ceiling access panels for instruments installed in accessible ceilings.

B. Product Certificates: For each product requiring a certificate.

C. Product Test Reports: For each product requiring test performed by manufacturer and witnessed by a qualified testing agency.

D. Source quality-control reports.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For instruments to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Environmental Conditions:

1. Instruments shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.

    a. If instrument alone cannot comply with requirement, install instrument in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, filtered, and ventilated as required by instrument and application.

2. Instruments and accessories shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Instruments not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Instrument-installed location shall dictate following NEMA 250 enclosure requirements:

    a. Outdoors, Protected: Type 2.
    b. Outdoors, Unprotected: Type 4.
    c. Indoors, Heated with Filtered Ventilation: Type 1.
    d. Indoors, Heated with Nonfiltered Ventilation: Type 2.
    e. Indoors, Heated and Air-Conditioned: Type 1.
    f. Mechanical Equipment Rooms:

        1) Chiller and Boiler Rooms: Type 12.
        2) Air-Moving Equipment Rooms: Type 1.

    g. Localized Areas Exposed to Washdown: Type 4.
    h. Within Duct Systems and Air-Moving Equipment Not Exposed to Possible Condensation: Type 2
    i. Within Duct Systems and Air-Moving Equipment Exposed to Possible Condensation: Type 4.

2.2 AIR-PRESSURE SENSORS

A. Duct Insertion Static Pressure Sensor:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. MAMAC Systems, Inc

2. Sensor probe with two opposing orifices designed to reduce error-associated air velocity.
3. Sensor insertion length shall be 4 inches or 8 inches.
4. Construct sensor of Type 304 stainless steel.
5. Connection: Threaded, NPS 1/8 swivel fitting for connection to copper tubing or NPS 1/4 barbed fitting for connection to polyethylene tubing.
6. Sensor probe attached to a mounting flange with neoprene gasket and two holes for fasteners.
7. Mounting flange shall suitable for flat oval, rectangular, and round duct configurations.

8. Pressure Rating: 10 psig. Duct Insertion Static Pressure Sensor:

B. Duct Traverse Static Pressure Sensor:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Air Monitor Corporation.

2. Sensor shall traverse the duct cross section and have at least one pickup point every 6 inches along length of sensor.
3. Construct sensor of 18-gage Type T6063-T5 extruded and anodized aluminum.
4. Sensor supported with threaded rod, sealing washer, and nut at one end and a mounting plate with gasket at other end.
5. Mounting plate with threaded, NPS 3/8 compression fitting for connection to tubing.
6. Accuracy within 1 percent of actual operating static pressure.
7. Dual offset static sensor design shall provide accurate sensing of duct static pressure in the presence of turbulent and rotational airflows with a maximum 30 degree yaw and pitch.
8. Suitable for velocities of 100 to 10000 fpm and temperatures of up to 200 deg F.
9. Sensor air resistance shall be less than 0.1 times the velocity pressure at probe-operating velocity.
10. Suitable for flat oval, rectangular, and round duct configurations.

2.3 AIR-PRESSURE SWITCHES

A. Air-Pressure Differential Switch:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Dwyer Instruments, Inc.

2. Diaphragm operated to actuate an SPDT snap switch.

   a. Fan safety shutdown applications: Switch with manual reset.

3. Electrical Connections: Three-screw configuration, including one screw for common operation and two screws for field-selectable normally open or closed operation.
4. Enclosure Conduit Connection: Knock out or threaded connection.
5. User Interface: Screw-type set-point adjustment located inside removable enclosure cover.
6. High and Low Process Connections: Threaded, NPS 1/8.
7. Enclosure:

   a. Dry Indoor Installations: NEMA 250, Type 1.
   b. Outdoor and Wet Indoor Installations: NEMA 250, Type 4.

c. Hazardous Environments: Explosion proof.

8. Operating Data:

a. Electrical Rating: 15 A at 120- to 480-V ac.
b. Pressure Limits:

1) Continuous: 45 inches wg.
2) Surge: 10 psig.

c. Temperature Limits: Minus 30 to 180 deg F.
d. Operating Range: Approximately 2 times set point.
e. Repeatability: Within 3 percent.
f. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Air-Pressure Differential Switch with Set-Point Indicator:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Dwyer Instruments, Inc.

2. Diaphragm operated to actuate an SPDT snap switch.
3. Electrical Connections: Three-screw configuration, including one screw for common operation and two screws for field-selectable normally open or closed operation.
4. Enclosure Conduit Connection: Knock out or threaded connection.
5. User Interface: Screw-type set-point adjustment with enclosed set-point indicator and scale.
6. High and Low Process Connections: Threaded, NPS 1/8.
7. Enclosure:

a. Dry Indoor Installations: NEMA 250, Type 1.
b. Outdoor and Wet Indoor Installations: NEMA 250, Type 4.
c. Hazardous Environments: Explosion proof.

8. Operating Data:

a. Electrical Rating: 15 A at 120- to 480-V ac.
b. Pressure Limits:

1) Continuous: 10 psig.
2) Surge: 25 psig.

c. Temperature Limits: Minus 30 to 110 deg F.
d. Operating Range: Approximately 2 times set point.
e. Repeatability: Within 1 percent.
f. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Air-Pressure Differential Indicating Switch:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Dwyer Instruments, Inc.

2. Combination gage with low- and high-limit switches.
3. Nominal 4-inch-diameter analog indication with white dial face, graduated black markings, pointer to indicate measured value, and a separate adjustable pointer for each switch set point.
4. Switch zero and set-point adjustment screws or knobs on the dial face.
5. Each switch used as a safety limit shall have a manual reset button local to switch.
6. Switch Type: Each set point shall have two Form C relays, DPDT.
7. Electrical Connections: Screw terminals.
8. Enclosure Conduit Connection: NPS 3/4 threaded connection.
9. High and Low Process Connections: Threaded, NPS 1/8.
10. Enclosure:

    a. Dry Indoor Installations: NEMA 250, Type 1.
    b. Outdoor and Wet Indoor Installations: NEMA 250, Type 4.
    c. Hazardous Environments: Explosion proof.

11. Operating Data:

    a. Electrical Rating: 10 A at 120- to 240-V ac.
    b. Pressure Limits: 25 psig.
    c. Temperature Limits: 20 to 120 deg F.
    d. Operating Range: Approximately twice normal operating range unless otherwise required for application.
    e. Accuracy:

        1) 4 percent for ranges through 0.5 in. wg.
        2) 2 percent for ranges 1 in. wg and greater.

    f. Repeatability: Within 1 percent of full scale.
    g. Switch Deadband: One pointer width and within 1 percent of full scale for each switch set point.
    h. Power Supply: 24-V ac, 50/60 Hz.
    i. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 AIR-PRESSURE TRANSMITTERS

A. Air-Pressure Differential Transmitter:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Ashcroft.
    b. Setra System.

2. Performance:

    a. Range: Approximately 2 times set point.
    b. Accuracy: Within 0.5 percent of the full-scale range.
    c. Hysteresis: Within 0.10 percent of full scale.
    d. Repeatability: Within 0.05 percent of full scale.
    e. Stability: Within 1 percent of span per year.
    f. Overpressure: 10 psig.
    g. Temperature Limits: Zero to 150 deg F.
    h. Compensate Temperature Limits: 40 to 150 deg F.
    i. Thermal Effects: 0.033 percent of full scale per degree F.
    j. Shock and vibration shall not harm the transmitter.

3. Output Signals:

    a. Analog Current Signal:

        1) Two-wire, 4- to 20-mA dc current source.
        2) Signal capable of operating into 800-ohm load.

    b. Analog Voltage Signal:

        1) Three wire, zero to 10 V.
        2) Minimum Load Resistance: 1000 ohms.

4. Display: Four-digit digital display with minimum 0.4-inch-high numeric characters.
5. Operator Interface: Zero and span adjustments located behind cover.
6. Construction:

    a. Plastic casing with removable plastic cover.
    b. Threaded, NPS 1/4 swivel fittings for connection to copper tubing or NPS 3/16 barbed fittings for connection to polyethylene tubing. Fittings on bottom of instrument case.
    c. Screw terminal block for wire connections.
    d. Vertical plane mounting.
    e. NEMA 250, Type 4.
    f. Provide mounting bracket suitable for installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.

C. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PRESSURE INSTRUMENT APPLICATIONS

A. Duct-Mounted Static Pressure Sensors:

1. Air Handling Systems,: Duct insertion static pressure sensor.

B. Air-Pressure Differential Transmitters:

1. Duct, as indicated on the plans,: Air-pressure differential transmitter with 0.25 percent accuracy and auto zero feature.
2. Space, as indicated on the plans,: Air-pressure differential transmitter with 0.10 percent accuracy and auto zero feature. Room pressure monitor shall include a bidirectional pressure sensor and wall mounted digital interface module. Room pressure monitoring shall utilize differential pressure-sensing technology to display the respective room’s pressure with reference to the entrance corridor.

3.3 INSTALLATION, GENERAL

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support instruments, tubing, piping wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement, sway, or a break in attachment when subjected to a reasonable force.

C. Provide ceiling, floor, roof, wall openings, and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

D. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not to overstress threads by using excessive force or oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

E. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

F. Corrosive Environments:

1. Use products that are suitable for environment to which they are subjected.
2. If possible, avoid or limit use of materials in corrosive environments.
3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where instruments are located in a corrosive environment and are not corrosive resistant from the manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.4 ELECTRICAL POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.5 PRESSURE INSTRUMENT INSTALLATION

A. Mounting Location:

1. Rough-in: Outline instrument-mounting locations before setting instruments and routing, cable, wiring, tubing, and conduit to final location.
2. Install switches and transmitters for air and liquid pressure associated with individual air-handling units and associated connected ductwork and piping near air-handlings units co-located in air-handling unit system control panel, to provide service personnel a single and convenient location for inspection and service.
3. Install liquid and steam pressure switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.

4. Install air-pressure switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
5. Mount switches and transmitters not required to be mounted within system control panels on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.
6. Install instruments (except pressure gages) in steam, liquid, and liquid-sealed piped services below their process connection point. Slope tubing down to instrument with a slope of 2 percent.
7. Install instruments in dry gas and noncondensable vapor piped services above their process connection point. Slope process connection lines up to instrument with a minimum slope of 2 percent.

B. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

C. Duct Pressure Sensors:

1. Install sensors using manufacturer's recommended upstream and downstream distances.
2. Unless indicated on Drawings, locate sensors approximately 75 percent of distance of longest hydraulic run. Location of sensors shall be submitted and approved before installation.
3. Install mounting hardware and gaskets to make sensor installation airtight.
4. Route tubing from the sensor to transmitter.
5. Use compression fittings at terminations.
6. Install sensor in accordance with manufacturer's instructions.
7. Support sensor to withstand maximum air velocity, turbulence, and vibration encountered to prevent instrument failure.

3.6 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification and on face of ceiling directly below instruments concealed above ceilings.

3.7 CHECKOUT PROCEDURES

A. Check out installed products before continuity tests, leak tests, and calibration.

B. Check instruments for proper location and accessibility.

C. Check instruments for proper installation with respect to direction of flow, elevation, orientation, insertion depth, or other applicable considerations that impact performance.

3.8 ADJUSTMENT, CALIBRATION, AND TESTING

A. Description:

1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
3. For each analog instrument, perform a three-point calibration test for both linearity and accuracy.
4. Equipment and procedures used for calibration shall comply with instrument manufacturer's recommendations.
5. Provide diagnostic and test equipment for calibration and adjustment.
6. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
7. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.
8. If, after calibration, indicated performance cannot be achieved, replace out-of-tolerance instruments.
9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements, and to supplement requirements indicated.

B. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.

C. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact.

D. Sensors: Check sensors at zero, 50, and 100 percent of project design values.

E. Switches: Calibrate switches to make or break contact at set points indicated.

F. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of project design values.

3.9 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.10 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain instrumentation and control devices.

B. Coordinate pressure instrument demonstration video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.

C. Record videos on DVD disks.

D. Owner shall have right to make additional copies of video for internal use without paying royalties.

END OF SECTION 230923.23

SECTION 230923.27 - TEMPERATURE INSTRUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Air temperature sensors.
2. Air temperature RTD transmitters.
3. Industrial-grade liquid and steam temperature sensors.
4. Industrial-grade liquid and steam temperature transmitters.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.27.

1.3 DEFINITIONS

A. HART (Highway Addressable Remote Transducer) Protocol: The global standard for sending and receiving digital information across analog wires between smart devices and control or monitoring systems through bidirectional communication that provides data access between intelligent field instruments and host systems. A host can be any software application from a technician's hand-held device or laptop to a plant's process control, asset management, safety, or other system using any control platform.

B. RTD: Resistance temperature detector.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, control signal over range, default control

signal with loss of power, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation operation and maintenance instructions, including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

C. Samples: For each exposed product installed in finished space.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plan drawings and corresponding product installation details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Product installation location shown in relationship to room, duct, pipe, and equipment.
2. Wall-mounted instruments located in finished space showing relationship to light switches, fire-alarm devices, and other installed devices.
3. Sizes and locations of wall access panels for instruments installed behind walls.
4. Sizes and locations of ceiling access panels for instruments installed in inaccessible ceilings.

B. Product Certificates: For each product requiring a certificate.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency.

D. Field quality-control reports.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials and parts that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

B. Provide two matching product(s) in Project inventory for each unique size and type of sensor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Environmental Conditions:

1. Instruments shall operate without performance degradation under the ambient environmental temperature, pressure, humidity, and vibration conditions specified and encountered for installed location.

a. If instrument alone cannot meet requirement, install instrument in a protective enclosure that is isolated and protected from conditions impacting performance. Enclosure shall be internally insulated, electrically heated, filtered, and ventilated as required by instrument and application.

2. Instruments and accessories shall be protected with enclosures satisfying the following minimum requirements unless more stringent requirements are indicated. Instruments not available with integral enclosures complying with requirements indicated shall be housed in protective secondary enclosures. Instrument's installed location shall dictate following NEMA 250 enclosure requirements:

a. Outdoors, Protected: Type 2.
b. Outdoors, Unprotected: Type 4.
c. Indoors, Heated with Filtered Ventilation: Type 1.
d. Indoors, Heated with Non-Filtered Ventilation: Type 2.
e. Indoors, Heated and Air Conditioned: Type 1.
f. Mechanical Equipment Rooms:

1) Chiller and Boiler Rooms: Type 4.
2) Air-Moving Equipment Rooms: Type 1.

g. Localized Areas Exposed to Washdown: Type 4.
h. Within Duct Systems and Air-Moving Equipment Not Exposed to Possible Condensation: Type 2.
i. Within Duct Systems and Air-Moving Equipment Exposed to Possible Condensation: Type 4.

2.2 AIR TEMPERATURE SENSORS

A. Thermal Resistors (Thermistors): Common Requirements:

1. 10,000 ohms at 25 deg C and a temperature coefficient of 23.5 ohms/ohm/deg C.
2. Two-wire, PTFE-insulated, 22-gage stranded copper leads.
3. Performance Characteristics:

a. Range: Minus 50 to 275 deg F.
b. Interchangeable Accuracy: At 77 deg F within 0.5 deg F.
c. Repeatability: Within 0.5 deg F.

d. Drift: Within 0.5 deg F over 10 years.
e. Self-Heating: Negligible.

4. Transmitter optional, contingent on compliance with end-to-end control accuracy.

B. Thermistor, Single-Point Duct Air Temperature Sensors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Minco

2. Temperature Range: Minus 50 to 275 deg F
3. Probe: Single-point sensor with a stainless-steel sheath.
4. Length: As required by application to achieve tip at midpoint of air tunnel, up to 18 inches.
5. Enclosure: Junction box with removable cover; NEMA 250, Type 1 for indoor applications and Type 4 for outdoor applications.
6. Gasket for attachment to duct or equipment to seal penetration airtight.
7. Conduit Connection: 1/2- inch trade size.

C. Thermistor Averaging Air Temperature Sensors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Minco

2. Temperature Range: Minus 50 to 275 deg F
3. Multiple sensors to provide average temperature across entire length of sensor.
4. Rigid probe of aluminum, brass, copper, or stainless-steel sheath.
5. Flexible probe of aluminum, brass, copper, or stainless-steel sheath and formable to a 4-inch radius.
6. Length: As required by application to cover entire cross section of air tunnel.
7. Enclosure: Junction box with removable cover; NEMA 250, Type 1 for indoor applications and Type 4 for outdoor applications.
8. Gasket for attachment to duct or equipment to seal penetration airtight.
9. Conduit Connection: 1/2-inch trade size.

D. Thermistor Outdoor Air Temperature Sensors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Minco

2. Temperature Range: Minus 50 to 275 deg F

3. Probe: Single-point sensor with a stainless-steel sheath.
4. Solar Shield: Stainless steel.
5. Enclosure: NEMA 250, Type 4 or 4X junction box or combination conduit and outlet box with removable cover and gasket.
6. Conduit Connection: 1/2-inch trade size.

E. Thermistor Space Air Temperature Sensors:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

   a. Minco

2. Temperature Range: Minus 50 to 212 deg F
3. Sensor assembly shall include a temperature sensing element mounted under a flush, brushed-aluminum cover.
4. Provide a mounting plate that is compatible with the surface shape that it is mounted to and electrical box used.
5. Concealed wiring connection.

