



Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

PROJECT MANUAL

DATE: August 2023



**PREPARED BY:
SIGMA ENGINEERED SOLUTIONS, PC
5909 FALLS OF NEUSE RD SUITE 101
RALEIGH NC 27609
NC LICENSE NUMBER C-2490**

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SECTION 000107 - SEALS PAGE


This section includes the Professional Seals by Design Professionals and others responsible for preparing the Construction Documents.

PLUMBING, MECHANICAL,
AND FIRE PROTECTION:

SEAL LOCATION:

SIGMA ENGINEERED SOLUTIONS, PC

NAME: Brent Hanes
(print)


Digitally signed by Brent Hanes
Date: 2023.08.02 13:09:00 -04'00'
(signature)

034319
(professional number)



Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

ELECTRICAL:

SEAL LOCATION:

SIGMA ENGINEERED SOLUTIONS, PC

NAME: _____
Reginald D. Adams
(print)

DocuSigned by:
Mr. Reginald D. Adams
61D76000BFA2424...

(signature)

019658
(professional number)



8/2/2023

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01
Raleigh, North Carolina

ARCHITECTURAL:

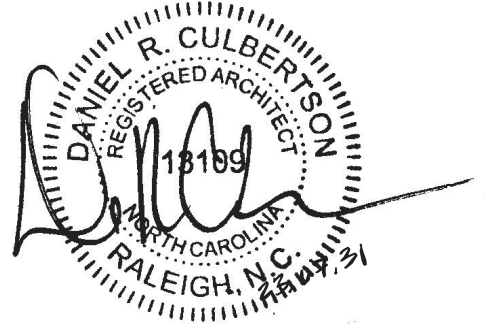
SEAL LOCATION:

PROVISION STUDIO

NAME: Daniel R. Culbertson
(print)


(signature)

13109
(professional number)



Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina


STRUCTURAL:



SEAL LOCATION:

LYSAGHT & ASSOCIATES

NAME: Mark R. Blankinship
(print)


(signature)

046123
(professional number)

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

CIVIL ENGINEER:

SEAL LOCATION:

CLH Design, PA

NAME: Steven J. Miller
(print)


(signature)

022625
(professional number)



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Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

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Form of Construction Contract

Form of Performance Bond

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APPENDIX 1: Asbestos Survey Report

ADVERTISEMENT FOR BIDS

Sealed proposals will be received until 3:00 pm on Wednesday, September 13th, 2023 at NCSU Administrative Building III, conference room 301.

for the construction of

Poe Hall – Fire Protection System Improvements

at which time and place bids will be opened and read.

Complete plans and specifications for this project can be obtained from:

Sigma Engineered Solutions, P.C.
5909 Falls of Neuse Rd, Suite 101
Raleigh NC 27609

during normal office hours after August 7th, 2023.

Plan Deposit \$100

The state reserves the unqualified right to reject any and all proposals.

Pre-Bid meeting will be held at NCSU Administrative Building III, conference room 301 at 2:00 pm Wednesday August 23rd.

Preferred manufacturers for mechanical door hardware are listed in the 012300 - Alternate section of the specifications. A preferred manufacturers' meeting will be held at NCSU Administrative Building III, conference room 301 at 2:30 pm Wednesday August 23rd.

Signed: North Carolina State University

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NOTICE TO BIDDERS

Sealed proposals will be received by North Carolina State University in *Raleigh* NC, in the Administrative Building III, conference room 301, up to 3:00 pm, Wednesday, September 13, 2023, and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment entering into the construction of

Poe Hall – Fire Protection System Improvements NC State University, SCO ID#: 22-24502-01

Bids will be received for single prime. All proposals shall be lump sum.

Pre-Bid Meeting

An open Pre-Bid meeting will be held at NCSU Administrative Building III, conference room 301 at 2:00 pm Wednesday August 23rd. The meeting will address project specific questions, issues, bidding procedures and bid forms.

Preferred manufacturers for mechanical door hardware are listed in the 012300 - Alternate section of the specifications.

Complete plans, specifications and contract documents will be open for inspection in the offices of Sigma Engineered Solutions P.C. and in the plan rooms of the Associated General Contractors, Carolinas Branch, Raleigh in the local North Carolina offices of McGraw-Hill Dodge Corporation, and in the Eastern Regional Office of Reed Construction Data in Norcross, GA and in Minority Plan Rooms in

Hispanic Contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh Areas – 877-227-1680

NCIMED Plan & Resource Center, 114 West Parrish Street, 6th Floor, Durham, NC 27701, 919-956-8889 or 919-287-3036

or may be obtained by those qualified as prime bidders, upon deposit of One Hundred dollars (\$100) in cash or certified check. The full plan deposit will be returned to those bidders provided all documents are returned in good, usable condition within ten (10) days after the bid date.

If a contractor is bidding under the dual system both as a single prime contractor and as a separate prime contractor, he must submit the bids on separate forms and in separate envelopes. Bidders should clearly indicate on the outside of the bid envelope which contract(s) they are bidding.

NOTE: The bidder shall include with the bid proposal the form *Identification of Minority Business Participation* identifying the minority business participation it will use on the project and shall include either *Affidavit A* or *Affidavit B* as applicable. Forms and instructions are included within the Proposal Form in the bid documents. Failure to complete these forms is grounds for rejection of the bid. (GS143-128.2c Effective 1/1/2002.)

All contractors are hereby notified that they must have proper license as required under the state laws governing their respective trades.

General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for Unlimited Building Construction.

NOTE--SINGLE PRIME CONTRACTS: Under GS 87-1, a contractor that superintends or manages construction of any building, highway, public utility, grading, structure or improvement shall be deemed a SCO-Notice To Bidders 2010 – (Updated Dec. 2010)

“general contractor” and shall be so licensed. Therefore a single prime project that involves other trades will require the single prime contractor to hold a proper General Contractors license. **EXCEPT:** On public buildings being bid single prime, where the total value of the general construction does not exceed 25% of the total construction value, contractors under GS87- Arts 2 and 4 (Plumbing, Mechanical & Electrical) may bid and contract directly with the Owner as the SINGLE PRIME CONTRACTOR and may subcontract to other properly licensed trades. [GS87-1.1- Rules .0210](#)

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company, insured by the Federal Deposit Insurance Corporation, of an amount equal to not less than five percent (5%) of the proposal, or in lieu thereof a bidder may offer a bid bond of five percent (5%) of the bid executed by a surety company licensed under the laws of North Carolina to execute the contract in accordance with the bid bond. Said deposit shall be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten days after the award or to give satisfactory surety as required by law.

A performance bond and a payment bond will be required for one hundred percent (100%) of the contract price.

Payment will be made based on ninety-five percent (95%) of monthly estimates and final payment made upon completion and acceptance of work.

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of 30 days.

The owner reserves the right to reject any or all bids and to waive informalities.

Designer:

**Sigma Engineered Solutions, PC
5909 Falls of Neuse Rd., Suite 101
Raleigh NC 27609
919-840-9300**

Owner:

**North Carolina State University
Design and Construction Services
Box 7261, Raleigh, NC 27695-7216**

**INSTRUCTIONS TO BIDDERS
AND
GENERAL CONDITIONS OF THE CONTRACT**

STANDARD FORM FOR CONSTRUCTION PROJECTS

**STATE CONSTRUCTION OFFICE
NORTH CAROLINA
DEPARTMENT OF ADMINISTRATION**

Form OC-15

This document is intended for use on State capital construction projects and shall not be used on any project that is not reviewed and approved by the State Construction Office. Extensive modification to the General Conditions by means of “Supplementary General Conditions” is strongly discouraged. State agencies and institutions may include special requirements in “Division 1 – General Requirements” of the specifications, where they do not conflict with the General Conditions.

Twenty Fourth Edition January 2013

INSTRUCTIONS TO BIDDERS

For a proposal to be considered it must be in accordance with the following instructions:

1. PROPOSALS

Proposals must be made in strict accordance with the Form of Proposal provided therefor, and all blank spaces for bids, alternates, and unit prices applicable to bidder's work shall be properly filled in. When requested alternates are not bid, the proposer shall so indicate by the words "No Bid". Any blanks shall also be interpreted as "No Bid". The bidder agrees that bid on Form of Proposal detached from specifications will be considered and will have the same force and effect as if attached thereto. Photocopied or faxed proposals will not be considered. Numbers shall be stated both in writing and in figures for the base bids and alternates. If figures and writing differ, the written number will supersede the figures.

Any modifications to the Form of Proposal (including alternates and/or unit prices) will disqualify the bid and may cause the bid to be rejected.

The bidder shall fill in the Form of Proposal as follows:

- a. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.
- b. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.
- c. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.
- d. If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable.
- e. All signatures shall be properly witnessed.
- f. If the contractor's license of a bidder is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the proposal. The title "Licensee" shall appear under his/her signature.

Proposals should be addressed as indicated in the Advertisement for Bids and be delivered, enclosed in an opaque sealed envelope, marked "Proposal" and bearing the title of the work, name of the bidder, and the contractor's license number of the bidder. Bidders should clearly mark on the outside of the bid envelope which contract(s) they are bidding.

Bidder shall identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts or an affidavit indicating work under contract will be self-performed, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f). Failure to comply with these requirements is grounds for rejection of the bid.

For projects bid in the single-prime alternative, the names and license numbers of major subcontractors shall be listed on the proposal form.

It shall be the specific responsibility of the bidder to deliver his bid to the proper official at the selected place and prior to the announced time for the opening of bids. Later delivery of a bid for any reason, including delivery by any delivery service, shall disqualify the bid.

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the contractor's cost involved in the work. See General Conditions, Article 19c-1.

2. EXAMINATION OF CONDITIONS

It is understood and mutually agreed that by submitting a bid the bidder acknowledges that he has carefully examined all documents pertaining to the work, the location, accessibility and general character of the site of the work and all existing buildings and structures within and adjacent to the site, and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, the character, quality and quantity of the material to be encountered, the character of the equipment, machinery, plant and any other facilities needed preliminary to and during prosecution of the work, the general and local conditions, the construction hazards, and all other matters, including, but not limited to, the labor situation which can in any way affect the work under the contract, and including all safety measures required by the Occupational Safety and Health Act of 1970 and all rules and regulations issued pursuant thereto. It is further mutually agreed that by submitting a proposal the bidder acknowledges that he has satisfied himself as to the feasibility and meaning of the plans, drawings, specifications and other contract documents for the construction of the work and that he accepts all the terms, conditions and stipulations contained therein; and that he is prepared to work in cooperation with other contractors performing work on the site.

Reference is made to contract documents for the identification of those surveys and investigation reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the work which have been relied upon by the designer in preparing the documents. The owner will make copies of all such surveys and reports available to the bidder upon request.

Each bidder may, at his own expense, make such additional surveys and investigations as he may deem necessary to determine his bid price for the performance of the work. Any on-site investigation shall be done at the convenience of the owner. Any reasonable request for access to the site will be honored by the owner.

3. BULLETINS AND ADDENDA

Any addenda to specifications issued during the time of bidding are to be considered covered in the proposal and in closing a contract they will become a part thereof. It shall be the bidder's responsibility to ascertain prior to bid time the addenda issued and to see that his bid includes any changes thereby required.

Should the bidder find discrepancies in, or omission from, the drawings or documents or should he be in doubt as to their meaning, he shall at once notify the designer who will send written instructions in the form of addenda to all bidders. Notification should be no later than seven (7) days prior to the date set for receipt of bids. Neither the owner nor the designer will be responsible for any oral instructions.

All addenda should be acknowledged by the bidder(s) on the Form of Proposal. However, even if not acknowledged, by submitting a bid, the bidder has certified that he has reviewed all issued addenda and has included all costs associated within his bid.

4. BID SECURITY

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or a bid bond in an amount equal to not less than five percent (5%) of the proposal, said deposit to be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract within ten (10) days after the award or to give satisfactory surety as required by law (G.S. 143-129).

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract. The owner may retain bid securities of any bidder(s) who may have a reasonable chance of award of contract for the full duration of time stated in the Notice to Bidders. Other bid securities may be released sooner, at the discretion of the owner. All bid securities (cash or certified checks) shall be returned to the bidders promptly after award of contracts, and no later than seven (7) days after expiration of the holding period stated in the Notice to Bidders. Standard Form of Bid Bond is included in these specifications and shall be used.

5. RECEIPT OF BIDS

Bids shall be received in strict accordance with requirements of the General Statutes of North Carolina. Bid security shall be required as prescribed by statute. Prior to the closing of the bid, the bidder will be permitted to change or withdraw his bid. Guidelines for opening of public construction bids are available from the State Construction Office.

6. OPENING OF BIDS

Upon opening, all bids shall be read aloud. Once bidding is closed, there shall not be any withdrawal of bids by any bidder and no bids may be returned by the designer to any bidder. After the opening of bids, no bid may be withdrawn, except under the provisions of General Statute 143-129.1, for a period of thirty days unless otherwise specified. Should the successful bidder default and fail to execute a contract, the contract may be awarded to the next lowest and responsible bidder. The owner reserves the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

- a. If the Form of Proposal furnished to the bidder is not used or is altered.
- b. If the bidder fails to insert a price for all bid items, alternate and unit prices requested.
- c. If the bidder adds any provisions reserving the right to accept or reject any award.
- d. If there are unauthorized additions or conditional bids, or irregularities of any kind which tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.
- e. If the bidder fails to complete the proposal form where information is requested so the bid may be properly evaluated by the owner.
- f. If the unit prices contained in the bid schedule are unacceptable to the owner and the State Construction Office.
- g. If the bidder fails to comply with other instructions stated herein.

7. BID EVALUATION

The award of the contract will be made to the lowest responsible bidder as soon as practical. The owner may award on the basis of the base bid and any alternates the owner chooses.

Before awarding a contract, the owner may require the apparent low bidder to qualify himself to be a responsible bidder by furnishing any or all of the following data:

- a. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the owner.
- b. A listing of completed projects of similar size.
- c. Permanent name and address of place of business.
- d. The number of regular employees of the organization and length of time the organization has been in business under present name.
- e. The name and home office address of the surety proposed and the name and address of the responsible local claim agent.
- f. The names of members of the firms who hold appropriate trade licenses, together with license numbers.
- g. If prequalified, contractor info will be reviewed and evaluated comparatively to submitted prequalification package.

Failure or refusal to furnish any of the above information, if requested, shall constitute a basis for disqualification of any bidder.

In determining the lowest responsible, responsive bidder, the owner shall take into consideration the bidder's compliance with the requirements of G.S. 143-128.2(c), the past performance of the bidder on construction contracts for the State with particular concern given to completion times, quality of work, cooperation with other contractors, and cooperation with the designer and owner. Failure of the low bidder to furnish affidavit and/or documentation as required by G.S. 143-128.2(c) shall constitute a basis for disqualification of the bid.

Should the owner adjudge that the apparent low bidder is not the lowest responsible, responsive bidder by virtue of the above information, said apparent low bidder will be so notified and his bid security shall be returned to him.

8. PERFORMANCE BOND

The successful bidder, upon award of contract, shall furnish a performance bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

9. PAYMENT BOND

The successful bidder, upon award of contract, shall furnish a payment bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

10. PAYMENTS

Payments to the successful bidders (contractors) will be made on the basis of monthly estimates. See Article 31, General Conditions.

11. PRE-BID CONFERENCE

Prior to the date set for receiving bids, the Designer may arrange and conduct a Pre-Bid Conference for all prospective bidders. The purpose of this conference is to review project requirements and to respond to questions from prospective bidders and their subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective bidders shall be as required by the "Notice to Bidders".

12. SUBSTITUTIONS

In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until ten (10) days prior to the receipt of bids when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as potential change order.

Submittals for proposed substitutions shall include the following information:

- a. Name, address, and telephone number of manufacturer and supplier as appropriate.
- b. Trade name, model or catalog designation.
- c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.
- d. Detailed comparison with specified products including performance capabilities, warranties, and test results.
- e. Other pertinent data including data requested by the Designer to confirm product equality.

If a proposed material, product, or equipment substitution is deemed equal by the Designer to those specified, all bidders of record will be notified by Addendum.