2.3 AIR TEMPERATURE RTD TRANSMITTERS

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

   a. Minco

B. Source Limitations: Obtain temperature-measuring sensors and transmitters and airflow from single manufacturer.

C. House electronics in NEMA 250 enclosure.

1. Duct: Type 1.
2. Outdoor: Type 4.
3. Space: Type 1.

D. Conduit Connection: 1/2-inch

E. Functional Characteristics:

1. Input:

   a. 100-ohm platinum RTD temperature coefficient of 0.00385 ohm/ohm/deg C, two-wire sensors.
   b. 1000-ohm platinum RTD temperature coefficient of 0.00385 ohm/ohm/deg C, two-wire sensors.

2. Span (Adjustable):

    a. Space: 40 to 90 deg F.
    b. Supply Air Cooling and Heating: 40 to 120 deg F.
    c. Supply Air Cooling Only: 40 to 90 deg F.
    d. Supply Air Heating Only: 40 to 120 deg F.
    e. Exhaust Air: 50 to 100 deg F.
    f. Return Air: 50 to 100 deg F.
    g. Mixed Air: Minus 40 to 140 deg F.
    h. Outdoor: Minus 40 to 140 deg F.

3. Output: 4- to 20-mA dc, linear with temperature; RFI insensitive; minimum drive load of 600 ohms at 24-V dc .
4. Zero and span field adjustments, plus or minus 5 percent of span. Minimum span of 50 deg F.
5. Match sensor with temperature transmitter and factory calibrate together.

F. Performance Characteristics:

1. Calibration Accuracy: Within 0.1 percent of the span.
2. Stability: Within 0.2 percent of the span for at least 6 months.
3. Combined Accuracy: Within 0.5 percent.

2.4 LIQUID AND STEAM TEMPERATURE SENSORS, INDUSTRIAL GRADE

A. RTD:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

    a. Rosemount; Emerson Process Management.

2. Resistance temperature sensors shall comply with IEC 60751, Class A requirements.
3. Platinum with a value of 100 ohms at zero deg C and a temperature coefficient of 0.00385 ohm/ohm/deg C.
4. Encase RTD in a Type 316 stainless-steel sheath with a 0.25-inch OD.
5. Provide four-wire, PTFE-insulated, nickel-coated, 22-gage, stranded copper leads.
6. Provide spring-loaded RTDs for thermowell installations.
7. Performance Characteristics:

    a. Range: Minus 328 to 932 deg F.
    b. Interchangeable Accuracy: Within 0.27 deg F at 32 deg F.
    c. Stability: Within 0.05 percent maximum ice-point resistance shift after 1000 hours at 752 deg F.
    d. Hysteresis: Within 0.04 percent of range.
    e. Response Time: 62.8 percent of change in 4 seconds with water flowing across sensor at 3 fps.

f. Self-Heating: 18-mW minimum power dissipation required to cause a 1.8 deg F temperature measurement error in water flowing at 3 fps.

B. Thermowells:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Rosemount; Emerson Process Management.

2. Stem: Straight or tapered shank formed from solid bar stock.
3. Material: Type 304] [or] [Type 316 stainless steel.
4. Process Connection: Threaded, NPS 3/4, or flange-face, NPS 1-1/2, Class 150 ASME B16.5.
5. Sensor Connection: Threaded, NPS 1/2.
6. Bore: Sized to accommodate sensor with tight tolerance between sensor and well.
7. Furnish thermowells installed in insulated pipes and equipment with an extended neck that extends beyond the face of the insulation covering.
8. Length: As required by application and pipe size.
9. Thermowells furnished with heat-transfer compound to eliminate air gap between wall of sensor and thermowell and to reduce time constant.

C. Connection Heads:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Rosemount; Emerson Process Management.

2. Housing: Low-copper cast-aluminum alloy, complying with NEMA 250, Type 4.
3. Terminals: Six or eight as required by sensor, nickel-plated brass.
4. Conduit Connection: 1/2-inch trade size.
5. Sensor Connection: Threaded, NPS 1/2.

D. Assembly: Sensor manufacturer shall furnish sensor, thermowell, and sensor connection head to provide a matched assembly.

2.5 LIQUID AND STEAM TEMPERATURE TRANSMITTERS, INDUSTRIAL GRADE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

a. Rosemount; Emerson Process Management.

B. Hazard Classification: FM Approved for hazardous environments.

1. Intrinsically safe for Classes I, II, and III; Division 1; Groups A through G.

2. Explosion proof for Class I; Division 1; Groups B, C, and D.
3. Dust-ignition proof for Classes II and III; Division 1; Groups E, F, and G.

C. Performance:

1. Digital Accuracy: Within 0.27 deg F with a 180 deg F span.
2. Digital to Analog Accuracy: Within 0.03 percent of span.
3. Total Accuracy: Within 0.32 deg F with a 180 deg F span.
4. Stability: Within 0.15 percent of output reading for 24 months.
5. Ambient Temperature Limits: Minus 4 to 185 deg F.
6. Humidity Limits: Zero to 99 percent.

D. Electronics Enclosure:

1. Materials: Aluminum alloy or stainless steel.
2. NEMA 250, Type 4X enclosure.
3. Conduit Connections: 1/2-inch trade size.
4. Mounting kit to suit application.

E. Functional Characteristics:

1. Input: 100-ohm platinum RTD temperature coefficient of 0.00385 ohm/ohm/deg C.
2. Range: Minus 328 to 1562 deg F.
3. Field-Adjustable Span: 18 deg F minimum.
4. Default Spans:

    a. Chilled Water: Zero to 100 deg F.
    b. Heating Hot Water: 32 to 212 deg F.

5. Output Signal:

    a. 4- to 20-mA dc, linear with temperature.
    b. Digital signal based on HART protocol carried with current signal.
    c. RFI insensitive.
    d. Minimum drive load of 600 ohms at 24-V dc.

6. Self-Calibration: The analog-to-digital measurement circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements.
7. Digital display of engineering units.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.

C. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support instruments, tubing, piping, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to a reasonable force.

C. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

D. Install products in locations that are accessible and that permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

E. Corrosive Environments:

1. Use products that are suitable for environment to which they are subjected.
2. If possible, avoid or limit use of materials in corrosive environments.
3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where instruments are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 TEMPERATURE INSTRUMENT INSTALLATIONS

A. Mounting Location:

1. Roughing In:

a. Outline instrument mounting locations before setting instruments and routing cable, wiring, tubing, and conduit to final location.
b. Provide independent inspection to confirm that proposed mounting locations comply with requirements indicated and approved submittals.

1) Indicate dimensioned locations with mounting height for all surface-mounted products on Shop Drawings.
2) Do not begin installation without submittal approval of mounting location.

c. Complete installation rough-in only after confirmation by independent inspection is complete and approval of location is documented for review by Owner and Architect on request.

2. Install switches and transmitters for air and liquid temperature associated with individual air-handling units and associated connected ductwork and piping near air-handling units co-located in air-handling unit system control panel to provide service personnel a single and convenient location for inspection and service.
3. Install liquid and steam temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
4. Install air temperature switches and transmitters for indoor applications in mechanical equipment rooms. Do not locate in user-occupied space unless indicated specifically on Drawings.
5. Mount switches and transmitters on walls, floor-supported freestanding pipe stands, or floor-supported structural support frames. Use manufacturer's mounting brackets to accommodate field mounting. Securely support and brace products to prevent vibration and movement.

B. Special Mounting Requirements:

1. Protect products installed outdoors from solar radiation, building and wind effect with stand-offs and shields constructed of Type 316 stainless.
2. Temperature instruments having performance impacted by temperature of mounting substrate shall be isolated with an insulating barrier located between instrument and substrate to eliminate effect. Where instruments requiring insulation are located in finished space, conceal insulating barrier in a cover matching the instrument cover.

C. Mounting Height:

1. Mount temperature instruments in user-occupied space to match mounting height of light switches unless otherwise indicated on Drawings. Mounting height shall comply with codes and accessibility requirements.
2. Mount switches and transmitters located in mechanical equipment rooms and other similar space not subject to code or state and Federal accessibility requirements within a range of 42 to 72 inchesabove the adjacent floor, grade, or service catwalk or platform.

    a. Make every effort to mount at 60 inches.

D. Seal penetrations to ductwork, plenums, and air-moving equipment to comply with duct static-pressure class and leakage and seal classes indicated using neoprene gaskets or grommets.

E. Space Temperature Sensor Installation:

1. Conceal assembly in an electrical box of sufficient size to house sensor and transmitter, if provided.
2. Install electrical box with a faceplate to match sensor cover if sensor cover does not completely cover electrical box.
3. In finished areas, recess electrical box within wall.
4. In unfinished areas, electrical box may be surface mounted if electrical light switches are surface mounted. Use a cast-aluminum electric box for surface-mounted installations.
5. Align electrical box with other electrical devices such as visual alarms and light switches located in the vicinity to provide a neat and well-thought-out arrangement. Where possible, align in both horizontal and vertical axis.

F. Outdoor Air Temperature Sensor Installation:

1. Mount sensor in a discrete location facing north.
2. Protect installed sensor from solar radiation and other influences that could impact performance.
3. If required to have a transmitter, mount transmitter remote from sensor in an accessible and serviceable location indoors.

G. Single-Point Duct Temperature Sensor Installation:

1. Install single-point-type, duct-mounted, supply- and return-air temperature sensors. Install sensors in ducts with sensitive portion of the element installed in center of duct cross section and located to sense near average temperature. Do not exceed 24 inches in sensor length.
2. Install return-air sensor in location that senses return-air temperature without influence from outdoor or mixed air.
3. Rigidly support sensor to duct and seal penetration airtight.
4. If required to have transmitter, mount transmitter remote from sensor at accessible and serviceable location.

H. Averaging Duct Temperature Sensor Installation:

1. Install averaging-type air temperature sensor for temperature sensors located within air-handling units, similar equipment, and large ducts with air tunnel cross-sectional area of 20 sq. ft. and larger.
2. Install sensor length to maintain coverage over entire cross-sectional area. Install multiple sensors where required to maintain the minimum coverage.
3. Fasten and support sensor with manufacturer-furnished clips to keep sensor taut throughout entire length.
4. If required to have transmitter, mount transmitter in an accessible and serviceable location.

I. Low-Limit Air Temperature Switch Installation:

1. Install multiple low-limit switches to maintain coverage over entire cross-sectional area of air tunnel.
2. Fasten and support sensing element with manufacturer-furnished clips to keep element taut throughout entire length.
3. Mount switches outside of airstream at a location and mounting height to provide easy access for switch set-point adjustment and manual reset.
4. Install on entering side of cooling coil unless otherwise indicated on Drawings.

J. Liquid Temperature Sensor Installation:

1. Assembly shall include sensor, thermowell and connection head.
2. For pipe NPS 4 and larger, install sensor and thermowell length to extend into pipe between 50 to 75 percent of pipe cross section.
3. For pipe smaller than NPS 4:

    a. Install reducers to increase pipe size to NPS 4at point of thermowell installation.
    b. For pipe sizes NPS 2-1/2 and NPS 3, thermowell and sensor may be installed at pipe elbow or tee to achieve manufacturer-recommended immersion depth in lieu of increasing pipe size.
    c. Minimum insertion depth shall be 2-1/2 inches.

4. Install matching thermowell.
5. Fill thermowell with heat-transfer fluid before inserting sensor.
6. Tip of spring-loaded sensors shall contact inside of thermowell.
7. For insulated piping, install thermowells with extension neck to extend beyond face of insulation.
8. Install thermowell in top dead center of horizontal pipe positioned in an accessible location to allow for inspection and replacement. If top dead center location is not possible due to field constraints, install thermowell at location along top half of pipe.
9. For applications with transmitters, mount transmitter remote from sensor in an accessible and serviceable location from floor service platform or catwalk.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at

points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification and on face of ceiling directly below instruments concealed above ceilings.

3.6 CLEANING

A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.

B. Wash and shine glazing.

C. Polish glossy surfaces to a clean shine.

3.7 CHECK-OUT PROCEDURES

A. Check installed products before continuity tests, leak tests, and calibration.

B. Check temperature instruments for proper location and accessibility.

C. Verify sensing element type and proper material.

D. Verify location and length.

E. Verify that wiring is correct and secure.

3.8 ADJUSTMENT, CALIBRATION, AND TESTING

A. Description:

1. Calibrate each instrument installed that is not factory calibrated and provided with calibration documentation.
2. Provide a written description of proposed field procedures and equipment for calibrating each type of instrument. Submit procedures before calibration and adjustment.
3. For each analog instrument, make a three-point test of calibration for both linearity and accuracy.
4. Equipment and procedures used for calibration shall meet instrument manufacturer's written instructions.
5. Provide diagnostic and test equipment for calibration and adjustment.
6. Field instruments and equipment used to test and calibrate installed instruments shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed instrument with an accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
7. Calibrate each instrument according to instrument instruction manual supplied by manufacturer.

8. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.
9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements and to supplement requirements indicated.

B. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistance source.

C. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact.

D. Sensors: Check sensors at zero, 50, and 100 percent of Project design values.

E. Switches: Calibrate switches to make or break contact at set points indicated.

F. Transmitters:

1. Check and calibrate transmitters at zero, 50, and 100 percent of Project design values.
2. Calibrate resistance temperature transmitters at zero, 50, and 100 percent of span using a precision-resistance source.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform according to manufacturer's written instruction.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.10 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.11 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include six months' full maintenance by manufacturer's authorized service representative. Include quarterly preventive maintenance, repair or replacement of worn or defective components, cleaning and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.12 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain temperature instruments.

B. Provide a complete set of instructional videos covering each product specified and installed and showing the following:

1. Software programming.
2. Calibration and test procedures.
3. Operation and maintenance requirements and procedures.
4. Troubleshooting procedures.

C. Coordinate video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.

D. Record videos on DVD disks.

E. Owner shall have right to make additional copies of video for internal use without paying royalties.

END OF SECTION 230923.27

SECTION 230923.43 - WEATHER STATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes weather stations connected to direct-digital controls for HVAC.

B. Related Requirements:

1. Section 230923 "Direct-Digital Control System for HVAC" for control equipment and software, relays, electrical power devices, uninterruptible power supply units, wire, and cable.
2. Section 230993 "Sequence of Operations for HVAC Controls" for requirements that relate to Section 230923.43.

1.3 DEFINITIONS

A. I/O: Input/output.

B. RS-232: A TIA standard for asynchronous serial data communications between terminal devices.

C. RS-485: A TIA standard for multipoint communications using two twisted pairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating control signal over range, electrical power requirements, and limitations of ambient operating environment including temperature and humidity.
3. Product description with complete technical data, performance curves, and product specification sheets.
4. Installation operation and maintenance instructions including factors affecting performance.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of product assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.
4. Include number-coded identification system for unique identification of wiring, cable, and tubing ends.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For weather stations to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WEATHER STATION

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are not limited to the following:

1. Automation Components Inc. (ACI)
2. Setra

B. Description:

1. Weather station shall measure air temperature, relative humidity, and CO2. It shall consist of a Relative Humidity Sensor, a Temperature Transmitter, a CO2 Sensor, a pressure sensor and an enclosure. The enclosure shall be a NEMA 250 Type 3 enclosure if sensors are not suitable to be exposed to rain, snow, and ice. Provide weather shield assembly if sensors are suitable for rain, snow, and ice
2. All sensors shall have a five-year warranty from the manufacturer.
3. The RH sensor shall be model RH Outside Air as manufactured by ACI.
4. The Temperature Sensor shall be model Thermistor Outside as manufactured by ACI.
5. The CO2 sensor shall be model ESENSE-Outdoor as manufactured by ACI.
6. The Pressure sensor shall be model 264 as manufactured by Setra Systems.
7. Weather station components shall use solid-state sensors with no moving parts.
8. The devices of the outdoor Weather Station shall be fully integrated into the BMS. The control points associated with these devices shall have trend capabilities as indicated on control points lists.