GENERAL CONDITIONS OF THE CONTRACT

The use or reproduction of this document or any part thereof is authorized for and limited to use on projects of the State of North Carolina, and is distributed by, through and at the discretion of the State Construction Office, Raleigh, North Carolina, for that distinct and sole purpose.

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ARTICLE 1 - DEFINITIONS

- a. The **contract documents** consist of the Notice to Bidders; Instructions to Bidders; General Conditions of the Contract; special conditions if applicable; Supplementary General Conditions; the drawing and specifications, including all bulletins, addenda or other modifications of the drawings and specifications incorporated into the documents prior to their execution; the proposal; the contract; the performance bond; the payment bond; insurance certificates; the approval of the attorney general; and the certificate of the Office of State Budget and Management. All of these items together form the contract.
- b. The **owner** is the State of North Carolina through the agency named in the contract.
- c. The **designer(s)** are those referred to within this contract, or their authorized representatives. The Designer(s), as referred to herein, shall mean architect and/or engineer. They will be referred to hereinafter as if each were of the singular number, masculine gender.
- d. The **contractor**, as referred to hereinafter, shall be deemed to be either of the several contracting parties called the "Party of the First Part" in either of the several contracts in connection with the total project. Where, in special instances hereinafter, a particular contractor is intended, an adjective precedes the word "contractor," as "general," "heating," etc. For the purposes of a single prime contract, the term Contractor shall be deemed to be the single contracting entity identified as the "Party of the First Part" in the single Construction Contract. Any references or adjectives that name or infer multiple prime contractors shall be interpreted to mean the single prime Contractor.
- e. A **subcontractor**, as the term is used herein, shall be understood to be one who has entered into a direct contract with a contractor, and includes one who furnishes materials worked to a special design in accordance with plans and specifications covered by the contract, but does not include one who only sells or furnishes materials not requiring work so described or detailed.
- f. **Written notice** shall be defined as notice in writing delivered in person to the contractor, or to a partner of the firm in the case of a partnership, or to a member of the contracting organization, or to an officer of the organization in the case of a corporation, or sent to the last known business address of the contracting organization by registered mail.
- g. **Work**, as used herein as a noun, is intended to include materials, labor, and workmanship of the appropriate contractor.
- h. The **project** is the total construction work to be performed under the contract documents by the several contractors.
- i. **Project Expediter**, as used herein, is an entity stated in the contract documents, designated to effectively facilitate scheduling and coordination of work activities. See Article 14(f) for responsibilities of a Project Expediter. **For the purposes of a single prime contract, the single prime contractor shall be designated as the Project Expediter.**
- j. **Change order**, as used herein, shall mean a written order to the contractor subsequent to the signing of the contract authorizing a change in the contract. The change order shall be signed by the contractor, designer and the owner, and approved by the State Construction Office, in that order (Article 19).

- k. **Field Order**, as used herein, shall mean a written approval for the contractor to proceed with the work requested by owner prior to issuance of a formal Change Order. The field order shall be signed by the contractor, designer, owner, and State Construction Office.
- l. **Time of completion**, as stated in the contract documents, is to be interpreted as consecutive calendar days measured from the date established in the written Notice to Proceed, or such other date as may be established herein (Article 23).
- m. **Liquidated damages**, as stated in the contract documents [, is an amount reasonably estimated in advance to cover the consequential damages associated with the Owner's economic loss in not being able to use the Project for its intended purposes at the end of the contract's completion date as amended by change order, if any, by reason of failure of the contractor(s) to complete the work within the time specified. Liquidated damages does not include the Owner's extended contract administration costs (including but not limited to additional fees for architectural and engineering services, testing services, inspection services, commissioning services, etc.), such other damages directly resulting from delays caused solely by the contractor, or consequential damages that the Owner identified in the bid documents that may be impacted by any delay caused solely by the Contractor (e.g., if a multi-phased project-subsequent phases, delays in start other projects that are dependent on the completion of this Project, extension of leases and/or maintenance agreements for other facilities).
- n. **Surety**, as used herein, shall mean the bonding company or corporate body which is bound with and for the contractor, and which engages to be responsible for the contractor and his acceptable performance of the work.
- o. **Routine written communications between the Designer and the Contractor** are any communication other than a "request for information" provided in letter, memo, or transmittal format, sent by mail, courier, electronic mail, or facsimile. Such communications can not be identified as "request for information".
- p. **Clarification or Request for information (RFI)** is a request from the Contractor seeking an interpretation or clarification by the Designer relative to the contract documents. The RFI, which shall be labeled (RFI), shall clearly and concisely set forth the issue or item requiring clarification or interpretation and why the response is needed. The RFI must set forth the Contractor's interpretation or understanding of the contract documents requirements in question, along with reasons for such an understanding.
- q. **Approval** means written or imprinted acknowledgement that materials, equipment or methods of construction are acceptable for use in the work.
- r. **Inspection** shall mean examination or observation of work completed or in progress to determine its compliance with contract documents.
- s. **"Equal to" or "approved equal"** shall mean materials, products, equipment, assemblies, or installation methods considered equal by the bidder in all characteristics (physical, functional, and aesthetic) to those specified in the contract documents. Acceptance of equal is subject to approval of Designer and owner.
- t. **"Substitution" or "substitute"** shall mean materials, products, equipment, assemblies, or installation methods deviating in at least one characteristic (physical, functional, or aesthetic) from those specified, but which in the opinion of the bidder would improve competition and/or enhance the finished installation. Acceptance of substitution is subject to the approval of the Designer and owner.

- u. **Provide** shall mean furnish and install complete in place, new, clean, operational, and ready for use.
- v. **Indicated and shown** shall mean provide as detailed, or called for, and reasonably implied in the contract documents.
- w. **Special inspector** is one who inspects materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the approved construction documents and referenced standards.
- x. **Commissioning** is a quality assurance process that verifies and documents that building components and systems operate in accordance to the owner's project requirements and the project design documents.
- y. **Designer Final Inspection** is the inspection performed by the design team to determine the completeness of the project in accordance with approved plans and specifications. This inspection occurs prior to SCO final inspection.
- z. **SCO Final Inspection** is the inspection performed by the State Construction Office to determine the completeness of the project in accordance with NC Building Codes and approved plans and specifications.
- aa. **Beneficial Occupancy** is requested by the owner and is occupancy or partial occupancy of the building after all life safety items have been completed as determined by the State Construction Office. Life safety items include but not limited to fire alarm, sprinkler, egress and exit lighting, fire rated walls, egress paths and security.
- bb. Final Acceptance is the date in which the State Construction Office accepts the construction as totally complete. This includes the SCO Final Inspection and certification by the designer that all punch lists are completed.

ARTICLE 2 - INTENT AND EXECUTION OF DOCUMENTS

- a. The drawings and specifications are complementary, one to the other, and that which is shown on the drawings or called for in the specifications shall be as binding as if it were both called for and shown. The intent of the drawings and specifications is to establish the scope of all labor, materials, transportation, equipment, and any and all other things necessary to provide a bid for a complete job. In case of discrepancy or disagreement in the contract documents, the order of precedence shall be: Form of Contract, specifications, large-scale detail drawings, small-scale drawings.
- b. The wording of the specifications shall be interpreted in accordance with common usage of the language except that words having a commonly used technical or trade meaning shall be so interpreted in preference to other meanings.
- c. The contractor shall execute each copy of the proposal, contract, performance bond and payment bond as follows:
 - 1. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.
 - 2. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.

3. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such persons shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.
4. If the documents are made by a joint venture, they shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable to each particular member.
5. All signatures shall be properly witnessed.
6. If the contractor's license is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the contract. The title "Licensee" shall appear under his/her signature.
7. The bonds shall be executed by an attorney-in-fact. There shall be attached to each copy of the bond a certified copy of power of attorney properly executed and dated.
8. Each copy of the bonds shall be countersigned by an authorized individual agent of the bonding company licensed to do business in North Carolina. The title "Licensed Resident Agent" shall appear after the signature.
9. The seal of the bonding company shall be impressed on each signature page of the bonds.
10. The contractor's signature on the performance bond and the payment bond shall correspond with that on the contract. The date of performance and payment bond shall not be prior to the date of the contract.

ARTICLE 3 - CLARIFICATIONS AND DETAIL DRAWINGS

- a. In such cases where the nature of the work requires clarification by the designer, such clarification shall be furnished by the designer with reasonable promptness by means of written instructions or detail drawings, or both. Clarifications and drawings shall be consistent with the intent of contract documents, and shall become a part thereof.
- b. The contractor(s) and the designer shall prepare, if deemed necessary, a schedule fixing dates upon which foreseeable clarifications will be required. The schedule will be subject to addition or change in accordance with progress of the work. The designer shall furnish drawings or clarifications in accordance with that schedule. The contractor shall not proceed with the work without such detail drawings and/or written clarifications.

ARTICLE 4 - COPIES OF DRAWINGS AND SPECIFICATIONS

The designer or Owner shall furnish free of charge to the contractors electronic copies of plans and specifications. If requested by the contractor, paper copies of plans and specifications shall be furnished free of charge as follows:

- a. General contractor - Up to twelve (12) sets of general contractor drawings and specifications, up to six (6) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

- b. Each other contractor - Up to six (6) sets of the appropriate drawings and specifications, up to three (3) sets of which shall include drawings and specifications of all other contracts, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.
- c. Additional sets shall be furnished at cost, including mailing, to the contractor upon request by the contractor. This cost shall be stated in the bidding documents.
- d. For the purposes of a single-prime contract, the contractor shall receive up to 30 sets of drawings and specifications, plus a clean set of black line prints on white paper of all appropriate drawings, upon which the contractor shall clearly and legibly record all work-in-place that is at variance with the contract documents.

ARTICLE 5 - SHOP DRAWINGS, SUBMITTALS, SAMPLES, DATA

- a. Within 15 consecutive calendar days after the notice to proceed, each prime contractor shall submit a schedule for submission of all shop drawings, product data, samples, and similar submittals through the Project Expediter to the Designer. This schedule shall indicate the items, relevant specification sections, other related submittal, data, and the date when these items will be furnished to the designer.
- b. The Contractor(s) shall review, approve and submit to the Designer all Shop Drawings, Coordination Drawings, Product Data, Samples, Color Charts, and similar submittal data required or reasonably implied by the Contract Documents. Required Submittals shall bear the Contractor's stamp of approval, any exceptions to the Contract Documents shall be noted on the submittals, and copies of all submittals shall be of sufficient quantity for the Designer to retain up to three (3) copies of each submittal for his own use plus additional copies as may be required by the Contractor. Submittals shall be presented to the Designer in accordance with the schedule submitted in paragraph (a). so as to cause no delay in the activities of the Owner or of separate Contractors.
- c. The Designer shall review required submittals promptly, noting desired corrections if any, and retaining three (3) copies (1 for the Designer, 1 for the owner and 1 for SCO) for his use. The remaining copies of each submittal shall be returned to the Contractor not later than twenty (20) days from the date of receipt by the Designer, for the Contractor's use or for corrections and resubmittal as noted by the Designer. When resubmittals are required, the submittal procedure shall be the same as for the original submittals.
- d. Approval of shop drawings/submittals by the Designer shall not be construed as relieving the Contractor from responsibility for compliance with the design or terms of the contract documents nor from responsibility of errors of any sort in the shop drawings, unless such lack of compliance or errors first have been called in writing to the attention of the Designer by the Contractor.

ARTICLE 6 - WORKING DRAWINGS AND SPECIFICATIONS AT THE JOB SITE

- a. The contractor shall maintain, in readable condition at his job office, one complete set of working drawings and specifications for his work including all shop drawings. Such drawings and specifications shall be available for use by the designer, his authorized representative, owner or State Construction Office.

- b. The contractor shall maintain at the job office, a day-to-day record of work-in-place that is at variance with the contract documents. Such variations shall be fully noted on project drawings by the contractor and submitted to the designer upon project completion and no later than 30 days after final acceptance of the project.
- c. The contractor shall maintain at the job office a record of all required tests that have been performed, clearly indicating the scope of work inspected and the date of approval or rejection.

ARTICLE 7 - OWNERSHIP OF DRAWINGS AND SPECIFICATIONS

All drawings and specifications are instruments of service and remain the property of the owner. The use of these instruments on work other than this contract without permission of the owner is prohibited. All copies of drawings and specifications other than contract copies shall be returned to the owner upon request after completion of the work.

ARTICLE 8 - MATERIALS, EQUIPMENT, EMPLOYEES

- a. The contractor shall, unless otherwise specified, supply and pay for all labor, transportation, materials, tools, apparatus, lights, power, heat, sanitary facilities, water, scaffolding and incidentals necessary for the completion of his work, and shall install, maintain and remove all equipment of the construction, other utensils or things, and be responsible for the safe, proper and lawful construction, maintenance and use of same, and shall construct in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the plans, stated in the specifications, or reasonably implied therefrom, all in accordance with the contract documents.
- b. All materials shall be new and of quality specified, except where reclaimed material is authorized herein and approved for use. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades except as exceeded or qualified by the specifications.
- c. Upon notice, the contractor shall furnish evidence as to quality of materials.
- d. Products are generally specified by ASTM or other reference standard and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed. However, the contractor shall be aware that the cited examples are used only to denote the quality standard of product desired and that they do not restrict bidders to a specific brand, make, manufacturer or specific name; that they are used only to set forth and convey to bidders the general style, type, character and quality of product desired; and that equivalent products will be acceptable. Request for substitution of materials, items, or equipment shall be submitted to the designer for approval or disapproval; such approval or disapproval shall be made by the designer prior to the opening of bids. Alternate materials may be requested after the award if it can clearly be demonstrated that it is an added benefit to the owner and the designer and owner approves.
- e. The designer is the judge of equality for proposed substitution of products, materials or equipment.

- g. If at any time during the construction and completion of the work covered by these contract documents, the language, conduct, or attire of any workman of the various crafts be adjudged a nuisance to the owner or designer, or if any workman be considered detrimental to the work, the contractor shall order such parties removed immediately from grounds.

ARTICLE 9 - ROYALTIES, LICENSES AND PATENTS

It is the intention of the contract documents that the work covered herein will not constitute in any way infringement of any patent whatsoever unless the fact of such patent is clearly evidenced herein. The contractor shall protect and save harmless the owner against suit on account of alleged or actual infringement. The contractor shall pay all royalties and/or license fees required on account of patented articles or processes, whether the patent rights are evidenced hereinafter.

ARTICLE 10 - PERMITS, INSPECTIONS, FEES, REGULATIONS

- a. The contractor shall give all notices and comply with all laws, ordinances, codes, rules and regulations bearing on the conduct of the work under this contract. If the contractor observes that the drawings and specifications are at variance therewith, he shall promptly notify the designer in writing. See Instructions to Bidders, Paragraph 3, Bulletins and Addenda. Any necessary changes required after contract award shall be made by change order in accordance with Article 19. If the contractor performs any work knowing it to be contrary to such laws, ordinances, codes, rules and regulations, and without such notice to the designer, he shall bear all cost arising therefrom. Additional requirements implemented after bidding will be subject to equitable negotiations.
- b. All work under this contract shall conform to the North Carolina State Building Code and other State, local and national codes as are applicable. The cost of all required inspections and permits shall be the responsibility of the contractor and included within the bid proposal. All water taps, meter barrels, vaults and impact fees shall be paid by the contractor unless otherwise noted.
- d. Projects constructed by the State of North Carolina or by any agency or institution of the State are not subject to inspection by any county or municipal authorities and are not subject to county or municipal building codes. The contractor shall, however, cooperate with the county or municipal authorities by obtaining building permits. Permits shall be obtained at no cost.
- e. Projects involving local funding (community colleges) are subject also to county and municipal building codes and inspection by local authorities. The contractor shall pay the cost of these permits and inspections.