C. Performance of RH Outside Air:

RH Supply Voltage	**4-20 mA:** 250 Ohm Load: 15 - 40 VDC / 18 - 28 VAC | **500 Ohm Load:** 18 - 40 VDC / 18 - 28 VAC
(Reverse Polarity Protected):	**0-5 VDC:** 12 - 40 VDC / 18 - 28 VAC | **0-10 VDC:** 18 - 40 VDC / 18 - 28 VAC
RH Supply Current (VA):	**Voltage Output:** 8 mA maximum (0.32 VA) | **Current Output:** 24 mA maximum (0.83 VA)
RH Output Load Resistance:	**4-20 mA:** 700 Ohms maximum | **0-5 VDC or 0-10 VDC:** 4K Ohms Minimum
RH Output Signal:	**2-wire:** 4 - 20 mA (Factory Default) | **3-wire**: 0-5 or 0-10 VDC & 4 - 20 mA (Field Selectable)
RH Accuracy @ 77°F (25°C):	+/- 1% over 20% RH Range between 20 to 90% | +/- 2%, 3%, or 5% from 10 to 95%
RH Measurement Range:	0-100%
Operating RH Range:	0 to 95% RH, non-condensing (Conformally Coated PCB's)
Operating Temperature Range:	-40 to 140°F (-40 to 60°C)
Storage Temperature Range:	-40 to 149°F (-40 to 65°C)
RH Stability | Repeatability | Sensitivity:	Less than 2% drift / 5 years | 0.5% RH | 0.1% RH
RH Response Time (T63):	20 Seconds Typical
RH Sensor Type:	Capacitive with Hydrophobic Filter
RH Transmitter Stabilization Time:	30 Minutes (Recommended time before doing accuracy verification)
RH Connections | Wire Size:	Screw Terminal Blocks (Polarity Sensitive) | 16 (1.31 mm^2) to 26 AWG (0.129 mm^2)
RH Terminal Block Torque Rating:	4.43 to 5.31 lb-in (0.5 to 0.6 Nm)
RH NIST Test Points:	**Default Test Points:** 3 Points (20%, 50% & 80%) or 5 Points (20%, 35%, 50%, 65% & 80%)
	1% NIST Test Points: 5 Points within selected 20% Range (ie. 30%-50% are 30, 35, 40, 45 & 50)
Enclosure Specifications (Material,	**"-EH" Enclosure:** ABS Plastic; UL94-V0; -40 to 140°F (-40 to 60°C)
Flammability, Temperature, NEMA/IP Rating):	**"-4X" Enclosure:** Polystyrene Plastic; UL94-V2; -40 to 158°F (-40 to 70°C); NEMA 4X (IP 66)
Sensing Tube Dimensions (Length x Diameter):	**"-EH" Models:** 3.00" (76.20 mm) x 1.125" (28.75 mm)
	"-4X" Models: 4.73" (120.14 mm) x 0.845" (21.46mm)
Product Dimensions (L x W x D):	See drawings on back of data sheet
Product Weight:	**A/RHx-O Series:** 0.59 lbs. (0.27 kg) | **A/RHx-O-4X Series:** 0.45 lbs. (0.204 kg)
Agency Approvals:	CE, RoHS2, WEEE

D. Performance of Temperature Outdoor Sensors:

Sensor Type | Sensor Curve:	Thermistor | Non-Linear, NTC (Negative Temperature Coefficient)	
Number Sensing Points:	One	
Number Wires:	Two (Non-Polarity Sensitive)	
Sensor Output @25°C (77°F) |	**A/1.8K:** 1.8KΩ nominal | (Red/Yellow)	**A/CSI:** 10KΩ nominal | (Green/Yellow)
(Lead Wire Colors):	**A/3K:** 3KΩ nominal | (White/Brown)	**A/10KS:** 10KΩ nominal | (White/Blue)
	A/AN (Type III): 10KΩ nominal | (White/White)	**A/10K-E1:** 10KΩ nominal | (Gray/Orange)
	A/AN-BC: 5.238KΩ nominal | (White/Yellow)	**A/20K:** 20KΩ nominal | (Brown/Blue)
	A/CP (Type II): 10KΩ nominal | (White/Green)	**A/100KS:** 100KΩ | (Black/Yellow)
Accuracy 0-70°C (32-158°F):	+/-0.2°C (+/-0.36°F) except **A/10K-E1 Series:** +/-0.3°C (+/-0.54°F)	
	A/1.8K Series: +/-0.5°C @ 25°C (77°F) and (+/-1.0°C) (+/-1.8°F)	
Power Dissipation Constant:	3 mW/°C except **A/1.8K Series:** 1 mW/°C | **A/10K-E1 Series:** 2 mW/°C	
Stability:	Sensor Dependent; Contact ACI for more information on the sensor in question.	
Response Time (63% Step Change):	25 Seconds nominal	
Enclosure Specifications (Temperature,	**"-EH" Enclosure:** PC/ASA Plastic w/ UV Protectant; -40 to 88°C (-40 to 190°F); UL94-V0	
Material, Flammability, NEMA/IP Ratings):	**"-4X" Enclosure:** Polystyrene Plastic, -40 to 70°C (-40 to 158°F), UL94-V2, NEMA 4X (IP 66)	
	"-BB" Enclosure: Aluminum, -40 to 121°C (-40 to 250°F), NEMA 3R	
Operating Temperature Range:	-40 to 70°C (-22 to 158°F)	
Storage Temperature Range:	-40 to 70°C (-22 to 158°F)	
Operating Humidity Range:	10 to 100% RH	
Lead Length | Conductor Size:	14" (35.6cm) | 22 AWG (0.65mm)	
Lead Wire Insulation | Wire Rating:	Etched Teflon (PTFE) Colored Leads | MIL-W-16878/4 (Type E)	
Conductor Material:	Silver Plated Copper	
Product Dimensions:	See Drawings on back of Data Sheet	
Product Weight:	**A/XX-O-EH:** 0.46 lbs. (0.21kg) | **A/XX-O-4X:** 0.38 lbs. (0.17kg) | **A/XX-O-BB:** 0.76 lbs. (0.35kg)	
Agency Approvals:	CE, RoHS2, WEEE	

E. Performance of CO2 ESENSE Sensors:

Sensor Type | Sensor Curve:	Thermistor | Non-Linear, NTC (Negative Temperature Coefficient)	
Number Sensing Points:	One	
Number Wires:	Two (Non-Polarity Sensitive)	
Sensor Output @25°C (77°F) |	**A/1.8K:** 1.8KΩ nominal | (Red/Yellow)	**A/CSI:** 10KΩ nominal | (Green/Yellow)
(Lead Wire Colors):	**A/3K:** 3KΩ nominal | (White/Brown)	**A/10KS:** 10KΩ nominal | (White/Blue)
	A/AN (Type III): 10KΩ nominal | (White/White)	**A/10K-E1:** 10KΩ nominal | (Gray/Orange)
	A/AN-BC: 5.238KΩ nominal | (White/Yellow)	**A/20K:** 20KΩ nominal | (Brown/Blue)
	A/CP (Type II): 10KΩ nominal | (White/Green)	**A/100KS:** 100KΩ | (Black/Yellow)
Accuracy 0-70°C (32-158°F):	+/-0.2°C (+/-0.36°F) except **A/10K-E1 Series:** +/-0.3°C (+/-0.54°F)	
	A/1.8K Series: +/-0.5°C @ 25°C (77°F) and (+/-1.0°C) (+/-1.8°F)	
Power Dissipation Constant:	3 mW/°C except **A/1.8K Series:** 1 mW/°C | **A/10K-E1 Series:** 2 mW/°C	
Stability:	Sensor Dependent; Contact ACI for more information on the sensor in question.	
Response Time (63% Step Change):	25 Seconds nominal	
Enclosure Specifications (Temperature,	**"-EH" Enclosure:** PC/ASA Plastic w/ UV Protectant; -40 to 88°C (-40 to 190°F); UL94-V0	
Material, Flammability, NEMA/IP Ratings):	**"-4X" Enclosure:** Polystyrene Plastic, -40 to 70°C (-40 to 158°F), UL94-V2, NEMA 4X (IP 66)	
	"-BB" Enclosure: Aluminum, -40 to 121°C (-40 to 250°F), NEMA 3R	
Operating Temperature Range:	-40 to 70°C (-22 to 158°F)	
Storage Temperature Range:	-40 to 70°C (-22 to 158°F)	
Operating Humidity Range:	10 to 100% RH	
Lead Length | Conductor Size:	14" (35.6cm) | 22 AWG (0.65mm)	
Lead Wire Insulation | Wire Rating:	Etched Teflon (PTFE) Colored Leads | MIL-W-16878/4 (Type E)	
Conductor Material:	Silver Plated Copper	
Product Dimensions:	See Drawings on back of Data Sheet	
Product Weight:	**A/XX-O-EH:** 0.46 lbs. (0.21kg) | **A/XX-O-4X:** 0.38 lbs. (0.17kg) | **A/XX-O-BB:** 0.76 lbs. (0.35kg)	
Agency Approvals:	CE, RoHS2, WEEE	

F. Performance of Outdoor Pressure Sensors:

Performance data

Accuracy RSS[1] (at constant temp)	±1.0% FS (standard); ±0.4% FS, ±0.25% FS (optional)
Non-linearity, BFSL	±0.96% FS (standard); ±0.38% FS, ±0.22% FS (optional)
Hysteresis	0.10% FS

Thermal effects[2]

Compensated range °F (°C)	0 to +150 (-18 to +65)
Zero shift %FS/100°F(50°C)	±0.033 (±0.06)
Span shift %FS/100°F(50°C)	±0.033 (±0.06)
Max. line pressure	10 PSI
Overpressure	Up to 10 PSI (range dependent)
Long term stability	0.5% FS/YR

Environmental data

Operating temperature °F (°C)[3]	0 to +175 (-18 to +79)
Storage temperature °F (°C)	-65 to +250 (-54 to +121)

Position effect[4]

Range	Zero offset (%FS/G)
0.1" W.C.	2.3
0.25" W.C.	1
0.5" W.C.	0.5
1.0" W.C.	0.3
2.5" W.C.	0.2
10" W.C.	0.15

Physical description

Case	Fire-retardant glass filled polyester (UL 94 V-O Approved)
Electrical Connection	Screw terminal strip
Mounting	4 screw holes on removable zinc plated steel base (designed for 2.75" snap track)
Pressure Fittings	3/16" O.D. barbed brass for 1/4" push on tubing
Zero and Span Adjustments	Accessible on top of case
Weight (approx.)	10 Ounces

Electrical data (voltage)

Circuit	3-Wire (Com, Out, Exc)
Excitation/output[5]	9 to 30 VDC / 0 to 5 VDC[6,7]
Output impedance	100 ohms
Bidirectional output at zero pressure	2.5 VDC[6,7]

Electrical data (current)

Circuit	2-wire
Output[8]	4 to 20 mA[9,10]
External load	0 to 800 ohms
Min. loop supply voltage (VDC)	9 + 0.02 x (resistance of receiver plus line)
Max. loop supply voltage (VDC)	30 + 0.004 x (resistance of receiver plus line)
Bidirectional output at zero pressure	12 mA[9,10]

Pressure media

Clean air or similar non-conducting gases.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install products level, plumb, parallel, and perpendicular with building construction.

B. Properly support weather station, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment when subjected to forces that are consistent with building code structural design requirements.

C. Fastening Hardware:

1. Stillson wrenches, pliers, and other tools that cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for work of assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

D. Corrosive Environments:

1. Use products that are suitable for environment to which they are subjected.
2. If possible, avoid or limit use of materials in corrosive environments.
3. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
4. Where components are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.3 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install engraved phenolic nameplate with instrument identification.

3.5 ADJUSTMENT, CALIBRATION, AND TESTING

A. Description:

1. Calibrate each weather station installed that is not factory calibrated and provided with calibration documentation.

2. Provide a written description of proposed field procedures and equipment used for calibrating. Submit procedures before calibration and adjustment.
3. For each analog signal, make a three-point test of calibration for both linearity and accuracy.
4. Equipment and procedures used for calibration shall comply with instrument manufacturer's written instructions.
5. Provide diagnostic and test equipment for calibration and adjustment.
6. Field instruments and equipment used to test and calibrate installed weather stations shall have accuracy at least twice the instrument accuracy being calibrated. For example, an installed weather station with a signal accuracy of 1 percent shall be checked by an instrument with an accuracy of 0.5 percent.
7. Calibrate each weather station according to instrument instruction manual supplied by manufacturer.
8. If after calibration indicated performance cannot be achieved, replace out-of-tolerance instruments.
9. Comply with field-testing requirements and procedures indicated by ASHRAE Guideline 11, "Field Testing of HVAC Control Components," in the absence of specific requirements and to supplement requirements indicated.

B. Analog Signals:

1. Check analog voltage signals using a precision voltage meter at zero, 50, and 100 percent.
2. Check analog current signals using a precision current meter at zero, 50, and 100 percent.
3. Check resistance signals for temperature sensors at zero, 50, and 100 percent of operating span using a precision-resistance source.

C. Digital Signals:

1. Check digital signals using a jumper wire.
2. Check digital signals using an ohmmeter to test for contact.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

3.8 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by manufacturer's authorized service representative. Include semiannual preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain weather stations.

B. Provide a complete set of instructional videos covering each product specified and installed and showing the following:

1. Software programming.
2. Calibration and test procedures.
3. Operation and maintenance requirements and procedures.
4. Troubleshooting procedures.

C. Coordinate video with operation and maintenance manuals and classroom instruction for use by Owner in operating, maintaining, and troubleshooting.

D. Record videos on DVD disks.

E. Owner shall have right to make additional copies of video for internal use without paying royalties.

END OF SECTION 230923.43

SECTION 230993.11 - SEQUENCE OF OPERATIONS FOR HVAC DDC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes control sequences for DDC for HVAC systems, subsystems, and equipment.

B. Related Requirements:

1. Section 230923 "DDC Systems for HVAC" for control equipment.

1.3 DEFINITIONS

A. Analog Output: Proportional output signal (zero- to 10-V dc, 4 to 20 mA).

B. Binary Output: On/off output signal or contact closure.

C. DDC: Direct digital control.

D. Digital Output: Data output that must be interpreted digitally.

1.4 ACTION SUBMITTALS

A. Product Data:

1. An instrumentation list for each controlled system. Label each element of the controlled system in table format. Show, in the table element name, type of device, manufacturer, model number, and control device product data sheet number.
2. A complete description of the operation of the control system, including sequences of operation. Include and reference a schematic diagram of the controlled system.

B. Shop Drawings:

1. Riser diagrams showing control network layout, communication protocol, and wire types.
2. Schematic diagram of each controlled system. Include all control points labeled with point names shown or listed. Show the location of control elements in the system.
3. Wiring diagram for each controlled system. Show all control elements labels. Where a control element is the same as that shown on the control system schematic, label with the same name. Label all terminals.

Main Food Production Area Room 1-14

Supply fans AC-1 and HV-1 serve the main production kitchen area in conjunction with exhaust fans EF-1, EF-2, EF-3, EF-4, EF-26, and EF-27. All operate together as a complete system. All systems are activated at the start of AC-1.

I. Air Handler AC-1

A. General

1. AC-1 serves the kitchen area. The system consists of a pair of preheat coils in series. A cooling coil, a 100% outside air damper and a supply fan.

B. Supply Fan Control

4. Occupied Mode
   - The occupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for occupancy shall be Monday through Friday 5:00am to 5:00pm (adj.).
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan by sending a gradual start-up speed command to the fan VFD. Fan to ramp up to full speed for a period of 5 minutes (adj.).
5. Unoccupied mode
   - The unoccupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for unoccupied mode shall be Monday through Friday 6:00pm to 4:00am and all-day Saturday and Sunday (adj.)
   - When commanded to stop, the BMS shall modulate the fan speed command to the VFD to 0%. The outside air dampers shall close.
6. If the supply fan is commanded on and the run status is not detected within the fan alarm delay period (300 seconds, default) then the fan will be commanded off and an alarm will be generated. If the fan has been running for more than two minutes and run status is lost, then the fan will be commanded off and an alarm will be generated. If the low temperature limit is detected, then the fan will be commanded off and an alarm will be generated.

C. Cooling Coil Control

1. Occupied Mode
   - When the supply fan is running, and the outside air temperature is greater than the discharge air set point plus 1°F then the control valve will modulate to maintain the discharge air set point.
   - The discharge air temperature setpoint shall be maintained at 55 °F (adj.) unless every zone is at minimum position and below desired space temperature of 68 °F (adj.).
   - The cooling valve shall not modulate if the preheat valve is open.

2. Unoccupied Mode
    - When the supply fan is off, or the outside air temperature is less than the unit discharge air temperature set point then the control valve will be closed.

D. Preheat Coil Control

1. Occupied Mode
    - At startup control valve to ramp up to full open for a period of 5 minutes (adj.).
    - When the supply fan is started, and the outside air temperature is less than the discharge air temperature set point minus 1°F or the outside air temperature is less than 43°F (adj.) then the control valve will be modulated to control the preheat temperature to the low limit preheat set point plus 4°F. If the preheat temperature is greater than the low limit preheat set point of plus 3°F then the preheat valves will be modulated to control the unit discharge air temperature to the discharge air set point. The controls shall be tuned for smooth operation of valves and to eliminate rapid modulation.
2. Unoccupied Mode
    - If the supply fan and the supply fan run indication are both off and the low limit is not tripped or if the outside air temperature is greater than the discharge air set point, then the preheat valve will be closed. If the low limit is tripped, then the preheat valve signal will be set to 10 psi. If the preheat temperature is less than the low limit preheat set point, then the valve will be modulated to control to the low limit preheat set point plus 4°F.

E. Reheat Coil Control

1. There is multiple zone reheats that shall maintain occupant temperature comfort beyond the discharge air temperature sequence 68 °F. The reheat shall be available all year. When the zone temperature drops below the occupant adjusted setpoint, the reheat shall modulate open to reach the zone temperature setpoint. The controls shall be tuned to provide to incremental modulation of the reheat to reduce excessive actuation.

F. Demand Control Ventilation

1. The controller shall monitor the CO2 levels in both the return air and the occupied zone via the CO2 sensors. The difference in CO2 concentration between outside and return air shall be maintained 700 ppm (adj.). The outside air damper shall be modulated to maintain the differential. The space CO2 shall not exceed 1000ppm CO2 and will override the differential control should this be exceeded.

G. Alarming

1. Fan Run Failure Alarm – If the supply fan run indication is not sensed within 30 seconds (adj.) after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default, adj.) then a flow alarm will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut

down until the flow alarm is manually reset through the operator interface at the front end.

3. Low Limit Temperature Alarm – If a low limit temperature cutout is detected then after 180 seconds (adj.) an alarm will be generated at the operator workstation. The system shall follow the normal shutdown procedure with all associated systems returning to their shutdown positions.
4. Freeze Problem Alarm – If the supply fan has been running for more than 150 seconds (adj.) and a low limit trip is detected then a freeze problem will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down and will remain off until the problem is cleared, and the freeze problem is manually reset through the operator workstation.
5. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and the unit is occupied then an alarm will be generated at the operator workstation.
6. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.
7. High CO2 Concentration – If the occupied space CO2 is greater than 1200 ppm (adj.).
8. Low CO2 Concentration – If the mixed air temperature is lower than 600ppm (adj.).