ARTICLE 11 - PROTECTION OF WORK, PROPERTY AND THE PUBLIC

- a. The contractors shall be jointly responsible for the entire site and the building or construction of the same and provide all the necessary protections, as required by the owner or designer, and by laws or ordinances governing such conditions. They shall be responsible for any damage to the owner's property, or of that of others on the job, by them, their personnel, or their subcontractors, and shall make good such damages. They shall be responsible for and pay for any damages caused to the owner. All contractors shall have access to the project at all times.
- b. The contractor shall provide cover and protect all portions of the structure when the work is not in progress, provide and set all temporary roofs, covers for doorways, sash and windows, and all other materials necessary to protect all the work on the building, whether set by him, or any of the subcontractors. Any work damaged through the lack of proper protection or from any other cause, shall be repaired or replaced without extra cost to the owner.
- c. No fires of any kind will be allowed inside or around the operations during the course of construction without special permission from the designer and owner.
- d. The contractor shall protect all trees and shrubs designated to remain in the vicinity of the operations by building substantial boxes around same. He shall barricade all walks, roads, etc., as directed by the designer to keep the public away from the construction. All trenches, excavations or other hazards in the vicinity of the work shall be well barricaded and properly lighted at night.
- e. The contractor shall provide all necessary safety measures for the protection of all persons on the job, including the requirements of the A.G.C. *Accident Prevention Manual in Construction*, as amended, and shall fully comply with all state laws or regulations and North Carolina State Building Code requirements to prevent accident or injury to persons on or about the location of the work. He shall clearly mark or post signs warning of hazards existing, and shall barricade excavations, elevator shafts, stairwells and similar hazards. He shall protect against damage or injury resulting from falling materials and he shall maintain all protective devices and signs throughout the progress of the work.
- f. The contractor shall adhere to the rules, regulations and interpretations of the North Carolina Department of Labor relating to Occupational Safety and Health Standards for the Construction Industry (Title 29, Code of Federal Regulations, Part 1926, published in Volume 39, Number 122, Part II, June 24, 1974, *Federal Register*), and revisions thereto as adopted by General Statutes of North Carolina 95-126 through 155.
- g. The contractor shall designate a responsible person of his organization as safety officer/inspector to inspect the project site for unsafe health and safety hazards, to report these hazards to the contractor for correction, and whose duties also include accident prevention on the project, and to provide other safety and health measures on the project site as required by the terms and conditions of the contract. The name of the safety inspector shall be made known to the designer and owner at the time of the preconstruction conference and in all cases prior to any work starting on the project.
- h. In the event of emergency affecting the safety of life, the protection of work, or the safety of adjoining properties, the contractor is hereby authorized to act at his own discretion, without further authorization from anyone, to prevent such threatened injury or damage.

Any compensation claimed by the contractor on account of such action shall be determined as provided for under Article 19(b).

- i. Any and all costs associated with correcting damage caused to adjacent properties of the construction site or staging area shall be borne by the contractor. These costs shall include but not be limited to flooding, mud, sand, stone, debris, and discharging of waste products.

ARTICLE 12 - SEDIMENTATION POLLUTION CONTROL ACT OF 1973

- a. Any land-disturbing activity performed by the contractor(s) in connection with the project shall comply with all erosion control measures set forth in the contract documents and any additional measures which may be required in order to ensure that the project is in full compliance with the Sedimentation Pollution Control Act of 1973, as implemented by Title 15, North Carolina Administrative Code, Chapter 4, Sedimentation Control, Subchapters 4A, 4B and 4C, as amended (15 N.C.A.C. 4A, 4B and 4C).
- b. Upon receipt of notice that a land-disturbing activity is in violation of said act, the contractor(s) shall be responsible for ensuring that all steps or actions necessary to bring the project in compliance with said act are promptly taken.
- c. The contractor(s) shall be responsible for defending any legal actions instituted pursuant to N.C.G.S. 113A-64 against any party or persons described in this article.
- d. To the fullest extent permitted by law, the contractor(s) shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, civil penalties, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance of work or failure of performance of work, provided that any such claim, damage, civil penalty, loss or expense is attributable to a violation of the Sedimentation Pollution Control Act. Such obligation shall not be construed to negate, abridge or otherwise reduced any other right or obligation of indemnity which would otherwise exist as to any party or persons described in this article.

ARTICLE 13 - INSPECTION OF THE WORK

- a. It is a condition of this contract that the work shall be subject to inspection during normal working hours and during any time work is in preparation and progress by the designer, designated official representatives of the owner, State Construction Office and those persons required by state law to test special work for official approval. The contractor shall therefore provide safe access to the work at all times for such inspections.
- b. All instructions to the contractor will be made only by or through the designer or his designated project representative. Observations made by official representatives of the owner shall be conveyed to the designer for review and coordination prior to issuance to the contractor.
- c. All work shall be inspected by designer, special inspector and/or State Construction Office prior to being covered by the contractor. Contractor shall give a minimum two weeks notice unless otherwise agreed to by all parties. If inspection fails, after the first reinspection all costs associated with additional reinspections shall be borne by the contractor.

- d. Where special inspection or testing is required by virtue of any state laws, instructions of the designer, specifications or codes, the contractor shall give adequate notice to the designer of the time set for such inspection or test, if the inspection or test will be conducted by a party other than the designer. Such special tests or inspections will be made in the presence of the designer, or his authorized representative, and it shall be the contractor's responsibility to serve ample notice of such tests.
- e. All laboratory tests shall be paid by the owner unless provided otherwise in the contract documents except the general contractor shall pay for laboratory tests to establish design mix for concrete, and for additional tests to prove compliance with contract documents where materials have tested deficient except when the testing laboratory did not follow the appropriate ASTM testing procedures.
- f. Should any work be covered up or concealed prior to inspection and approval by the designer, special inspector, and/or State Construction Office such work shall be uncovered or exposed for inspection, if so requested by the designer in writing. Inspection of the work will be made upon notice from the contractor. All cost involved in uncovering, repairing, replacing, recovering and restoring to design condition, the work that has been covered or concealed will be paid by the contractor involved.

ARTICLE 14 - CONSTRUCTION SUPERVISION AND SCHEDULE

- a. Throughout the progress of the work, each contractor shall keep at the job site, a competent superintendent and supervisory staff satisfactory to the designer and the owner. The superintendent and supervisory staff shall not be changed without the consent of the designer and owner unless said superintendent ceases to be employed by the contractor or ceases to be competent as determined by the contractor, designer or owner. The superintendent and other staff designated by the contractor in writing shall have authority to act on behalf of the contractor, and instructions, directions or notices given to him shall be as binding as if given to the contractor. However, directions, instructions, and notices shall be confirmed in writing.
- b. The contractor shall examine and study the drawings and specifications and fully understand the project design, and shall provide constant and efficient supervision to the work. Should he discover any discrepancies of any sort in the drawings or specifications, he shall report them to the designer without delay. He will not be held responsible for discrepancies in the drawings and/or specifications, but shall be held responsible to report them should they become known to him.
- c. All contractors shall be required to cooperate and consult with each other during the construction of this project. Prior to installation of work, all contractors shall jointly prepare coordination drawings, showing locations of various ductworks, piping, motors, pumps, and other mechanical or electrical equipment, in relation to the structure, walls and ceilings. These drawings shall be submitted to the designer through the Project Expediter for information only. Each contractor shall lay out and execute his work to cause the least delay to other contractors. Each contractor shall be financially responsible for any damage to other contractor's work and for undue delay caused to other contractors on the project.
- d. The contractor is required to attend job site progress conferences as called by the designer. The contractor shall be represented at these job progress conferences by both home office and project personnel. These representatives shall have authority to act on behalf of the contractor. These meetings shall be open to subcontractors, material

suppliers and any others who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation and assistance in every practical way toward the end of maintaining progress of the project on schedule and to complete the project within the specified contract time. Each contractor shall be prepared to assess progress of the work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The designer or his authorized representative shall be the coordinator of the conferences and shall preside as chairman. The contractor shall turn over a copy of his daily reports to the Designer and Owner at the job site progress conference. Owner will determine daily report format.

- e. The contractor(s) shall, employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a bench mark in a location where same will not be disturbed and where direct instruments sights may be taken.
- f. The designer shall designate a Project Expediter on projects involving two or more prime contracts. The Project Expediter shall be designated in the Supplementary General Conditions. The Project Expediter shall have at a minimum the following responsibilities.
 - 1. Prepare the project construction schedule and shall allow all prime contractors (multi-prime contract) and subcontractors (single-prime contract) performing general, plumbing, HVAC, and electrical work equal input into the preparation of the initial construction schedule.
 - 2. Maintain a project progress schedule for all contractors.
 - 3. Give adequate notice to all contractors to ensure efficient continuity of all phases of the work.
 - 4. Notify the designer of any changes in the project schedule.
 - 5. Recommend to the owner whether payment to a contractor shall be approved.
- g. It shall be the responsibility of the Project Expediter to cooperate with and obtain from several prime contractors and subcontractors on the job, their respective work activities and integrate these activities into a project construction schedule in form of a detailed bar chart or Critical Path Method (CPM), schedule. Each prime contractor shall provide work activities within fourteen (14) days of request by the Project Expediter. A “work activity”, for scheduling purposes, shall be any component or contractual requirement of the project requiring at least one (1) day, but not more than fourteen (14) days, to complete or fulfill. The project construction schedule shall graphically show all salient features of the work required to construct the project from start to finish and within the allotted time established in the contract. The time (in days) between the contractor’s early completion and contractual completion dates is part of the project total float time; and shall be used as such, unless amended by a change order. On a multi-prime project, each prime contractor shall review the proposed construction schedule and approve same in writing. The Project Expediter shall submit the proposed construction schedule to the designer for comments. The complete Project construction schedule shall be of the type set forth in the Supplementary General Condition or subparagraph (1) or (2) below, as appropriate:

1. For a project with total contracts of \$500,000 or less, a bar chart schedule will satisfy the above requirement. The schedule shall indicate the estimated starting and completion dates for each major element of the work.
2. For a project with total contracts over \$500,000, a Critical Path Method (CPM) schedule shall be utilized to control the planning and scheduling of the Work. The CPM schedule shall be the responsibility of the Project Expediter and shall be paid for by the Project Expediter.

Bar Chart Schedule: Where a bar chart schedule is required, it shall be time-scaled in weekly increments, shall indicate the estimated starting and completion dates for each major element of the work by trade and by area, level, or zone, and shall schedule dates for all salient features, including but not limited to the placing of orders for materials, submission of shop drawings and other Submittals for approval, approval of shop drawings by designers, the manufacture and delivery of material, the testing and the installation of materials, supplies and equipment, and all Work activities to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s). Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

CPM Schedule: Where a CPM schedule is required, it shall be in time-scaled precedence format using the Project Expediter's logic and time estimates. The CPM schedule shall be drawn or plotted with activities grouped or zoned by Work area or subcontract as opposed to a random (or scattered) format. The CPM schedule shall be time-scaled on a weekly basis and shall be drawn or plotted at a level of detail and logic which will schedule all salient features of the work to be performed by the Contractor. The Contractor shall allow sufficient time in his schedule for all commissioning, required inspections and completion of final punchlist(s).. Each Work activity will be assigned a time estimate by the Contractor. One day shall be the smallest time unit used.

The CPM schedule will identify and describe each activity, state the duration of each activity, the calendar dates for the early and late start and the early and late finish of each activity, and clearly highlight all activities on the critical path. "Total float" and "free float" shall be indicated for all activities. Float time shall not be considered for the exclusive use or benefit of either the Owner or the Contractor, but must be allocated in the best interest of completing the Work within the Contract time. Extensions to the Contract time, when granted by Change Order, will be granted only when equitable time adjustment exceeds the Total Float in the activity or path of activities affected by the change. On contracts with a price over \$2,500,000, the CPM schedule shall also show what part of the Contract Price is attributable to each activity on the schedule, the sum of which for all activities shall equal the total Contract Price.

Early Completion of Project: The Contractor may attempt to complete the project prior to the Contract Completion Date. However, such planned early completion shall be for the Contractor's convenience only and shall not create any additional rights of the Contractor or obligations of the Owner under this Contract, nor shall it change the Time

for Completion or the Contract Completion Date. The Contractor shall not be required to pay liquidated damages to the Owner because of its failure to complete by its planned earlier date. Likewise, the Owner shall not pay the Contractor any additional compensation for early completion nor will the Owner owe the Contractor any compensation should the Owner, its officers, employees, or agents cause the Contractor not to complete earlier than the date required by the Contract Documents.

- h. The proposed project construction schedule shall be presented to the designer no later than fifteen (15) days after written notice to proceed. No application for payment will be processed until this schedule is accepted by the designer and owner.
- i. The approved project construction schedule shall be distributed to all contractors and displayed at the job site by the Project Expediter.
- j. The several contractors shall be responsible for their work activities and shall notify the Project Expediter of any necessary changes or adjustments to their work. The Project Expediter shall maintain the project construction schedule, making biweekly adjustments, updates, corrections, etc., that are necessary to finish the project within the Contract time, keeping all contractors and the designer fully informed. Copy of a bar chart schedule annotated to show the current progress shall be submitted by the Contractor(s) to the designer, along with monthly request for payment. For project requiring CPM schedule, the Contractor shall submit a biweekly report of the status of all activities. The bar chart schedule or status report shall show the actual Work completed to date in comparison with the original Work scheduled for all activities. If any activities of the work of several contractors are behind schedule, the contractor must indicate in writing, what measures will be taken to bring each such activity back on schedule and to ensure that the Contract Completion Date is not exceeded. A plan of action and recovery schedule shall be developed and submitted to the designer by the Project Expediter, when (1) the contractor's report indicates delays, that are in the opinion of the designer or the owner, of sufficient magnitude that the contractor's ability to complete the work by the scheduled completion is brought into question; (2) the updated construction schedule is thirty (30) days behind the planned or baseline schedule and no legitimate time extensions, as determined by the Designer, are in process; and (3) the contractor desires to make changes in the logic (sequencing of work) or the planned duration of future activities of the CPM schedule which, in the opinion of the designer or the owner, are of a major nature. The plan of action, when required shall be submitted to the Owner for review within two (2) business days of the Contractor receiving the Owner's written demand. The recovery schedule, when required, shall be submitted to the Owner within five (5) calendar days of the Contractor's receiving the Owner's written demand. Failure to provide an updated construction schedule or a recovery schedule may be grounds for rejection of payment applications or withholding of funds as set forth in Article 33.
- k. The Project Expediter shall notify each contractor of such events or time frames that are critical to the progress of the job. Such notice shall be timely and reasonable. Should the progress be delayed due to the work of any of the several contractors, it shall be the duty of the Project Expediter to immediately notify the contractor(s) responsible for such delay, the designer, the State Construction Office and other prime contractors. The designer shall determine the contractor(s) who caused the delays and notify the bonding company of the responsible contractor(s) of the delays; and shall make a recommendation to the owner regarding further action.
- l. Designation as Project Expediter entails an additional project control responsibility and does not alter in any way the responsibility of the contractor so designated, nor the

responsibility of the other contractors involved in the project. The project expeditor's Superintendent(s) shall be in attendance at the Project site at all times when work is in progress unless conditions are beyond the control of the Contractor or until termination of the Contract in accordance with the Contract Documents. It is understood that such Superintendent shall be acceptable to the Owner and Designer and shall be the one who will be continued in that capacity for the duration of the project unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The Superintendent shall not be employed on any other project for or by the Contractor or by any other entity during the course of the Work. If the Superintendent is employed by the Contractor on another project without the Owner's approval, then the Owner may deduct from the Contractor's monthly general condition costs and amount representing the Superintendent's cost and shall deduct that amount for each month thereafter until the Contractor has the Superintendent back on the Owner's Project full-time.

ARTICLE 15 - SEPARATE CONTRACTS AND CONTRACTOR RELATIONSHIPS

- a. Effective from January 1, 2002, Chapter 143, Article 8, was amended, to allow public contracts to be delivered by the following delivery methods: single-prime, dual (single-prime and separate-prime), construction manager at risk, and alternative contracting method as approved by the State Building Commission. The owner reserves the right to prepare separate specifications, receive separate bids, and award separate contracts for such other major items of work as may be in the best interest of the State. For the purposes of a single prime contract, refer to Article 1 – Definitions.
- b. All contractors shall cooperate with each other in the execution of their work, and shall plan their work in such manner as to avoid conflicting schedules or delay of the work. See Article 14, Construction Supervision.
- c. If any part of contractor's work depends upon the work of another contractor, defects which may affect that work shall be reported to the designer in order that prompt inspection may be made and the defects corrected. Commencement of work by a contractor where such condition exists will constitute acceptance of the other contractor's work as being satisfactory in all respects to receive the work commenced, except as to defects which may later develop. The designer shall be the judge as to the quality of work and shall settle all disputes on the matter between contractors.
- d. Any mechanical or electrical work such as sleeves, inserts, chases, openings, penetrations, etc., which is located in the work of the general contractor shall be built in by the general contractor. The respective mechanical and electrical contractors shall set all sleeves, inserts and other devices that are to be incorporated into the structure in cooperation and under the supervision of the general contractor. The responsibility for the exact location of such items shall be that of the mechanical and/or electrical contractor.
- e. The designer and the owner shall have access to the work whenever it is in preparation and progress and during normal working hours. The contractor shall provide facilities for such access so the designer may perform his functions under the contract documents.
- f. Should a contractor cause damage to the work or property of another contractor, he shall be directly responsible, and upon notice, shall promptly settle the claim or otherwise resolve the dispute.