II. Air Handler HV-1

A. General
1. HV-1 serves the kitchen area. The system consists of a pair of preheat coils in series. A cooling coil, a 100% outside damper and a supply fan.

B. Supply Fan Control

1. Occupied Mode
   - The occupied mode shall be activated when AC-1 supply fan is commanded on. When AC-1 unit occupancy is on and a fan run indication is sensed for AC-1 then HV-1 supply fan will be commanded on. If AC-1 has a flow problem alarm or a freeze problem alarm, then the supply fan will be commanded off until the flow or freeze problem flags have been cleared.
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan by sending a gradual start-up speed command to the fan VFD. Fan to ramp up to full speed for a period of 5 minutes (adj.)
2. Unoccupied mode
   - When AC-1 is in the unoccupied mode then HV-1 supply fan will be commanded off.
   - When commanded to stop, the BMS shall modulate the fan speed command to the VFD to 0%. The outside air dampers shall close.

C. Preheat Coil Control

1. The pair of preheat coils are jointly controlled by a normally open valve.
2. Occupied Mode
   - At startup control valves to ramp up to full open for a period of 5 minutes (adj.).

- If the supply fan is on, then the valves will be modulated to maintain the discharge air temperature to the discharge air temperature set point of 55 °F (adj.). The controls shall be tuned for smooth operation of valves and to eliminate rapid modulation.

3. Unoccupied Mode
   - When the supply fan is started, and the outside air temperature is less than 42 °F (adj.) then the control valve will be modulated to control the preheat temperature to the low limit preheat set point. If the preheat temperature is greater than 42 °F (adj.) then the preheat valves will be closed. If the low limit is tripped, then the valves will be fully open.

D. Damper Control

1. When the supply fan is commanded on then the outside air damper shall open to 100% open to outside air. Then supply fan shall be energized. When the supply fan is off the dampers will be closed.

E. Demand Control Ventilation

1. The controller shall monitor the CO2 levels in both the return air and the occupied zone via the CO2 sensors. The difference in CO2 concentration between outside and return air shall be maintained 700 ppm (adj.). The outside air damper shall be modulated to maintain the differential. The space CO2 shall not exceed 1000ppm CO2 and will override the differential control should this be exceeded.

F. Alarming

1. Fan Run Failure Alarm – If the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) (adj.) then a flow alarm will be enabled and an alarm will be energized at the operator workstation. The fan will be shutdown until the flow alarm is manually reset through the operator workstation.
3. Low Limit Alarm - If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
4. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and AC-1 is in the occupied mode then an alarm will be generated at the operator workstation.
5. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.
6. High CO2 Concentration – If the occupied space CO2 is greater than 1200 ppm (adj.).
7. Low CO2 Concentration – If the mixed air temperature is lower than 600ppm (adj.).

Test Kitchen and Lab room Areas

Supply fans AC-2 and HV-2 serve the test kitchen and lab rooms area in conjunction with exhaust fans EF-7 and EF-8. All operate together as a complete system.

I. Air Handler AC-2

A. General

1. AC-2 serves the test kitchen area. The system consists of two preheat coils an upper and lower coil, a Cooling coil, a 100% outside air damper and a supply fan.
2. AC-2 cooling coil is supplied by the ice water chiller.
3. EF-7 operates during food preparation periods only and not during food serving periods.

B. Supply Fan Control

1. Occupied Mode
   - The occupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for occupancy shall be Monday through Friday 5:00am to 5:00pm (adj.).
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan by sending a gradual start-up speed command to the fan VFD. Fan to ramp up to full speed for a period of 5 minutes (adj.).
2. Unoccupied mode
   - When AC-2 is in the unoccupied mode then supply fan will be commanded off.
   - When commanded to stop, the BMS shall modulate the fan speed command to the VFD to 0%. The outside air dampers shall close.
3. If the supply fan is commanded on and the run status is not detected within the fan alarm delay period (300 seconds, default) then the fan will be commanded off and an alarm will be generated. If the fan is running and run status is lost, then the fan will be commanded off and an alarm will be generated. If the low temperature limit is detected, then the fan will be commanded off and an alarm will be generated.

C. Cooling Coil Control

1. The cooling coil is controlled by a normally closed valve.
2. Occupied Mode
   - When the supply fan is running, and the outside air temperature is greater than the discharge air set point of 55 °F (adj.) plus 1°F then the valve will modulate to maintain the discharge air set point.
3. Unoccupied Mode
   - When the fan is off, or the outside air temperature is less than the unit discharge air temperature set point of 55 °F (adj.) then the valve will be closed.

D. Preheat Coil Control

1. The preheat coils are each controlled by normally open valves.
2. Occupied Mode

- At startup control valves to ramp up to full open for a period of 5 minutes (adj.).
- When the supply fan is commanded on or the supply fan run is sensed, and the outside air temperature is less than the discharge air temperature set point of 55 °F (adj.) minus 1 °F or the outside air temperature is less than 43°F then the lower coil's valve will be modulated to control the preheat temperature to the low limit preheat set point plus 4 °F. The upper coil valve will modulate open if low limit preheat set point is not met by the lower coil. If the preheat temperature is greater than the low limit preheat set point plus 3 °F, then the preheat valves will be modulated to control the unit discharge air temperature to the discharge air set point. The controls shall be tuned for smooth operation of valves and to eliminate rapid modulation.

3. Unoccupied Mode
    - If the supply fan and the supply fan run indication are both off and if the outside air temperature is greater than the discharge air set point of 55 °F (adj.) then both preheat valves will be closed. If the preheat temperature is less than the low limit preheat set point, then the valves will be modulated to control to the low limit preheat set point plus 4°F.

E. Discharge Air Reset Control

1. The discharge air set point is reset by a PID loop from 55°F to 75°F based on space temperature conditions relative to space temperature set point.

F. Damper Control

1. When the supply fan is commanded on then the outside air damper shall open to 100% open to outside air. Then supply fan shall be energized. When the supply fan is off the dampers will be closed.

G. Alarming

1. Fan Run Failure Alarm – If the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) (adj.) then a flow alarm will be enabled and an alarm will be generated at the operator workstation. The fan will be shut down until the flow alarm flag is manually reset through the operator interface at the front end.
3. Low Limit Alarm – If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
4. Freeze Problem Alarm – If the supply fan is running for more than 180 seconds and a low limit trip is detected then a freeze problem flag will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down and will remain off until the problem is cleared, and the freeze problem flag is manually reset through the operator interface at the front end.
5. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and the unit is occupied then an alarm will be generated at the operator workstation.

6. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.

II. Air Handler HV-2

A. General

1. The air handler HV-2 serves the test kitchen area. This unit works as a system along with EF-7. The air handler consists of two preheat coils an upper and lower coil, a 100% outside air damper and a supply fan.

B. Supply Fan Control

1. Occupied Mode
   - The occupied mode shall be activated when AC-2 supply fan is commanded on.
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan. Fan to ramp up to full speed for a period of 5 minutes (adj.).
   - When the unit occupancy point is on then the supply fan, EF-7 and EF-8 will be commanded on.
   - If AC-2 has a flow problem alarm or a freeze problem alarm, then the supply fan will be commanded off until the flow or freeze problem has been cleared.
2. Unoccupied Mode
   - When AC-2 is in the unoccupied mode then HV-2 supply fan and EF-7 and EF-8 will be commanded off.

C. Preheat Coil Control

1. The preheat coils are each controlled by normally open valves.
2. Occupied Mode
   - At startup control valve to ramp up to full open for a period of 5 minutes (adj.).
   - When the supply fan is commanded on or the supply fan run is sensed, and the outside air temperature is less than the discharge air temperature set point of 55 °F (adj.) minus 1 °F or the outside air temperature is less than 43°F then the lower coil's valve will be modulated to control the preheat temperature to the low limit preheat set point plus 4 °F. The upper coil valve will modulate open if low limit preheat set point is not met by the lower coil. If the preheat temperature is greater than the low limit preheat set point plus 3 °F, then the preheat valves will be modulated to control the unit discharge air temperature to the discharge air set point. The controls shall be tuned for smooth operation of valve and eliminate rapid modulation.
3. Unoccupied Mode
   - If the supply fan and the supply fan run indication are both off and if the outside air temperature is greater than the discharge air set point of 55 °F (adj.) then both preheat valves will be closed. If the preheat temperature is less than the low limit preheat set point, then the valves will be modulated to control to the low limit preheat set point plus 4°F.

D. Damper Control

1. When the supply fan is commanded on then the outside air damper shall open to 100% open to outside air. Then supply fan shall be energized. When the supply fan is off the dampers will be closed.

E. Alarming

1. Fan Run Failure Alarm – if the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) (adj.) then a flow alarm will be enabled and an alarm will be generated at the operator workstation. The fan will be shut down until the flow alarm flag is manually reset through the operator interface at the front end.
3. Low Limit Alarm – If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
4. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and AC-1 is in the occupied mode then an alarm will be generated at the operator workstation.
5. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation

Temporary Kitchen Hood System

I. MAU-1 and EF-1

A. General

1. Hood exhaust fan and make-up air unit serve the temporary kitchen in room RS-3. The system is being controlled by a stand-alone Melink controller.
2. When the MAU-1/EF-1 system is turned on via the Melink keypad located in the basement mechanical room, a digital input from the Melink controller shall enable temperature control via the new DDC controller.
3. If the space temperature is below 68 deg F (adjustable) and the outside air temperature is below 60 deg F (adjustable) the system shall operate in heating mode.
4. When the space temperature is above 68 deg F and the outside air temperature is below 60 deg F, the system shall operate in economizer cooling with the condensing unit locked out.
5. When the space temperature is above 72 deg F (adjustable) and the outside air temperature is above 70 deg F (adjustable), the system shall operate in cooling mode.

B. Heating Mode

1. When the outside air temperature, as measured by the new outdoor air temperature sensor is 45 deg F (adjustable) or below, the modulating steam control valve shall fully

open. The face and bypass coil air damper actuator shall modulate to maintain a constant discharge air temperature as measured by the new averaging discharge air temperature sensor.

2. At outside air temperatures above 45 deg F (adjustable), the face and bypass coil actuator shall fully open and the steam control valve shall modulate to maintain discharge air temperature. Discharge air temperature shall be reset as required to satisfy the new room space sensor.
3. If the space temperature is below setpoint, the discharge air temperature setpoint shall be increased. If the space temperature is above setpoint, the discharge air temperature shall be decreased. The minimum discharge air temperature shall be 100 deg F (adjustable).

C. Cooling Mode

1. Upon a call for cooling as measured by the room temperature sensor stage 1 DX cooling shall be enabled. If there is a continued call for cooling, stage 2 DX cooling shall be enabled.

D. Freeze Protection

1. When the freezestat trips, the DDC controller shall alarm, and the face and bypass coil steam control valve shall fully open outside air damper operation and fan operation shall be controlled via a dry contact interlock with the Melink controller.

Administrative Area

I. Air Handler AC-3

A. General

1. AC-3 serves the office area. The system consists of a preheat coil, a cooling coil, outside, return, and exhaust mixing dampers and a supply and return fan. The system also includes EF-12, EF-13 and EF-20 that are started and stopped with AC-3.

B. Supply Fan Control

1. Occupied Mode
   - The occupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for occupancy shall be Monday through Friday 5:00am to 5:00pm (adj.).
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan and its associated exhaust fans EF-12, EF-13, EF-20.
2. Unoccupied mode
   - When AC-3 is in the unoccupied mode then exhaust fans EF-12, EF-13 and EF-20 will be commanded off.
3. If the supply fan is commanded on and the run status is not detected, then the supply fan call will remain on, but other system fans will not be called. If the fan is running and run status is lost, then the fans will be commanded off and an alarm will be generated. If the low temperature limit is detected after the supply fan has been running for greater than 90 seconds, then the fans will be commanded off and an alarm will be generated.

C. Cooling Coil Control

1. The cooling coil is controlled by a normally closed valve.
2. Occupied Mode
   - When the supply fan is running, and the outside air temperature is greater than the discharge air set point of 55 °F (adj.) plus 1°F then the valve will modulate to maintain the discharge air set point.
3. Unoccupied Mode
   - When the fan is off, or the outside air temperature is less than the unit discharge air temperature set point of 55 °F (adj.) then the valve will be closed.

D. Preheat Coil Control

1. The preheat coil is controlled by normally open valves.
2. Occupied Mode
   - If the supply fan is on, then the valve will be modulated to maintain the discharge air temperature 55 °F (adj.). Each reheat coil control valve will continuously modulate to maintain the space temperature set point of the space it serves.
3. Unoccupied Mode
   - If the supply fan and the supply fan run indication are both off and if the outside air temperature is greater than the discharge air set point of 55 °F (adj.) then preheat valve will be closed. If the preheat temperature is less than the low limit preheat set point, then the valves will be modulated to control to the low limit preheat set point plus 4°F.

E. Reheat Coil Control

1. There is multiple zone reheats that shall maintain occupant temperature comfort beyond the discharge air temperature sequence. The reheat shall be available all year. When the zone temperature drops below the occupant adjusted setpoint, the reheat shall modulate open to reach the zone temperature setpoint. The controls shall be tuned to provide to incremental modulation of the reheat to reduce excessive actuation.

F. Discharge Air Reset Control

1. The discharge air set point is reset based on the largest space temperature error (difference between space and space set point). If the largest space temperature error is 3°F or higher, then the discharge air set point will be 45°F. If the largest space temperature error is between 0°F and 3°F then the discharge air set point will be 50°F and if the largest space temperature error is less than 0°F then the discharge air set point will be 60°F.

G. Damper Control

1. The exhaust and outside (intake) dampers are normally closed and linked together. The return damper is normally open operates independently of the exhaust and outside air dampers.
2. Smoke Purge Mode – if smoke purge mode is on then the outside air and exhaust air dampers shall be fully open, and the return air dampers shall be closed.
3. Occupied mode

- When the supply fan run indication is on and the unit is not in smoke purge mode then the outside air, exhaust air and return air dampers will modulate together to maintain the discharge air temperature to the discharge air set point. If the minimum ventilation alarm is set, then the outside air and exhaust air dampers will go to the minimum open position and the return air damper will go to the minimum closed position.

4. Unoccupied Mode
   - When the supply fan run indication is off then the outside air and exhaust air dampers will be closed, and the return air dampers will be fully open unless the minimum ventilation alarm is set then the outside air and exhaust air dampers will go to the minimum open position and the return air damper will go to the minimum closed position.

H. Minimum Ventilation Control

1. If the outside air temperature is less than the return air temperature minus 6 °F, then the minimum ventilation alarm will be off otherwise the minimum ventilation alarm will be on.

I. Alarming

1. Supply Fan Run Failure Alarm – If the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) (adj.) then a flow alarm flag will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down until the flow alarm flag is manually reset through the operator interface at the front end.
3. Return Fan Run Failure Alarm – If the return fan run indication is not sensed for 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
4. Low Limit Alarm – If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
5. Freeze Problem Alarm – If the supply fan has been running for more than 90 seconds and a low limit trip is detected then a freeze problem will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down and will remain off until the problem is cleared, and the freeze problem is manually reset through the operator interface at the front end.
6. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and the unit is occupied then an alarm will be generated at the operator workstation.
7. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.

Basement Area

I. Air Handler HV-3

A. General

1. HV-3 serves the basement area. The unit consists of two preheat coils, an upper and lower coil, a 100% outside air two position damper and a constant speed supply fan. The system also includes EF-9, EF-10 and EF-11 that are started and stopped with HV-3.

B. Supply Fan Control

1. Occupied Mode
   - The occupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for occupancy shall be Monday through Friday 5:00am to 5:00pm (adj.).
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan by sending a gradual start-up speed command to the fan VFD. Fan to ramp up to full speed for a period of 5 minutes (adj.).
   - Once supply fan indication is sensed then HV-3's associated exhaust fans EF-9, EF-10 and EF-11 will be started.
2. Unoccupied mode
   - The unoccupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for unoccupied mode shall be Monday through Friday 6:00pm to 4:00am and all-day Saturday and Sunday (adj.)
   - When commanded to stop, the BMS shall modulate the fan speed command to the VFD to 0%. The outside air dampers shall close.
   - When HV-3 is in unoccupied mode exhaust fans EF-9, EF-10 and EF-11 will be commanded off.
3. If the supply fan is commanded on and the run status is not detected within the fan alarm delay period (300 seconds, default) (adj.) then the supply fan and its associated exhaust fans will be commanded off and an alarm will be generated. If the fan is running and run status is lost, then the fan will be commanded off and an alarm will be generated. If the low temperature limit is detected, then the supply fan and its associated exhaust fans will be commanded off and an alarm will be generated.

C. Preheat Coil Control

1. The preheat coils are controlled by a normally open valve.
2. Occupied Mode
   - At startup control valve to ramp up to full open for a period of 5 minutes (adj.).
   - When the supply fan is started, or the supply fan run is sensed and the outside air temperature is less than the discharge air temperature 55 °F (adj.) then the valve will be immediately opened then if the supply fan run indication is verified, the valve will be modulated to control heating operation to the low limit preheat air setpoint. The controls shall be tuned for smooth operation of valves and to eliminate rapid modulation.

3. Unoccupied Mode
    - If the supply fan and the supply fan run indication are both off and if the outside air temperature is greater than the discharge air set point 55 °F (adj.) then the preheat valve will be closed. If the preheat temperature is less than the low limit preheat set point, or the unit freeze problem is on then the valve will be modulated to control to the low limit preheat set point plus 4°F.