ARTICLE 16 - SUBCONTRACTS AND SUBCONTRACTORS

- a. Within thirty (30) days after award of the contract, the contractor shall submit to the designer, owner and to the State Construction Office a list giving the names and addresses of subcontractors and equipment and material suppliers he proposes to use, together with the scope of their respective parts of the work. Should any subcontractor be disapproved by the designer or owner, the designer or owner shall submit his reasons for disapproval in writing to the State Construction Office for its consideration with a copy to the contractor. If the State Construction Office concurs with the designer's or owner's recommendation, the contractor shall submit a substitute for approval. The designer and owner shall act promptly in the approval of subcontractors, and when approval of the list is given, no changes of subcontractors will be permitted except for cause or reason considered justifiable by the designer or owner.
- b. The designer will furnish to any subcontractor, upon request, evidence regarding amounts of money paid to the contractor on account of the subcontractor's work.
- c. The contractor is and remains fully responsible for his own acts or omissions as well as those of any subcontractor or of any employee of either. The contractor agrees that no contractual relationship exists between the subcontractor and the owner in regard to the contract, and that the subcontractor acts on this work as an agent or employee of the contractor.
- d. The owner reserves the right to limit the amount of portions of work to be subcontracted as hereinafter specified.

ARTICLE 17 - CONTRACTOR AND SUBCONTRACTOR RELATIONSHIPS

The contractor agrees that the terms of these contract documents shall apply equally to each subcontractor as to the contractor, and the contractor agrees to take such action as may be necessary to bind each subcontractor to these terms. The contractor further agrees to conform to the Code of Ethical Conduct as adopted by the Associated General Contractors of America, Inc., with respect to contractor-subcontractor relationships, and that payments to subcontractors shall be made in accordance with the provisions of G.S. 143-134.1 titled Interest on final payments due to prime contractors: payments to subcontractors.

- a. On all public construction contracts which are let by a board or governing body of the state government or any political subdivision thereof, except contracts let by the Department of Transportation pursuant to G.S. 136-28.1, the balance due prime contractors shall be paid in full within 45 days after respective prime contracts of the project have been accepted by the owner, certified by the architect, engineer or designer to be completed in accordance with terms of the plans and specifications, or occupied by the owner and used for the purpose for which the project was constructed, whichever occurs first. Provided, however, that whenever the architect or consulting engineer in charge of the project determines that delay in completion of the project in accordance with terms of the plans and specifications is the fault of the contractor, the project may be occupied and used for the purposes for which it was constructed without payment of any interest on amounts withheld past the 45 day limit. No payment shall be delayed because of the failure of another prime contractor on such project to complete his contract. Should final payment to any prime contractor beyond the date such contracts have been certified to be completed by the designer or architect, accepted by the owner, or occupied by the owner and used for the purposes for which the project was constructed, be delayed by more than 45 days, said prime contractor shall be paid interest, beginning on the 46th day, at the rate of one percent (1%) per month or fraction thereof unless a lower rate is

agreed upon on such unpaid balance as may be due. In addition to the above final payment provisions, periodic payments due a prime contractor during construction shall be paid in accordance with the payment provisions of the contract documents or said prime contractor shall be paid interest on any such unpaid amount at the rate stipulated above for delayed final payments. Such interest shall begin on the date the payment is due and continue until the date on which payment is made. Such due date may be established by the terms of the contract. Funds for payment of such interest on state-owned projects shall be obtained from the current budget of the owning department, institution or agency. Where a conditional acceptance of a contract exists, and where the owner is retaining a reasonable sum pending correction of such conditions, interest on such reasonable sum shall not apply.

- b. Within seven days of receipt by the prime contractor of each periodic or final payment, the prime contractor shall pay the subcontractor based on work completed or service provided under the subcontract. Should any periodic or final payment to the subcontractor be delayed by more than seven days after receipt of periodic or final payment by the prime contractor, the prime contractor shall pay the subcontractor interest, beginning on the eighth day, at the rate of one percent (1%) per month or fraction thereof on such unpaid balance as may be due.
- c. The percentage of retainage on payments made by the prime contractor to the subcontractor shall not exceed the percentage of retainage on payments made by the owner to the prime contractor. Any percentage of retainage on payments made by the prime contractor to the subcontractor that exceeds the percentage of retainage on payments made by the owner to the prime contractor shall be subject to interest to be paid by the prime contractor to the subcontractor at the rate of one percent (1%) per month or fraction thereof.
- d. Nothing in this section shall prevent the prime contractor at the time of application and certification to the owner from withholding application and certification to the owner for payment to the subcontractor for unsatisfactory job progress; defective construction not remedied; disputed work; third-party claims filed or reasonable evidence that claim will be filed; failure of subcontractor to make timely payments for labor, equipment and materials; damage to prime contractor or another subcontractor; reasonable evidence that subcontract cannot be completed for the unpaid balance of the subcontract sum; or a reasonable amount for retainage not to exceed the initial percentage retained by owner.

ARTICLE 18 - DESIGNER'S STATUS

- a. The designer shall provide general administration of the performance of construction contracts, including liaison and necessary inspection of the work to ensure compliance with plans and specifications. He is the agent of the owner only for the purpose of constructing this work and to the extent stipulated in the contract documents. He has authority to direct work to be performed, to stop work, to order work removed, or to order corrections of faulty work, where any such action by the designer may be necessary to assure successful completion of the work.
- b. The designer is the impartial interpreter of the contract documents, and, as such, he shall exercise his powers under the contract to enforce faithful performance by both the owner and the contractor, taking sides with neither.
- c. Should the designer cease to be employed on the work for any reason whatsoever, then the owner shall employ a competent replacement who shall assume the status of the former designer.

- d. The designer and his consultants will make inspections of the project. He will inspect the progress, the quality and the quantity of the work.
- e. The designer and the owner shall have access to the work whenever it is in preparation and progress during normal working hours. The contractor shall provide facilities for such access so the designer and owner may perform their functions under the contract documents.
- f. Based on the designer's inspections and evaluations of the project, the designer shall issue interpretations, directives and decisions as may be necessary to administer the project. His decisions relating to artistic effect and technical matters shall be final, provided such decisions are within the limitations of the contract.

ARTICLE 19 - CHANGES IN THE WORK

- a. The owner may have changes made in the work covered by the contract. These changes will not invalidate and will not relieve or release the contractor from any guarantee given by him pertinent to the contract provisions. These changes will not affect the validity of the guarantee bond and will not relieve the surety or sureties of said bond. All extra work shall be executed under conditions of the original contract.
- b. Except in an emergency endangering life or property, no change shall be made by the contractor except upon receipt of approved change order or written field order from the designer, countersigned by the owner and the state construction office authorizing such change. No claim for adjustments of the contract price shall be valid unless this procedure is followed.

A field order, transmitted by fax, electronically, or hand delivered, may be used where the change involved impacts the critical path of the work. A formal change order shall be issued as expeditiously as possible.

In the event of emergency endangering life or property, the contractor may be directed to proceed on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the designer or owner, a correct account of costs together with all proper invoices, payrolls and supporting data. Upon completion of the work the change order will be prepared as outlined under either Method "c(1)" or Method "c(2)" or both.