D. Cooling Coil Control

1. The cooling coil is controlled by a normally closed valve.
2. Occupied Mode
    - When the supply fan is running and the outdoor air temperature is above 58 °F, the valve is modulated to maintain the dew point temperature in the basement corridor at between 54 °F and 56 °F.
3. Unoccupied Mode
    - When the supply fan is off the valve will be closed.

E. Reheat Coil Control

1. The reheat coil are controlled by a normally open valve.
2. Occupied Mode
    - When the supply fan is started, or the supply fan run is sensed then the valve will modulate to maintain the discharge air temperature setpoint 55 °F (adj.).
3. Unoccupied Mode
    - If the supply fan and the supply fan run indication are both off and the low-limit alarm is tripped, the valve shall remain open.

F. Discharge Air Reset Control

1. If the unit supply fan run is off, then the discharge air set point will be 55°F otherwise the discharge air set point is reset based on the space temperature error (difference between space and space set point). As the space temperature error varies from 0°F to ±1°F the discharge air temperature will modulate from 55 °F to 90 °F.

G. Damper Control

1. When the supply fan is commanded on then the outside air damper shall open 100% to outside air. The supply fan shall be energized. When the supply fan is off the dampers will be closed.

H. Alarming

1. Supply Fan Run Failure Alarm – If the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) (adj.) then a flow alarm will be

enabled and an alarm will be generated at the operator workstation. The fan will be shut down until the flow alarm is manually reset through the operator workstation.

3. Low Limit Alarm – If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
4. Freeze Problem Alarm – If the supply fan has been running for more than 90 seconds and a low limit trip is detected then a freeze problem will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down and will remain off until the problem is cleared, and the freeze problem is manually reset through the operator interface at the front end.
5. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and the unit is occupied then an alarm will be generated at the operator workstation.
6. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.

Ware Wash Area

I. Air Handler AC-4

A. General

1. AC-4 serves the ware wash area. The system consists of a preheat coil, a cooling coil, outside, return, and exhaust mixing dampers and a supply and return fan. The system also includes WW8_3 and WW8_4 exhaust fans that are started and stopped with AC-4.

B. Supply Fan Control

1. Occupied Mode
   - When the unit is in occupied mode then the outside air damper shall modulate open, and the controller is to start the fan. Once supply fan run indication is sensed then AC-4 return fan and its associated exhaust fans WW8_3 and WW8_4 will be commanded on.
2. Unoccupied mode
   - When AC-4 is in the unoccupied mode then exhaust fans WW8_3 and WW8_4 will be commanded off.
3. If the supply fan is commanded on and the run status is not detected within the fan alarm delay period (300 seconds, default) then the supply fan and its associated exhaust fans will be commanded off and an alarm will be generated. If the fan is running and run status is lost, then the fans will be commanded off and an alarm will be generated. If the low temperature limit is detected after the supply fan has been running, then the fans will be commanded off and an alarm will be generated.

C. Cooling Coil Control

1. The cooling coil is controlled by a normally closed valve.
2. Unoccupied Mode
   - When the fan is off, or the outside air temperature is less than 60°F (winter mode) then the valve will be closed.

3. Occupied Mode
    - When the supply fan is running, and the outside air temperature is greater than 61°F (summer mode) then the valve will modulate to maintain the discharge air temperature at the discharge air set point plus 1°F.

D. Preheat Coil Control

1. The preheat coil is controlled by a normally open valve.
2. Occupied Mode
    - When the supply fan run indication is on and the outside air temperature is less than 60°F (winter mode) then the valve will modulate to maintain the discharge air temperature at the discharge air set point minus 1°F.
3. Unoccupied Mode
    - If the supply fan run indication is off or the outside air temperature is greater than 61°F (summer mode) then the preheat valve will be closed. If the supply fan run indication is off and the low limit has tripped then the preheat valve will modulate to maintain the preheat temperature to the low limit preheat set point (45°F, default) plus 4°F.

E. Discharge Air Reset Control

1. The discharge air set point is reset based on the space temperature error (difference between space and space set point). If the outside air temperature is less than 55°F, then the discharge air set point will modulate to maintain the space temperature at set point from 55°F to 80°F and if the outside air temperature is greater than 55°F then the discharge air set point will modulate from 55°F to 63°F to maintain the space temperature at set point.

F. Damper Control

1. The exhaust and outside (intake) dampers are normally closed and linked together. The return damper is normally open and operates independently of the exhaust and outside air dampers.
2. Smoke Purge Mode – If smoke purge mode is on then the outside air and exhaust air dampers shall be fully open, and the return air dampers shall be closed.
3. Occupied mode
    - When the supply fan run indication is on and the unit is not in smoke purge mode then if the unit is in summer mode the outside air and exhaust air dampers will remain closed and the return air dampers will close 10%. If the unit is in winter mode (outside air less than 60°F) and the outside air is greater than 41°F then the outside air, exhaust air and return air dampers will modulate together to maintain the discharge air temperature to the discharge air set point minus 2°F. If the outside air temperature is less than 40°F or if the preheat temperature is less than 15°F, then the outside air and the exhaust air dampers will be closed, and the return air damper will be closed 10%.
4. Unoccupied Mode
    - When the supply fan run indication is off then the outside air and exhaust air dampers will be closed, and the return air dampers will be fully open.

G. Alarming
1. Supply Fan Run Failure Alarm – If the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) then a flow alarm flag will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down until the flow alarm flag is manually reset through the operator workstation.
3. Return Fan Run Failure Alarm – If the return fan run indication is not sensed for 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
4. Low Limit Alarm – If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
5. Freeze Problem Alarm – If the supply fan has been running for more than 90 seconds and a low limit trip is detected then a freeze problem will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down and will remain off until the problem is cleared, and the freeze problem is manually reset through the operator workstation.
6. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and the unit is occupied then an alarm will be generated at the operator workstation.
7. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.

Food Processing Spaces (RS-2, RS-3, RS-4, RS-13 Thru RS-16, RS-19, RS-20, RS-23 and 1-8)

I. Air Handler AC-5

A. General

1. AC-5 serves the cold storage area. The system consists of two preheat coils an upper and lower coil, a cooling coil, a 100% outside air damper, a packaged liquid desiccant system and a supply fan.

B. Supply Fan Control

1. Occupied Mode
   - The occupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for occupancy shall be Monday through Friday 5:00am to 5:00pm (adj.).
   - When commanded to start, the outside air damper shall modulate open, and the controller is to start the fan. Fan to ramp up to full for a period of 5 minutes (adj.).
2. Unoccupied mode
   - The unoccupied mode shall be activated by a time-of-day schedule or operator override at the workstation. The initial schedule for unoccupied mode shall be Monday through Friday 6:00pm to 4:00am and all-day Saturday and Sunday (adj.)

3. If the supply fan is commanded on and the run status is not detected within the fan alarm delay period (300 seconds, default) then the fan will be commanded off and an alarm will be generated. If the fan has been running for more than 45 seconds and run status is lost, then the fan will be commanded off and an alarm will be generated. Once the fan is running and low temperature limit is detected after the fan has been running for 90 seconds then the fan will be commanded off and an alarm will be generated.

C. Cooling Coil Control

1. The cooling coil is controlled by a normally closed valve.
2. Unoccupied Mode
   - When the fan is off, or the outside air temperature is less than the unit discharge air temperature set point 55 °F (adj.) plus 1°F then the valve will be closed.
3. Occupied Mode
   - When the supply fan is running, and the outside air temperature is greater than the discharge air set point 55 °F (adj.) plus 1°F then the valve will modulate to maintain the discharge air set point.

D. Preheat Coil Control

1. The preheat coils are each controlled by normally open valves
2. Occupied Mode
   - At startup control valve to ramp up to full open for a period of 5 minutes (adj.).
   - When the supply fan is commanded on or the supply fan run is sensed, and the outside air temperature is less than the discharge air temperature set point of 55 °F (adj.) minus 1 °F or the outside air temperature is less than 43°F then the lower coil's valve will be modulated to control the preheat temperature to the low limit preheat set point plus 4 °F. The upper coil valve will modulate open if low limit preheat set point is not met by the lower coil. If the preheat temperature is greater than the low limit preheat set point plus 3 °F, then the preheat valves will be modulated to control the unit discharge air temperature to the discharge air set point. The controls shall be tuned for smooth operation of valves and to eliminate rapid modulation.
3. Unoccupied Mode
   - If the supply fan and the supply fan run indication are both off and if the outside air temperature is less than 42°F then the valve signal will be fully open, but if the outside air temperature is greater than 42°F then the valves will be closed. If the low limit is tripped, then the valves will be fully open.

E. Damper Control

1. When the supply fan is commanded on then the outside air damper shall open 100% to outside air. The supply fan shall be energized. When the supply fan is off the dampers will be closed.

F. Desiccant System Control

1. When the supply fan is commanded on and the outside air is between 40°F and 65°F then the system shall be enabled. When the fan is off, and the outside air temperature is not between 40°F and 65°F then the system will be stopped.

G. Alarming

1. Fan Run Failure Alarm – if the supply fan run indication is not sensed within 30 seconds after the fan has been commanded on then an alarm will be generated at the operator workstation.
2. Flow Problem Alarm – If the supply fan is commanded on and run indication is not sensed within the fan alarm delay time (5-minute, default) (adj.) then a flow alarm will be enabled and an alarm will be generated at the operator workstation. The fan will be shut down until the flow alarm is manually reset through the operator workstation.
3. Low Limit Alarm – If a low limit temperature cutout is detected then after 180 seconds an alarm will be generated at the operator workstation.
4. BAC System Alarm – If a BAC common alarm input or an ice pump alarm input is sensed after a 10 second delay an alarm will be generated at the operator workstation.
5. Freeze Problem Alarm – If the supply fan has been running for more than 150 seconds and a low limit trip is detected then a freeze problem will be enabled, and an alarm will be generated at the operator workstation. The fan will be shut down and will remain off until the problem is cleared, and the freeze problem is manually reset through the operator workstation.
6. Discharge Air Temperature Alarm – If the discharge air temperature is not between 40°F and 90°F and the unit is occupied then an alarm will be generated at the operator workstation.
7. Dirty Filter Alarm – If a dirty filter is detected by an excessive pressure drop across it then an alarm will be generated at the operator workstation.

Space Temperature and Humidity

A. General

1. The combination temperature and humidity sensors will be used for monitoring spaces.

B. Alarming

1. If humidity falls below or above setpoint then an alarm will be generated at the operator workstation.
2. If temperature falls below or above setpoint an alarm will be generated at the operator workstation.

Exhaust Fans Control

A. General

1. There are multiple control scenarios for the exhaust fans on this site.

B. Damper Control

1. For exhaust fans that have isolation dampers associated with them, when the exhaust fans are off their associated dampers shall be closed.
2. When exhaust fans are commanded on then their associated dampers shall open.

C. General Exhaust

1. Occupied mode
   - Exhaust fans for toilet exhaust and general exhaust will be started and stopped by schedule as determined by the operator.
2. Unoccupied mode
   - The exhaust fans will be commanded off.

D. Mechanical Room Exhaust (EF-14, EF-15, EF-16, EF-17, EF-18, EF-21, EF-22)

1. Mechanical room exhaust includes electrical closets, data closets, mechanical equipment rooms and elevator rooms.
2. When the space temperature of the mechanical room exceeds the space temperature set point then the exhaust fan will be commanded on.
3. When the space temperature of the mechanical room drops below the space temperature set point then the exhaust fan will be commanded off.

E. Air Handler Exhaust Fans (EF-1, EF-2, EF-3, EF-4, EF-7, EF-8, EF-9, EF-10, EF-11, EF-12, EF-13, EF-20, EF-26, EF-27)

1. Occupied Mode
   - When the supply fan run indication of the air handlers associated with the exhaust fans is sensed then the exhaust fans will be commanded on.
2. Unoccupied Mode
   - When the supply fan run indications of the associated air handlers are off the exhaust fans will be commanded off.

F. Alarms

1. Run Failure Alarm – If the exhaust fan is commanded on and a run is not sensed for 30 seconds an alarm will be generated.

Cook Tanks Control

A. Alarming

The BMS system has control over temperature alarming of each cook tank. Tank Temperature and supply water temperature are monitored for alarming.

1. The alarming program can be started or stopped through the graphical user interface. If the program is stopped all alarming will be stopped for that tank.
2. If the cook tank probe is enabled, then an alarm will be generated ten seconds after any of the following conditions occur.
   a. If the probe is enabled for more than 10 hours

b. If the cook tank supply water temperature is greater than set point minus 20°F for more than six hours and the probe temperature is less than set point minus 20°F.
c. If the cook tank supply water temperature is greater than set point minus 20°F and the probe temperature is greater than set point minus 20°F for more than ten minutes.

3. If the cook tank probe is not enabled and the bypass is enabled, then an alarm will be generated if any of the following conditions occur.
   a. If the bypass is enabled for more than 3 hours.
   b. If the cook tank supply temperature is greater than set point minus 20°F for more than 8.5 minutes.
4. Once an alarm is generated then the program must be stopped to clear the alarm.

Chilled Water System

A. General

1. The chilled water system consists of two chillers along with dual chilled water pumps and chiller isolation valves.

B. Chiller Isolation Valves

1. Valve Open
   - Upon a call for the chiller to start its associated chiller isolation valve shall be commanded open.
2. Valve Closed
   - When the chiller is commanded off the associated chiller isolation valve shall remain open for a period of five minutes to allow for the chiller to pump down.

C. Chiller Pumps

1. Pump Start
   - Upon a call for the chiller to start its associated pump shall be commanded on. If a run indication for the pump is not received within the pump alarm delay period (60 sec, default) then the chiller and its associated pump and isolation valve shall be commanded off and an alarm will be generated.
2. Pump Stop
   - When the chiller is commanded off then the pumps will continue to run for five minutes to allow the chiller to pump down.
3. Pump Failure
   - Upon a loss of run indication for the chiller pump and after a delay greater than the pump alarm delay period then the pump shall be commanded off and an alarm will be generated.

D. Chiller Control

1. Chiller off
   - The chiller will be off whenever the outside air is less than 55°F or the chilled water system is unoccupied.

2. Chiller on
    - The Lead chiller shall be commanded on during occupied mode when the outside air temperature is greater than the outside air lockout temperature (60°F, default). If the manual start enable is on and outside air temperature is above 55°F then the chiller shall be commanded to start. If the outside air temperature is greater than 55°F and the chilled water supply temperature is greater than the chilled water supply temperature set point (43°F, default) for a period greater than the lag chiller delay (30 minutes, default) then the chiller will be started.

E. Lead-Lag Control

1. Each chiller shall be designated as the lead chiller with the other chiller being the lag chiller for a period equal to the lead time switch over (200 minutes, default). When a chiller has run for a period equal to the lead time switch over then the BMS system shall automatically switch the lead chiller to the other chiller and the current lead chiller shall become the lag chiller. The lead chiller can be switched manually at the operator interface if the operator desires for any reason before the normal switch over period has expired.

F. Alarming

1. Flow Problem Alarm - If the chilled water pumps fail to run any time after being commanded on for a period equal to the pump alarm delay period, then the chiller and its associated pump and isolation valve shall be closed, and an alarm will be generated. Once an alarm has been generated the chiller system shall remain in alarm and shutdown until the operator resets the alarm at the operator interface.
2. BAC Tower Alarm – If the BAC cooling tower panel alarm is on for more than 10 seconds then an alarm will be generated at the operator workstation.
3. BAC Tower System Alarm – If the BAC cooling tower system alarm is on for more than 10 seconds then an alarm will be generated at the operator workstation and an alarm dial out will be initiated.
4. Ice Water High Temp Alarm – If the ice water temperature is greater than 45°F then an alarm dial out will be initiated.

Ice Water System

A. General
1. The Ice Water System is controlled by a stand alone control panel. This includes chiller, cooling tower, chilled water and condenser water pumps.

B. Occupied Period:

1. Remote Startup
    a. Navigate the Red Lion Control to “System Mode” and select “Remote”
    b. Startup will be initiated through Rockland Psychiatric’s Building Management System’s BACnet Point (BACnet). The BACnet Point is currently wired and the active control input, the hard wired point is an alternate control input for use during system testing.

c. As long as remote point is enabled the chiller plant will run automatically to achieve and maintain the chiller plant set point. Chiller to run based on demand during business hours if needed and then build ice between 11:00PM and 6:00AM to maximum allowable level.

2. Local Startup
   a. Navigate the Red Lion Control to “System Mode” and select “Local”
   b. Check chilled water pipes – all valves must be open.
   c. Check condenser water pipes – all valves must be open.
   d. Confirm breakers are on for the following:
      - Main
      - Chiller
      - Control Panel
      - VFD
      - Unit Heater (if required)
      - Transformer
      - Tower Heater (if required)
   e. Confirm there are no alarms on the Carrier Navigator (Chiller Interface)
   f. Confirm Chiller Control Panel Switches
      - Remote Contact Switch – Enable
      - Emergency – On
   g. Tower Fan VFD – Place in Auto Mode
      - On the ABB VFD interface ensure the drive is on
      - Select “Auto”
   h. Confirm all (5) relays in control panel are on (vertical position)
      - Chilled Water Pump #1
      - Chilled Water Pump #2
      - Condenser Water Pump #1
      - Condenser Water Pump #2
      - Bubbler Pump #1
   i. Confirm power to OEMctrl controller
      - Check for LED chase light
      - Confirm communication lights
   j. Using the RedLion Interface confirm:
      - CHWP Control : Check chilled water pumps are in auto
      - CWP Control: Condenser pumps in auto
      - Fan: Bubble in Auto
      - Confirm PID loop settings
        i. TIC-01 (OWB Plus Setpoint): 5 °F
        ii. TIC-02 (Setpoint): 65 °F
   k. Clear all alarms on Red Lion interface.
   l. Red Lion mode screen set to “Local”
   m. Selecting “Local” will initialize the chiller plant.
   n. As long as local point is enabled the chiller plant will run automatically to achieve and maintain the chiller plant setpoint. Chiller plant will continue to run until the ice build is complete according to the level switch or the remote enable point is de-energized.
   o. Monitor RedLLion Main Screen

3. EMERGENCY Operation

(CAUTION: Running the chiller plant in hand is not recommended. Some standard safeties may be bypassed relying solely on operator input and system monitoring. The following sequence may not cover all aspects of manually controlling the plant. The following sequence assumes loss of the RedLion Interface. Please contact Carrier Commercial Services in the event of an emergency.)

a. Check chilled water pipes – all valves must be open.
b. Check condenser water pipes – all valves must be open.
c. Confirm breakers are on for the following:
   - Main
   - Chiller
   - Control Panel
   - VFD
   - Unit Heater (if required)
   - Transformer
   - Tower Heater (if required)
d. Confirm there are no alarms on the Carrier Navigator (Chiller Interface)
e. Confirm Chiller Control Panel Switches
   - Remote Contact Switch – Off
   - Emergency – On
f. Confirm all (5) relays in control panel are on (vertical position)
   - Chilled Water Pump #1
   - Chilled Water Pump #2
   - Condenser Water Pump #1
   - Condenser Water Pump #2
   - Bubbler Pump #1
g. Confirm power to OEMctrl controller
   - Check for LED chase light
   - Confirm communication lights
h. Select Local Mode for Chiller
   - On chiller control panel select “off” for Remote Mode
i. Within 15 seconds start one condenser water pump and one chilled water pump and bubbler.
   - To start pumps, move corresponding hand/off/auto switch on the OEMctrl to “hand” for one of each pump.
     i. Chilled Water Pump 1 – UO-1
     ii. Chilled Water Pump 2 – UO-2
     iii. Condenser Water Pump 1 – UO-3
     iv. Condenser Water Pump 2 – UO-4
j. Immediately after pumps have started, enable the cooling tower VFD
   - On the ABB interface, put drive in “Off”.
   - Press the “Hand” button
   - Select VFD speed based on outside air conditions
     i. Condenser water temperature entering chiller should be between 65°F and 85°F
k. Monitor Loop Conditions

- Condenser Water Flow
- Chilled Water Flow
- Condenser Entering Temperature
- Condenser Leaving Temperature
- Chilled Water Return Temperature
- Chilled Water Leaving Temperature
- Condenser Water Pressures
- Chilled Water Pressures

l. Standard Safeties may be bypassed operating the system in hand. The system will continue to build ice until the system is manually shut off.

C. Unoccupied Period:

1. Remote Shutdown

a. Shutdown will be initiated through Rockland Psychiatric's Building Management System's BACnet Point (BACnet).

b. The OEMCtl and Carrier Controller will follow the appropriate shutdown sequence including local safeties.

2. Local Shutdown
   a. Red Lion Mode Screen set to "Off"
   b. Selecting "Off" will shut down the chiller plant.
   c. The OEMCtl and Carrier Controller will follow the appropriate shutdown sequence.

3. Emergency Shutdown (without RedLion Interface)
(CAUTION: Running the chiller plant in hand is not recommended. Standard Safeties may be bypassed relying solely on operator input and system monitoring. The following sequence may not cover all aspects of manually controlling the plant. Please contact Carrier Commercial Services in the event of an emergency.)

a. Turn Chiller Off
   - On chiller control panel select "Off" for Remote Mode

b. Turn Chilled Water Pump Off
   - On OEMctrl move On/Off/Auto switch from "On" to "Auto"
     i. Chilled Water Pump 1 – UO-1
     ii. Chilled Water Pump 2 – UO-2

c. Maintain appropriate Condenser water temperature by varying tower speed
   - Condenser water temperature entering chiller should be between 65°F and 85°F

d. Wait 20 minutes to turn Condenser Water Pump Off
   - On OEMctrl move On/Off/Auto switch from "On" to "Auto"
     i. Condenser Water Pump 1 – UO-3
     ii. Condenser Water Pump 2 – UO-4

e. Turn Bubbler Off
   - On OEMctrl move On/Off/Auto switch from "On" to "Auto"
     i. Bubbler Pump – UO-5

f. Turn Cooling Tower Fan VFD Off

- Select “Off” on the ABB VFD Interface

D. Standard Operating Conditions

1. Condenser Water Flow: 320 gpm
2. Chilled Water Flow: 410gpm
3. Condenser Entering Temperature: 75 °F to 90 °F
4. Condenser Leaving Temperature: 80 °F to 100 °F
5. Chilled Water Return Temperature: 24 °F to 40 °F
6. Chilled Water Leaving Temperature: 18 °F to 34 °F
7. Condenser Water Pressures: 12 PSI to 25 PSI
8. Chilled Water Pressures: 16 PSI to 42 PSI
9. Bubbler Pressure: 2 PSI to 4 PSI

E. Ice Build Schedule

1. The first priority sequence is for the system to build ice between the hours of 11PM to 6AM, when the upper limit sensor is not satisfied/tripped. The intent is to have maximum ice storage during this time period.
2. Ice build tank to build ice when needed after hours (following 3:00pm) regenerate to at least 80% if not more in preparation for the next day.
3. Weekly operation is from Sunday 3:00PM – Friday at 3:00PM
4. The Ice storage tank shall circulate every 6 hours for at least 30 minutes. Additionally, between 7:00AM – 10:00AM the system shall circulate continuously so that the water quality can be tested daily.
5. Condenser pumps to be engaged during the times of circulation.
   Proposed circulation schedule as follows:
   3:00AM – 3:30AM
   7:00AM-10:00AM
   2:00PM – 2:30PM
   8:30PM – 9:00PM
   *All schedules need to be overridable

Ice Water Pump System

A. Occupied Period:

1. Primary IWP(6A or 6B) to be enabled.
2. Primary/Standby pumps to alternate daily or upon pump failure.
3. Primary IWP to modulate speed to maintain minimum 20psig set point at differential pressure sensor.
4. IWP-7 is maintained off.

B. Alarms:

1. VFD output alarm per pump.
2. Failure to maintain differential pressure set point for more than 60 seconds.
3. Temperature sensor outside of high and low limits.

4. Flow failure.
5. Overpressure alarm.

C. Unoccupied:

1. Pump IWP-7 to run continuously.
2. Pumps IWP-6A and 6B are to be disabled during unoccupied mode.

Heating Plant

A. General

1. The heating system consists of 3 boilers and associated pumps and combustion dampers and a fuel oil tank and pumping system. The BMS system provides control for the combustion air dampers, fuel oil pumps, day fuel oil tank valve, monitoring of the boilers and pumps and system alarming.

B. Combustion dampers

1. If the system detects a run status for boiler 1 or boiler 3 then combustion air damper 1 will open and when boiler 1 and boiler 3 are off, then combustion air damper 1 will be closed.
2. If run status is detected for boiler 2 or boiler 3 then combustion air damper 2 will open, when boiler 2 and boiler 3 run statuses are off then combustion air damper 2 shall be closed.

C. Boilers

1. There are 3 self-controlled boilers that are monitored for run status and flame failure.

D. Pumps

1. The system pumps are monitored for run status only.

E. Fuel oil pumping system

1. The fuel oil system consists of the main fuel oil tank, a day fuel oil tank, a day tank fuel oil valve and fuel oil pumps.
2. The boilers can run on multiple fuels and if there is a call for fuel oil for all 3 boilers then the fuel oil pumps will be enabled to run providing fuel oil to the boilers. If there is a call to fill the day tank, then the fuel oil pumps will be enabled to run, and the day tank valve will be opened.

F. Alarming

1. Day tank Low Level Alarm – If the day tank low level input is detected an alarm will be generated at the operator workstation.

2. Day tank High Level Alarm - If the day tank low level input is detected an alarm will be generated at the operator workstation.
3. Low Gas Alarm – If the low gas indicator is detected then an alarm will be generated at the operator workstation.
4. Power Failure Alarm – If the power failure input is detected then an alarm will be generated at the operator workstation.
5. Boiler Flame Failure Alarm – Each boiler has a flame failure input. If any boilers flame failure input is detected, then an alarm will be generated at the operator workstation.

Domestic Hot Water System

A. General

1. The system consists of two hot water heaters. Each is equipped with a circulator pump, hot water return pump, temperature sensor, steam valve and actuator, and steam pressure sensor. The systems are to always operate, including circulation pumps.

B. Alarming

1. Pump Failure Alarm- If a pump is commanded on and a run indication is not sensed for 30 seconds then an alarm will be generated.
2. Supply Water Temperature Alarm- If the hot water supply temperature is 5 °F above or below the setpoint and the pump is running then an alarm will be generated at the operator workstation.
3. Steam Pressure Alarm- If steam pressure is above or below the setpoint then an alarm will be generated at the operator workstation.
4. System Emergency shutdown

Diesel Generator

A. General

6. The diesel generator is monitored for alarming.

B. Alarming

7. There is one general alarm for multiple points monitored on the generator. If any one of the following points is detected, then an alarm will be generated at the operator workstation.
   a. Generator Run indication
   b. Day fuel oil tank fill indication
   c. Over crank indication
   d. Over speed indication
   e. Low battery indication
   f. Low water temperature indication
   g. High water temperature indication
   h. Low fuel level indication

i. Low oil pressure indication
j. Common alarm indication

8. All generator alarms except the Generator run and day fuel oil tank fill will cause the alarm dial out system to be enabled.

Heat Exchangers 1/1A Control

A. General

1. The heating hot water heat exchangers use low pressure steam from the central plant to heat heating hot water for use in hydronic perimeter radiation and cabinet unit heaters.
2. Heat exchanger 1 and 1A provide hot water to the perimeter radiation and cabinet unit heaters. The system consists of two, steam to hot water, converters and two pumps that operate with lead lag control. Each converter normally open steam valve.

B. Lead Lag control

1. The dual pump system will operate in the lead lag mode. One pump will be designated as the lead pump and will run continuously when called while the other pump acts as a standby pump.
2. The lead pump in the system will operate for the period specified by the lead time switch over variable (150 hours, default). When the pump run time has exceeded the specified time the lead pump will switch to the lag pump position and the lag pump will become the new lead pump. Both pumps will operate in this manner whenever they are called to run.

C. Pump Control

1. Pumps off

G. Both pumps will be off until the outside air temperature is less than the outside air converter 1 set point variable designated as (OATC 55°F default) (adj.).

2. Pumps On

H. When the outside air temperature is less than 55°F (enable set point) then the lead pump will be called to run. If the lead pump is commanded to run and there is no run indication for a period greater than the pump alarm delay (20 seconds, default) then the lead pump will be stopped, and an alarm will be generated to the operator workstation. If the lead pump has been running for at least 10 minutes and the outside air temperature is greater than the enable set point plus 5°F, then the pump will be commanded off.

D. Converter Valve Control

1. If either pump is running, then the BMS shall modulate the low-pressure steam valve of the heat exchanger to maintain the designated radiation loop supply temperature setpoint (adj.)

1. If the temperature is below setpoint, the steam valve shall be modulated open to raise the temperature of the water to the required setpoint.
2. If the temperature is above the setpoint, the steam valve shall be modulated closed to reduce the temperature of the water to the required setpoint.

3. Modulation of the steam valve shall be gradual to minimize the short cycling of the valve.

E. Hot Water Supply Set Point Control

1. The radiation hot water supply temperature set point is reset from 130°F at 60°F outside air temperature to 190°F at 0°F outside air temperature.

F. Alarming

1. Pump Run Alarm – If a pump is commanded on and a run indication is not sensed for 30 seconds then an alarm will be generated.
2. Pump Flow Problem Alarm – If a pump is commanded to run and status is not received within 20 seconds then the pump will be commanded off and the hot water pump problem will be enabled. If the pump problem is on for more than 300 seconds, then an alarm will be generated to the operator workstation. Once the pump problem is enabled the pump will not run until the alarm is manually reset at the operator workstation.
3. Loop Hot Water Supply Temperature Alarm – If the hot water supply temperature is not between 120 and 200 for over 250 seconds and either pump is running then an alarm will be generated at the operator workstation.

Heat Exchangers 2/2A Control

A. General

1. The heating hot water heat exchangers use low pressure steam from the central plant to heat heating hot water for use in hydronic reheat coils.
2. Heat exchangers 2 and 2A provide hot water to the reheat coils. The system consists of two, steam to hot water, converters and two pumps that operate with lead lag control. Each converter has an open steam valve.

B. Lead Lag control

1. The dual pump system will operate in the lead lag mode. One pump will be designated as the lead pump and will run continuously when called while the other pump acts as a standby pump.
2. The lead pump in the system will operate for the period specified by the lead time switch over variable (250 hours, default). When the pump run time has exceeded the specified time the lead pump will switch to the lag pump position and the lag pump will become the new lead pump. Both pumps will operate in this manner whenever they are called to run.

C. Pump Control

1. Pumps off

I. Both pumps will be off until the outside air temperature is less than the outside air converter 2 set point variable designated as (OAT 60°F default) (adj.)

2. Pumps On

J. When the outside air temperature is less than 60°F (enable set point) then the lead pump will be called to run. If the lead pump is commanded to run and there is no run indication for a period greater than the pump alarm delay (20 seconds, default) then the lead pump will be stopped, and an alarm will be generated to the operator workstation. If the lead pump has been running for at least 10 minutes and the outside air temperature is greater than the enable set point, then the pump will be commanded off.

D. Converter Valve Control

3. If either pump is running, then the BMS shall modulate the low-pressure steam valve of the heat exchanger to maintain the designated radiation loop supply temperature setpoint (adj.)
4. If the temperature is below setpoint, the steam valve shall be modulated open to raise the temperature of the water to the required setpoint.
5. If the temperature is above the setpoint, the steam valve shall be modulated closed to reduce the temperature of the water to the required setpoint.
6. Modulation of the steam valve shall be gradual to minimize the short cycling of the valve.

E. Hot Water Supply Set Point Control

1. The reheat hot water supply temperature set point is set at 150°F.

F. Alarming

1. Pump Run Alarm – If a pump is commanded on and a run indication is not sensed for 30 seconds then an alarm will be generated.
2. Pump Flow Problem Alarm – If a pump is commanded to run and status is not received within 20 seconds then the pump will be commanded off and the hot water pump problem flag will be enabled. If the pump problem is on for more than 300 seconds, then an alarm will be generated to the operator workstation. Once the pump problem is enabled the pump will not run until the alarm is manually reset at the operator workstation.
3. Loop Hot Water Supply Temperature Alarm – If the hot water supply temperature is not between 120 and 200 for over 250 seconds and either pump is running then an alarm will be generated at the operator workstation.

Refrigeration Control
(RS-1, RS-5, RS-6, RS-7, RS-8, RS-9, RS-10, RS-11, RS-12, RS-14, RS-17, RS-21, RS-22, RS-24, RS-25, RS-26, RS-27, RS-28B and RS-29A)

A. General

1. Refrigeration is monitor only for alarming. The high limits, low limits and design temperatures are user settable and can be adjusted at the front end to determine alarming parameters.

B. Alarming

1. Refrigeration High Alarm – If the box temperature exceeds the box high limit set point by over 2°F for more than 120 seconds then an alarm will be generated at the operator workstation.
2. Refrigeration Box Low Alarm – If the box temperature goes below the low limit set point by more than 120 seconds then an alarm will be generated at the operator workstation.
3. Refrigeration Dial Out Alarm – If the total number of refrigeration boxes in alarm increases and remains high for over 90 minutes then the system will enable the dial out alarm.

Miscellaneous Equipment

A. Sump Pump

1. The sump pump run indication is monitor only.
2. The High-level alarm is monitored for alarming. If the high-level alarm is on for more than 5 minutes, then an alarm is generated at the operator workstation.

B. Sewer Ejector pumps

1. The sewer ejector north and sewer ejector south are monitor only.
2. The sewer ejector high alarm is monitored for alarming. If the high-level alarm is on for more than 5 minutes, then an alarm is generated at the operator workstation.

C. Ice Pump Alarm

1. The ice pump alarm is monitored for alarming. If the ice pump alarm is on for more than 5 minutes, then an alarm is generated at the operator workstation.

D. Niagara Unit Alarm

1. The Niagara unit alarm is monitored for alarming. If the Niagara unit alarm is on for more than 5 minutes, then an alarm is generated at the operator workstation.

E. BAC Common Alarm

1. The BAC common unit alarm is monitored for alarming. If the BAC common unit alarm is on for more than 5 minutes, then an alarm is generated at the operator workstation.

F. Paratemp System

1. The Paratemp system is controlled by a stand alone control panel.
2. Refrigerated space temperature set at local controller.
3. Alarm input is an adjustable offset with adjustable time delay.
4. Actual refrigerated space temperature reported via remote sensor.
5. Calibrate local control operating sensor & remote sensor to be within 0.2°F.
6. Provide redundant high level alarm from remote sensor input.
7. Programmable outputs can be provided to control timed air defrost vis local relay.
8. Summary alarm output from Paratemp units.

9. Enable input to Paratemp units.
10. Enable input to ECU on 2°F Rise of RS-22 above setpoint.

J. PRODUCTS (Not Applicable)

K. EXECUTION (Not Applicable)

END OF SECTION 230993.11

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Steel pipe and fittings.
   2. Joining materials.
   3. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

   1. Pipe
   2. Fittings.
   3. Joining materials.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

   1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Pipe Brazing: : Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX or AWS B2.2 Standard for Brazing Procedure and Performance Qualification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Hot-Water Heating Piping: 150 psig at 200 deg F (93 deg C
2. Chilled-Water Piping: 150 psig 200 deg F

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

E. Wrought-Steel Fittings: ASTM A234/A234M, wall thickness to match adjoining pipe.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Steel Pipe Nipples: ASTM A733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Matco-Norca.
d. WATTS.
e. Wilkins.
f. Zurn Industries, LLC.

2. Description:

a. Standard: ASSE 1079.

b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 150 psig (1035 kPa)
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder- joint copper alloy and threaded ferrous.

C. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig (1035 kPa)

c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

D. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements,available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Elster Perfection Corporation.
b. Grinnell G-Fire by Johnson Controls Company.
c. Matco-Norca.
2. Description:

a. Standard: IAPMO PS 66.
b. Electroplated steel nipple, complying with ASTM F1545.
c. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C)
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping and chilled water piping, aboveground, NPS 2 (DN 50) and smaller, shall be one the following:

1. Schedule 40 steel pipe Class 150, malleable-iron fittings; steel flanges and flange fittings; and threaded joints.
2. Schedule 40 steel pipe Class 150, malleable-iron fittings; steel flanges and flange fittings; and welded joints.

B. Hot-water heating piping and chilled water piping, aboveground, NPS 2-1/2 (DN 65) and larger , shall be[any of] the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
2. Schedule 40 steel pipe; welded joints and fittings.
3. Schedule 40 steel pipe screwed joints and fittings.

C. Pipe shall match existing. Do NOT install copper piping in steel systems.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated

otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

M. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

N. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

O. Install valves according to the following:

1. Section 230523.11 "Globe Valves for HVAC Piping."
2. Section 230523.12 "Ball Valves for HVAC Piping."
3. Section 230523.13 "Butterfly Valves for HVAC Piping."
4. Section 230523.14 "Check Valves for HVAC Piping."
5. Section 230523.15 "Gate Valves for HVAC Piping."

P. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

S. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

T. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements

for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric nipples.

C. Dielectric Fittings for NPS 2-1/2 and larger): Use dielectric flange kits

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

C. Install hangers for steel piping, with maximum horizontal spacing of 12 feet and maximum

vertical spacing of 15 feet and minimum rod diameters, to comply with MSS-58, section 305 of the NYS Mechanical Code, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 18 inches (300 mm) of each fitting and coupling.

E. Support vertical runs of steel piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gauges and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use

drains installed at low points for complete draining of test liquid.

3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall be a minimum of 100 psig and shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. Comply with NYS Mechanical Code Chapter 12 for hydronic pipe testing.
6. After hydrostatic test pressure has been applied for at least 15 minutes as per Section 1208 of the NYS Mechanical Code, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
7. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232213 - STEAM AND CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes pipe and fittings for LP steam and condensate piping:

1. Steel pipe and fittings.
2. Joining materials.

B. Related Requirements:

1. Section 232216 "Steam and Condensate Heating Piping Specialties" for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Steel pipe and fitting.
2. Joining material.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Other building services.
3. Structural members.

B. Qualification Data: For Installer, including welding procedure(s).

C. Welding certificates.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

1. .

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to the following:

1. ASME Compliance: Comply with ASME B31.1, "Power Piping," and ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current. Certification shall be specific to the welding type and orientation required for the installation. Submit pipe welding procedures.

D. The contractor is notified that EME and DASNY will perform visual inspections of welds and welding procedures. These inspections will include verification/ review of welder qualification, welding procedure, welding procedure qualification record, and visual inspection of the welds. Suspect welds may be subject to CWI inspection.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:

1. LP Steam Piping: 10 to 15 psi.
2. Condensate Piping: 0 psig at 212 deg F.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, plain ends, welded and seamless, Grade B, and Schedule as indicated in piping applications articles.

B. Malleable-Iron Threaded Fittings: ASME B16.3; Classes 150 and 300 as indicated in piping applications articles.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in piping applications articles.

D. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

E. Wrought-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.

2. End Connections: Butt welding.
3. Facings: Raised face.

F. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, black steel of same Type, Grade, and Schedule as pipe in which installed.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

D. Welding Materials: Comply with Section II, Part C, of ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

PART 3 - EXECUTION

3.1 LP STEAM PIPING APPLICATIONS

A. LP Steam Piping, NPS 2 (DN 50) and Smaller Schedule 40, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

B. LP Steam Piping, NPS 2-1/2 through NPS 12: Schedule 40, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.

C. Condensate piping above grade, NPS 2 and smaller, shall be the following:

1. Schedule 80, Type S, Grade B, steel pipe; Class 125 cast-iron fittings; and threaded joints.

D. Condensate piping above grade, NPS 2-1/2 and larger, shall be the following:

1. Schedule 80, Type E, Grade B, steel pipe; Class 150 wrought-steel fittings, flanges, and flange fittings; and welded and flanged joints.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless otherwise indicated.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

K. Install drains, consisting of a tee fitting, NPS 3/4 full port-ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

L. Install steam supply piping at a minimum uniform grade of 0.2 percent downward in direction of steam flow.

M. Install condensate return piping at a minimum uniform grade of 0.4 percent downward in direction of condensate flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side down.

O. Install valves according to the following Sections or other Sections as needed:
   1. Section 230523.15 "Gate Valves for HVAC Piping."

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

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S. Install strainers on supply side of control valves, pressure-reducing valves, traps, and elsewhere as indicated. Install NPS 3/4 nipple and full port ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

T. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

3.3 STEAM AND CONDENSATE PIPING SPECIALTIES INSTALLATION

A. Comply with requirements in Section 232216 "Steam and Condensate Heating Piping Specialties" for installation requirements for strainers, flash tanks, special-duty valves, steam traps, thermostatic air vents and vacuum breakers, and steam and condensate meters.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for installation of hangers, supports, and anchor devices.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.

C. Install hangers for steel steam supply piping and steel steam condensate piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting.

E. Support vertical runs of steel steam supply piping and steel steam condensate piping to comply with MSS-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

E. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install vacuum breakers downstream from control valve, close to coil inlet connection.

3.7 FIELD QUALITY CONTROL

A. Prepare steam and condensate piping according to ASME B31.1, "Power Piping," and ASME B31.9, "Building Services Piping," and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush system with clean water. Clean strainers.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength.

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3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
4. If the contractor chooses an alternative test procedure, submit alternative testing procedure to Engineer. Alternatives will be approved at the sole discretion of the Engineer.
5. Comply with ASME and the NYS Mechanical Code for all testing.

D. Prepare test and inspection reports.

END OF SECTION 232213

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SECTION 232216 - STEAM AND CONDENSATE HEATING PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Welder’s Certificates specified under 232213

1.2 SUMMARY

A. Section includes the following piping specialties for steam and condensate piping:
   1. Steam meters

B. Related Requirements:

   1. Section 230523.12 "Ball Valves for HVAC Piping" for specification and installation requirements for ball valves common to most piping systems.
   2. Section 230523.15 "Gate Valves for HVAC Piping" for specification and installation requirements for gate valves common to most piping systems.
   3. Section 230923.11. "Control Valves" for automatic control valve and sensor specifications, installation requirements, and locations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Valve.
   2. Connector.
   3. Meters.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For valves, safety valves, pressure-reducing valves, steam traps, air vents, vacuum breakers, and meters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to the following:

1. ASME Compliance: Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp flash tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:

1. LP Steam Piping: 0 to 15 psi.

2.2 STEAM METERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Spirax Sarco, Model # RIM20-VTP-S-L-D-AC-1B-P1-PNPTR-E Turbine Insertion Flowmeter
2. Approved or Equal

B. Principle of Operation: The meter shall use the local velocity, pipe size and Reynolds number to calculate the average steam velocity and volumetric flow rate. The meter shall perform real time calculation of energy consumption

C. Material: Wetted surface shall be 316L stainless steel.

D. Temperature Range: -330°F to 500°F.

E. Ambient temperature -40°F to 140°F

F. Meters shall have a microprocessor to display totalizer flow, flow rate, temperature, pressure, time, and date; alarms for high and low flow rate and temperature.

1. Computer shall have 4- to 20-mA or 2- to 10-V output for temperature, pressure, and contact closure for flow increments.
2. Independent timers to store four peak flow rates and total flow.
3. Interface compatible with central workstation described in Section 230923 "Direct Digital Control (DDC) System for HVAC."
4. Microprocessor Enclosure: NEMA 250, Type 4.
5. Pulse output to interface with OMH WEAM system.

G. Sensor: Turbine type with stainless-steel wetted parts; and with velocity, temperature, and pressure sensors. removable and serviceable without shutting down the process.

H. Meter Accuracy:
   1. Mass Flow rate: +- 2% of rate
   2. Temperature: +- 2°F
   3. Pressure: +- 0.3% of full scale
   4. Density: +- 0.5% of reading

I. Provide steam line fittings with nipple and valve so meter can be removed without turning off steam supply.

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff duty valves at branch connections to steam supply mains, at steam supply connections to equipment.

3.2 PIPING INSTALLATION

A. Install piping to permit valve servicing.

B. Install valves according to Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."

C. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment and elsewhere as indicated.

D. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment as necessary.

3.3 Commissioning

A. Retain the services of the manufacturer’s representative to approve the steam meters’ installation, verify the operation of the steam meters, verify start-up of the meters.

B. Submit start-up forms to Engineer for review and approval.

C. Coordinate all work, start-up, operation verification and training with the commissioning authority.

END OF SECTION 232216

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233113 "Metal Ducts"
3. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, and turning vanes.

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top and bottom of ducts.
5. Dimensions of all duct runs from building grid lines.
6. Fittings.

7. Reinforcement and spacing.
8. Seam and joint construction.
9. Equipment installation based on equipment being used on Project.
10. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
11. Hangers and supports, including methods for duct and building attachment

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.6 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Airstream Surfaces: Surfaces in contact with airstream shall comply with requirements in ASHRAE 62.1.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Startup."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

E. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches (914 mm), select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches (914 mm) or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible. All longitudinal seams shall be Pittsburgh lock seams unless otherwise specified for specific application.

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. For ducts exposed to weather, construct of Type 304 stainless steel indicated by manufacturer to be suitable for outdoor installation.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than [60 (1524)] Inches (mm) in Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A653/A653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Tie Rods: Galvanized steel, 1/4-inch- (6-mm-) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch- (10-mm-) minimum diameter for lengths longer than 36 inches (900 mm).

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL. Conform to the NYS Mechanical Code and UL 181 as required.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.

E. Steel Cable End Connections: Galvanized-steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Install dampers, and all other duct-mounted accessories in air ducts where indicated on Drawings, specifications, and as required to progress the work.

J. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation.

K. Elbows: Use long-radius elbows wherever they fit.

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.
2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches (300 mm) and smaller and a minimum of five segments for 14 inches (350 mm) and larger.

L. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCTWORK EXPOSED TO WEATHER

A. All external joints are to have secure watertight mechanical connections. Seal all openings to provide weatherproof construction.

B. Construct ductwork to resist external loads of wind, snow, ice, and other effects of weather. Provide necessary supporting structures.

C. Single Wall:
1. Ductwork shall be galvanized steel.

a. If duct outer surface is uninsulated, protect outer surface with suitable paint. Paint materials and application requirements are specified in Section 099113 "Exterior Painting."

b. If ductwork is exposed and non insulated stainless steel or aluminum construction is required.

2. Where ducts have external insulation, provide weatherproof aluminum jacket. See Section 230713 "Duct Insulation."

3.4 DUCT SEALING

A. All ducts shall be sealed to SMACNA Seal Class A, as defined in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible." All seams, joints and penetrations are to be sealed.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts or structural-steel fasteners appropriate for construction materials to which hangers are being attached. Powder actuated fasteners are not permitted.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2,

"Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1220 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. All duct installations shall be visually inspected for leaks. If leaks are found, the contractor shall test ducts to Leakage Class 4 and comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.

3.8 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.
2. All ducts to be Seal Class A and Leakage Class 4. Ducts to be Pressure Class 3 “ w.c., Unless otherwise noted.
3. The ducts associated with AC-1 to be 6” w.c. AC-2 and HV-1 systems to be 4” w.c.

B. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

    a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

C. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

    a. Rectangular Main to Rectangular Branch: 45-degree entry.
    b. Rectangular Main to Round Branch: Conical spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

END OF SECTION 233113

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. RoHS: Restriction of Hazardous Substances.

B. VFC: Variable-frequency controller.

C. VFD: Variable-frequency drive.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: Indicate type, use, location, and termination locations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency and/or manufacturer's authorized service representative.

B. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

D. Conductor Insulation:

1. Type THHN and Type THWN-2: Comply with UL 83.
2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

E. VFD Cable:

1. Type TC-XLPE: Cable designed for use with VFD’s, with thicker, industrial grade XLPE insulations providing low capacitance for extended motor life, reduced likelihood of corona discharge, reduced magnitude of standing waves and increased efficiency of power transfer. Cable shall be Belden or equivalent.

2. Type TC-ER: Cable designed for use with VFCs, with oversized crosslinked polyethylene insulation, spiral-wrapped foil plus 85 percent coverage braided shields and insulated full-size ground wire, and sunlight- and oil-resistant outer PVC jacket.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description:
1. A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
2. A full sized insulated copper ground conductor.

B. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. RoHS compliant.

4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

C. Circuits:

1. Single circuit and multicircuit with color-coded conductors.

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Ground Conductor: Insulated.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.

G. Armor: Steel, interlocked.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One or Two hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Feeders: Copper for feeders smaller than No. 4 AWG; copper for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway, Armored cable, Type MC.

B. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway and Underground feeder cable, Type UF.

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway and Armored cable, Type MC.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway and Underground branch-circuit cable, Type UF.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material [and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:

   a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
   b. Test bolted connections for high resistance using one of the following:

      1) A low-resistance ohmmeter.
      2) Calibrated torque wrench.
      3) Thermographic survey.

   c. Inspect compression-applied connectors for correct cable match and indentation.
   d. Inspect for correct identification.
   e. Inspect cable jacket and condition.
   f. Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable for a one-minute duration.
   g. Continuity test on each conductor and cable.

h. Uniform resistance of parallel conductors.

3. Initial Infrared Scanning: After Substantial Completion, but before Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.

   a. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
   b. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Cables will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports to record the following:

1. Procedures used.
2. Results that comply with requirements.
3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Backboards.
2. Category 5e balanced twisted pair cable.
3. Category 6 balanced twisted pair cable.
4. Category 6a balanced twisted pair cable.
5. Balanced twisted pair cabling hardware.
6. RS-485 cabling.
7. Low-voltage control cabling.
8. Control-circuit conductors.
9. Identification products.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

C. Plenum: A space forming part of the air distribution system to which one or more air ducts are connected. An air duct is a passageway, other than a plenum, for transporting air to or from heating, ventilating, or air-conditioning equipment.

D. RCDD: Registered Communications Distribution Designer.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency, RCDD, layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

1. Flame Travel Distance: 60 inches or less.
2. Peak Optical Smoke Density: 0.5 or less.
3. Average Optical Smoke Density: 0.15 or less.

C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

E. RoHS compliant.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

2.3 CATEGORY 5e BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.

B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.

C. Conductors: 100-ohm, 24 AWG solid copper.

D. Shielding/Screening: Shielded twisted pairs (FTP).

E. Cable Rating: Plenum.

F. Jacket: White thermoplastic.

2.4 CATEGORY 6 BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.

B. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Shielded twisted pairs (FTP).

E. Cable Rating: Plenum.

F. Jacket: White thermoplastic.

2.5 CATEGORY 6a BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz.

B. Standard: Comply with TIA-568-C.2 for Category 6a cables.

C. Conductors: 100-ohm, 23 AWG solid copper.

D. Shielding/Screening: Shielded twisted pairs (FTP).

E. Cable Rating: Plenum.

F. Jacket: White thermoplastic.

2.6 BALANCED TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable

B. General Requirements for Balanced Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain balanced twisted pair cable hardware from same manufacturer as balanced twisted pair cable, from single source.

D. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated.

G. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with an eight-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
2. Patch cords shall have color-coded boots for circuit identification.

H. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
3. Marked to indicate transmission performance.

I. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standards:

a. Category 5e, unshielded balanced twisted pair cable shall comply with IEC 60603-7-2.
b. Category 5e, shielded balanced twisted pair cable shall comply with IEC 60603-7-3.
c. Category 6, unshielded balanced twisted pair cable shall comply with IEC 60603-7-4.
d. Category 6, shielded balanced twisted pair cable shall comply with IEC 60603-7.5.
e. Category 6a, unshielded balanced twisted pair cable shall comply with IEC 60603-7-41.
f. Category 6a, shielded balanced twisted pair cable shall comply with IEC 60603-7.51.

4. Marked to indicate transmission performance.

J. Faceplate:

1. Two port, vertical single-gang faceplates designed to mount to single-gang wall boxes.
2. Twelve port, vertical double-gang faceplates designed to mount to double-gang wall boxes.
3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
4. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
5. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

K. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.7 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pair, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.

5. Flame Resistance: NFPA 262.

2.8 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1685.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.9 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test twisted pair cables according to TIA-568-C.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
2. Outlet boxes for cables shall be no smaller than 4 inches square by 2-1/8 inches deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.
3. Flexible metal conduit shall not be used.

B. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

D. Raceway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering the room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

E. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.

6. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lie on removable ceiling tiles.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.
14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
15. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Do not untwist balanced twisted pair cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.
2. Use insulated spade lugs for wire and cable connection to screw terminals.
3. Comply with requirements specified in Section 260533 "Raceways and Boxes for Electrical Systems."

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Below each feed point, neatly coil a minimum of 72 inches of cable in a coil not less than 12 inches diameter.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-D recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 5 inches
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment or Circuit Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment or Circuit Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment or Circuit Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or 5 HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

D. Perform tests and inspections.

E. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination, but not after cross-connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in its "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in its "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

F. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

G. End-to-end cabling will be considered defective if it does not pass tests and inspections.

H. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

B. Related Requirements:

1. Section 260548.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Slotted support systems, hardware, and accessories.
b. Clamps.
c. Hangers.
d. Sockets.
e. Eye nuts.
f. Fasteners.
g. Anchors.
h. Saddles.
i. Brackets.

2. Include rated capacities and furnished specialties and accessories.

B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated-Design Submittal: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Ductwork, piping, fittings, supports and sprinklers.
3. Structural members to which hangers and supports will be attached.

B. Seismic Qualification Data: Certificates, for hangers and supports for electrical equipment and systems, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M or AWS D1.2/D1.2M.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M.
2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified and the supported equipment and systems will be fully operational after the seismic event."
2. Component Importance Factor: 1.0.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D 635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
2. Material for Channel, Fittings, and Accessories: Galvanized steel.
3. Channel Width: Selected for applicable load criteria.
4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
7. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.
4. NECA 105.
5. NECA 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least [25] <Insert number> percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps using spring friction action for retention in support channel.

F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and RMC may be supported by openings through structure members, according to NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
2. To Existing Concrete: Expansion anchor fasteners.
3. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
4. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, complying with MSS SP-69.
5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Metal wireways and auxiliary gutters.
3. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 078400 "Firestopping" for firestopping at conduit and box entrances.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. EMT: Electric metallic tubing.

C. RMC: Rigid metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

D. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:
1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. GRC: Comply with ANSI C80.1 and UL 6.
3. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
    a. Comply with NEMA RN 1.
    b. Coating Thickness: 0.040 inch, minimum.
4. EMT: Comply with ANSI C80.3 and UL 797.
5. FMC: Comply with UL 1; zinc-coated steel.

B. Metal Fittings:
1. Comply with NEMA FB 1 and UL 514B.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
    a. Material: Steel.
    b. Type: Compression.

6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R or Type 4 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Hinged type or Screw-cover type unless otherwise indicated.

D. Finish: Manufacturer's standard enamel finish.

2.3 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Construction Manager and/or Prime coated, ready for field painting.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

H. Gangable boxes are allowed.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R or Type 4 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

J. Cabinets:

1. NEMA 250, Type 1, Type 3R or Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC, RMC.
2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or Type 4.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT, GRC or RMC.
2. Exposed, Not Subject to Severe Physical Damage: EMT, GRC OR RMC.
3. Exposed and Subject to Severe Physical Damage: GRC or RMC. Raceway locations include the following:

   a. Mechanical rooms.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

C. Do not fasten conduits onto the bottom side of a metal deck roof.

D. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

E. Complete raceway installation before starting conductor installation.

F. Arrange stub-ups so curved portions of bends are not visible above finished slab.

G. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

H. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.

I. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

J. Support conduit within 12 inches of enclosures to which attached.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Conduit extending from interior to exterior of building.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078400 “Firestopping."

3.5 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve seal systems.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Wall Sleeves, Steel:

1. Description: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

B. Wall Sleeves, Cast Iron:

1. Description: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.

C. Pipe Sleeves, PVC:

1. Description: ASTM D1785, Schedule 40.

D. Molded Sleeves, PVC:

1. Description: With nailing flange for attaching to wooden forms.

E. Molded Sleeves, PE or PP:

1. Description: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sheet Metal Sleeves, Galvanized Steel, Round:

1. Description: Galvanized-steel sheet; thickness not less than 0.0239-inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 RECTANGULAR SLEEVES

A. Sheet Metal Sleeves, Galvanized Steel, Rectangular:

1. Description:

a. Material: Galvanized sheet steel.
b. Minimum Metal Thickness:

1) For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness must be 0.052 inch.
2) For sleeve cross-section rectangle perimeter not less than 50 inches or with one or more sides larger than 16 inches, thickness must be 0.138 inch.

2.3 SLEEVE SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Description: Single-component, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.6 FOAM SEALANTS

A. Description: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless sleeve seal system is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

C. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

D. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.2 INSTALLATION OF RECTANGULAR SLEEVES AND SLEEVE SEALS

A. Install sleeves in existing walls without compromising structural integrity of walls. Do not cut structural elements without reinforcing the wall to maintain the designed weight bearing and wall stiffness.

B. Install conduits and cable with no crossings within the sleeve.

C. Fill opening around conduits and cables with expanding foam without leaving voids.

D. Provide metal sheet covering at both wall surfaces and finish to match surrounding surfaces. Metal sheet must be same material as sleeve.

3.3 INSTALLATION OF SLEEVE SEAL SYSTEMS

A. Install sleeve seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Color and legend requirements for raceways, conductors, and warning labels and signs.
2. Labels.
3. Bands and tubes.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.
8. Paint for identification.
9. Fasteners for labels and signs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with ASME A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Comply with NFPA 70E requirements for arc-flash warning labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

B. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded branch-circuit conductors.

1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.

2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

3. Color for Neutral: White.
4. Color for Equipment Grounds: Bare copper or Green.
5. Colors for Isolated Grounds: Green with white stripe.

C. Warning Label Colors:

1. Identify system voltage with black letters on an orange background.

D. Warning labels and signs shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

E. Equipment Identification Labels:

1. Black letters on a white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

B. Snap-around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

C. Self-Adhesive Wraparound Labels: [Preprinted] [Write-on], 3-mil-thick, [polyester] [vinyl] flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil-thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

   a. 1-1/2 by 6 inches for raceway and conductors.
   b. 3-1/2 by 5 inches for equipment.
   c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameters sized to suit diameters and that stay in place by gripping action.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at a maximum of 200 deg F. Comply with UL 224.

2.5 TAPES

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.

C. Floor Marking Tape: 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch or 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

C. Write-on Tags:
1. Polyester Tags: 0.010 inch or 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
3. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396-inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inches.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. in., minimum 1/16 inch thick.
b. For signs larger than 20 sq. in., 1/8 inch thick.
c. Engraved legend with black letters on white face.

d. Punched or drilled for mechanical fasteners with 1/4-inch grommets in corners for mounting or Self-adhesive.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of each item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

I. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.

J. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

1. "POWER."

K. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at a location with high visibility and accessibility.

2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to the location and substrate.

L. Snap-around Labels: Secure tight to surface at a location with high visibility and accessibility.

M. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

N. Self-Adhesive Labels:

1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.

O. Snap-around Color-Coding Bands: Secure tight to surface at a location with high visibility and accessibility.

P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at a location with high visibility and accessibility.

Q. Marker Tapes: Secure tight to surface at a location with high visibility and accessibility.

R. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

S. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

T. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.

U. Metal Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose plenum-rated cable ties.

V. Nonmetallic Preprinted Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose plenum-rated cable ties.

W. Write-on Tags:

1. Place in a location with high visibility and accessibility.
2. Secure using general-purpose plenum-rated cable ties.

X. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on minimum 1-1/2-inch-high sign; where two lines of text are required, use signs minimum 2 inches high.

Y. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

Z. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high sign; where two lines of text are required, use labels 2 inches high.

AA. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels or vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

D. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

1. "POWER."

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels, self-adhesive wraparound labels, snap-around labels, snap-around color-coding bands or self-adhesive vinyl tape to identify the phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: Marker tape or Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

J. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels or Baked-enamel warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Controls with external control power connections.

M. Arc Flash Warning Labeling: Self-adhesive labels.

N. Operating Instruction Signs: Self-adhesive labels or Baked-enamel warning signs.

O. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label or Baked-enamel signs.
2. Outdoor Equipment: Laminated acrylic or melamine sign or Stenciled legend 4 inches high.
3. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchboards.
    e. Motor-control centers.
    f. Variable-speed controllers.
    g. Push-button stations.
    h. Contactors.

END OF SECTION 260553

SECTION 262923 - VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes separately enclosed, preassembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

B. Related Requirements:

1. Section 262419 "Motor-Control Centers" for VFCs installed in motor-control centers.

1.3 DEFINITIONS

A. CE: Conformite Europeene (European Compliance).

B. CPT: Control power transformer.

C. DDC: Direct digital control.

D. EMI: Electromagnetic interference.

E. LED: Light-emitting diode.

F. NC: Normally closed.

G. NO: Normally open.

H. OCPD: Overcurrent protective device.

I. PID: Control action, proportional plus integral plus derivative.

J. RFI: Radio-frequency interference.

K. VFC: Variable-frequency motor controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFC indicated.

1. Include dimensions and finishes for VFCs.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For each VFC indicated.

1. Include mounting and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Required working clearances and required area above and around VFCs.
2. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements.
3. Show support locations, type of support, and weight on each support.
4. Indicate field measurements.

B. Qualification Data: For testing agency.

C. Seismic Qualification Data: Certificates, for each VFC, accessories, and components, from manufacturer.

1. Certificate of compliance.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

D. Product Certificates: For each VFC from manufacturer.

E. Harmonic Analysis Report: Provide Project-specific calculations and manufacturer's statement of compliance with IEEE 519.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and motor-circuit protector trip settings.
b. Manufacturer's written instructions for setting field-adjustable overload relays.
c. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
d. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
e. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.
f. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.
4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

1.9 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General Requirements for VFCs:

1. VFCs and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508A.

B. Application: Constant torque

C. VFC Description: Variable-frequency motor controller, consisting of power converter that employs pulse-width-modulated inverter, factory built and tested in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors, as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."
3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

D. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

E. Output Rating: Three phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

F. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 15 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 96 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 98 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 100 kA.
7. Ambient Temperature Rating: Not less than 32 deg F and not exceeding 104 deg F.
8. Humidity Rating: Less than 95 percent (noncondensing).
9. Altitude Rating: Not exceeding 3300 feet.
10. Vibration Withstand: Comply with NEMA ICS 61800-2.
11. Overload Capability: 1.5 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
12. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
13. Speed Regulation: Plus or minus 5 percent.
14. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
15. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

G. Inverter Logic: Microprocessor based, 32 bit, isolated from all power circuits.

H. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.

I. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 0.1 to 999.9 seconds.
4. Deceleration: 0.1 to 999.9 seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

J. Self-Protection and Reliability Features:

1. Surge Suppression: Factory installed as an integral part of the VFC, complying with UL 1449 SPD, Type 1 or Type 2.
2. Surge Suppression: Field-mounted surge suppressors complying with Section 264313 "Surge Protection for Low-Voltage Electrical Power Circuits," UL 1449 SPD, Type 2.
3. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
4. Under- and overvoltage trips.
5. Inverter overcurrent trips.

6. VFC and Motor-Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor-overload alarm and trip; settings selectable via the keypad.
7. Critical frequency rejection, with **three** selectable, adjustable deadbands.
8. Instantaneous line-to-line and line-to-ground overcurrent trips.
9. Loss-of-phase protection.
10. Reverse-phase protection.
11. Short-circuit protection.
12. Motor-overtemperature fault.

K. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

L. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

M. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

N. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

O. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

P. Integral Input Disconnecting Means and OCPD: UL 489, molded-case switch, with power fuse block and current-limiting with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
3. Auxiliary Contacts: NO or NC, arranged to activate before switch blades open.
4. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
5. NC alarm contact that operates only when circuit breaker has tripped.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: VFCs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. The designated VFCs shall be tested and certified by an NRTL as meeting the ICC-ES AC 156 test procedure requirements.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.3 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English-language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.

a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.

C. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display and additional readout devices as required, mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

a. A minimum of two programmable analog inputs: 0- to 10-V dc.
b. A minimum of six multifunction programmable digital inputs.

2. Pneumatic Input Signal Interface: 3 to 15 psig.
3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the DDC system for HVAC or other control systems:

a. 0- to 10-V dc.
b. 4- to 20-mA dc.
c. Potentiometer using up/down digital inputs.
d. Fixed frequencies using digital inputs.

4. Output Signal Interface: A minimum of one programmable analog output signal(s) (0 to 10-V dc) which can be configured for any of the following:

a. Output frequency (Hz).
b. Output current (load).
c. DC-link voltage (V dc).
d. Motor torque (percent).
e. Motor speed (rpm).
f. Set point frequency (Hz).

5. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.
b. Set point speed reached.
c. Fault and warning indication (overtemperature or overcurrent).
d. PID high- or low-speed limits reached.

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

1. Number of Loops: Two

G. Interface with DDC System for HVAC: Factory-installed hardware and software shall interface with DDC system for HVAC to monitor, control, display, and record data for use in processing reports. VFC settings shall be retained within VFC's nonvolatile memory.

1. Hardwired Points:

a. Monitoring: On-off status,
b. Control: On-off operation,

2. Communication Interface: Comply with ASHRAE 135. Communication shall interface with DDC system for HVAC to remotely control and monitor lighting from a DDC system for HVAC operator workstation. Control features and monitoring points displayed locally at lighting panel shall be available through the DDC system for HVAC.

2.4 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: Based on the manufacturer's harmonic analysis study and report, provide input filtering, as required, to limit total demand (harmonic current) distortion and total harmonic voltage demand at the defined point of common coupling to meet IEEE 519 recommendations.

B. EMI/RFI Filtering: CE marked; certify compliance with IEC 61800-3 for Category C2

2.5 BYPASS SYSTEMS

A. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

B. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor, and retransfer shall only be allowed with the motor at zero speed.

C. Bypass Mode: Field-selectable automatic or manual, allows local and remote transfer between power converter and bypass contactor and retransfer, either via manual operator interface or automatic-control system feedback.

D. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller**;** with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

E. Bypass Controller: Three-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter input and output and permit safe testing and troubleshooting of the power converter, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Input and Output Isolating Contactors: Non-load-break, NEMA-rated contactors.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

F. Bypass Contactor Configuration: Full-voltage (across-the-line) type.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
    b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: 200VA.

6. Overload Relays: NEMA ICS 2.

    a. Melting-Alloy Overload Relays:

        1) Inverse-time-current characteristic.
        2) Class 10 tripping characteristic.
        3) Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

    b. Bimetallic Overload Relays:

        1) Inverse-time-current characteristic.
        2) Class 10 tripping characteristic.
        3) Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
        4) Ambient compensated.
        5) Automatic resetting.

    c. Solid-State Overload Relays:

        1) Switch or dial selectable for motor-running overload protection.
        2) Sensors in each phase.
        3) Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
        4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
        5) Analog communication module.

    d. NC isolated overload alarm contact.
    e. External overload, reset push button.

2.6 OPTIONAL FEATURES

A. Multiple-Motor Capability: VFC suitable for variable-speed service to multiple motors. Overload protection shuts down VFC and motors served by it, and generates fault indications when overload protection activates.

1. Configure to allow two or more motors to operate simultaneously at the same speed; separate overload relay for each controlled motor.
2. Configure to allow two motors to operate separately; operator selectable via local or remote switch or contact closures; single overload relay for both motors; separate output magnetic contactors for each motor.
3. Configure to allow two motors to operate simultaneously and in a lead/lag mode, with one motor operated at variable speed via the power converter and the other at constant speed via the bypass controller; separate overload relay for each controlled motor.

B. Damper control circuit with end-of-travel feedback capability.

C. Sleep Function: Senses a minimal deviation of a feedback signal and stops the motor. On an increase in speed-command signal deviation, VFC resumes normal operation.

D. Motor Preheat Function: Preheats motor when idle to prevent moisture accumulation in the motor.

E. Terminals: Mode selection, controller status, and controller fault.

F. Remote digital operator kit.

G. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer.

2.7 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Other Wet or Damp Indoor Locations: Type 4.
3. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFC as "Plenum Rated."

2.8 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.

1. Push Buttons: Covered.
2. Pilot Lights: Push to test.
3. Selector Switches: Rotary type.
4. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

B. NC bypass contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

E. Supplemental Digital Meters:

1. Elapsed-time meter.
2. Kilowatt meter.
3. Kilowatt-hour meter.

F. Spare control-wiring terminal blocks; wired.

2.9 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.

1. Test each VFC while connected to a motor that is comparable to that for which the VFC is rated.
2. Verification of Performance: Rate VFCs according to operation of functions and features specified.

B. VFCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance of the Work.

B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Wall-Mounting Controllers: Install with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Floor-Mounting Controllers: Install VFCs on 4-inch nominal thickness concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Roof-Mounting Controllers: Install VFC on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.

1. Curbs and roof penetrations are specified in Section 077200 "Roof Accessories."
2. Structural-steel channels are specified in Section 260529 "Hangers and Supports for Electrical Systems."

D. Seismic Bracing: Comply with requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

F. Install fuses in each fusible-switch VFC.

G. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

H. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors are installed.

I. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

J. Comply with NECA 1.

3.3 CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Section 260523 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switches are in manual-control position.
2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor-overload protectors.

3.4 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Owner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform tests according to the Inspection and Test Procedures for Adjustable Speed Drives stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections, and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each VFC. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each VFC 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. VFCs will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of instantaneous-only circuit breakers and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to 6 times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed 8 times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers.

E. Set field-adjustable pressure switches.

3.8 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION 262923