- c. In determining the values of changes, either additive or deductive, contractors are restricted to the use of the following methods:
 - 1. Where the extra work involved is covered by unit prices quoted in the proposal, or subsequently agreed to by the Contractor, Designer, Owner and State Construction Office the value of the change shall be computed by application of unit prices based on quantities, estimated or actual as agreed of the items involved, except in such cases where a quantity exceeds the estimated quantity allowance in the contract by one hundred percent (100%) or more. In such cases, either party may elect to proceed under subparagraph c2 herein. If neither party elects to proceed under c2, then unit prices shall apply.
 - 2. The contracting parties shall negotiate and agree upon the equitable value of the change prior to issuance of the change order, and the change order shall stipulate the corresponding lump sum adjustment to the contract price.

- d. Under Paragraph "b" and Methods "c(2)" above, the allowances for overhead and profit combined shall be as follows: all contractors (the single contracting entity (prime), his subcontractors(1st tier subs), or their sub-subcontractors (2nd tier subs, 3rd tier subs, etc)) shall be allowed a maximum of 10% on work they each self-perform; the prime contractor shall be allowed a maximum of 5% on contracted work of his 1st tier sub; 1st tier, 2nd tier, 3rd tier, etc contractors shall be allowed a maximum of 2.5% on the contracted work of their subs. ; Under Method "c(1)", no additional allowances shall be made for overhead and profit. In the case of deductible change orders, under Method "c(2)" and Paragraph (b) above, the contractor shall include no less than five percent (5%) profit, but no allowances for overhead.
- e. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein shall be limited to the following:
1. The actual costs of materials and supplies incorporated or consumed as part of the work;
 2. The actual costs of labor expended on the project site; labor expended in coordination, change order negotiation, record document maintenance, shop drawing revision or other tasks necessary to the administration of the project are considered overhead whether they take place in an office or on the project site.
 3. The actual costs of labor burden, limited to the costs of social security (FICA) and Medicare/Medicaid taxes; unemployment insurance costs; health/dental/vision insurance premiums; paid employee leave for holidays, vacation, sick leave, and/or petty leave, not to exceed a total of 30 days per year; retirement contributions; worker's compensation insurance premiums; and the costs of general liability insurance when premiums are computed based on payroll amounts; the total of which shall not exceed thirty percent (30%) of the actual costs of labor;
 4. The actual costs of rental for tools, excluding hand tools; equipment; machinery; and temporary facilities required for the work;
 5. The actual costs of premiums for bonds, insurance, permit fees, and sales or use taxes related to the work.

Overtime and extra pay for holidays and weekends may be a cost item only to the extent approved by the owner.

- f. Should concealed conditions be encountered in the performance of the work below grade, or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the contract documents, the contract sum and time for completion may be equitably adjusted by change order upon claim by either party made within thirty (30) days after the condition has been identified. The cost of such change shall be arrived at by one of the foregoing methods. All change orders shall be supported by a unit cost breakdown showing method of arriving at net cost as defined above.
- g. In all change orders, the procedure will be for the designer to request proposals for the change order work in writing. The contractor will provide such proposal and supporting data in suitable format. The designer shall verify correctness. Delay in the processing of the change order due to lack of proper submittal by the contractor of all required supporting data shall not constitute grounds for a time extension or basis of a claim. Within fourteen (14) days after receipt of the contractor's accepted proposal including all supporting documentation required by the designer, the designer shall prepare the change order and forward to the contractor for his signature or otherwise respond, in writing, to

the contractor's proposal. Within seven (7) days after receipt of the change order executed by the contractor, the designer shall, certify the change order by his signature, and forward the change order and all supporting data to the owner for the owner's signature. The owner shall execute the change order and forward to the State Construction Office for final approval, within seven (7) days of receipt. The State Construction Office shall act on the change order within seven (7) days. In case of emergency or extenuating circumstances, approval of changes may be obtained verbally by telephone or field orders approved by all parties, then shall be substantiated in writing as outlined under normal procedure.

- h. At the time of signing a change order, the contractor shall be required to certify as follows:

"I certify that my bonding company will be notified forthwith that my contract has been changed by the amount of this change order, and that a copy of the approved change order will be mailed upon receipt by me to my surety."

- i. A change order, when issued, shall be full compensation, or credit, for the work included, omitted or substituted. It shall show on its face the adjustment in time for completion of the project as a result of the change in the work.
- j. If, during the progress of the work, the owner requests a change order and the contractor's terms are unacceptable, the owner, with the approval of the State Construction Office, may require the contractor to perform such work on a time and material basis whereupon the contractor shall proceed and keep accurately on such form as specified by the Designer or owner, a correct account of cost together with all proper invoices, payrolls and supporting data. Upon completion of the work a change order will be prepared with allowances for overhead and profit per paragraph d. above and "net cost" and "cost" per paragraph e. above. Without prejudice, nothing in this paragraph shall preclude the owner from performing or to have performed that portion of the work requested in the change order.

ARTICLE 20 - CLAIMS FOR EXTRA COST

- a. Should the contractor consider that as a result of instructions given by the designer, he is entitled to extra cost above that stated in the contract, he shall give written notice thereof to the designer within seven (7) days without delay. The written notice shall clearly state that a claim for extra cost is being made and shall provide a detailed justification for the extra cost. The contractor shall not proceed with the work affected until further advised, except in emergency involving the safety of life or property, which condition is covered in Article 19(b) and Article 11(h). No claims for extra compensation shall be considered unless the claim is so made. The designer shall render a written decision within seven (7) days of receipt of claim.
- b. The contractor shall not act on instructions received by him from persons other than the designer, and any claims for extra compensation or extension of time on account of such instruction will not be honored. The designer shall not be responsible for misunderstandings claimed by the contractor of verbal instructions which have not been confirmed in writing, and in no case shall instructions be interpreted as permitting a departure from the contract documents unless such instruction is confirmed in writing and supported by a properly authorized change order.
- c. Should a claim for extra compensation that complies with the requirements of (a) above by the contractor and is denied by the designer or owner, and cannot be resolved by a

representative of the State Construction Office, the contractor may request a mediation in connection with GS 143-128(f1) in the dispute resolution rules adopted by the State Building Commission (1 N.C.A.C. 30H .0101 through .1001). If the contractor is unable to resolve its claim as a result of mediation, the contractor may pursue the claim in accordance with the provisions of G.S. 143-135.3, or G.S. 143-135.6 where Community Colleges are the owner, and the following:

1. A contractor who has not completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The director may deny, allow or compromise the claim, in whole or in part. A claim under this subsection is not a contested case under Chapter 150B of the General Statutes.
2. (a) A contractor who has completed a contract with a board for construction or repair work and who has not received the amount he claims is due under the contract may submit a verified written claim to the director of the State Construction Office of the Department of Administration for the amount the contractor claims is due. The claim shall be submitted within sixty (60) days after the contractor receives a final statement of the board's disposition of his claim and shall state the factual basis for the claim.
 - (b) The director shall investigate a submitted claim within ninety (90) days of receiving the claim, or within any longer time period upon which the director and the contractor agree. The contractor may appear before the director, either in person or through counsel, to present facts and arguments in support of his claim. The director may allow, deny or compromise the claim, in whole or in part. The director shall give the contractor a written statement of the director's decision on the contractor's claim.
 - (c) A contractor who is dissatisfied with the director's decision on a claim submitted under this subsection may commence a contested case on the claim under Chapter 150B of the General Statutes. The contested case shall be commenced within sixty (60) days of receiving the director's written statement of the decision.
 - (d) As to any portion of a claim that is denied by the director, the contractor may, in lieu of the procedures set forth in the preceding subsection of this section, within six (6) months of receipt of the director's final decision, institute a civil action for the sum he claims to be entitled to under the contract by filing a verified complaint and the issuance of a summons in the Superior Court of Wake County or in the superior court of any county where the work under the contract was performed. The procedure shall be the same as in all civil actions except that all issues shall be tried by the judge, without a jury.

ARTICLE 21 - MINOR CHANGES IN THE WORK

The designer will have the authority to order minor changes in the work not involving an adjustment in the contract sum or time for completion, and not inconsistent with the intent of the contract documents. Such changes shall be effected by written order, copied to the State Construction Office, and shall be binding on the owner and the contractor.

ARTICLE 22 - UNCORRECTED FAULTY WORK

Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the owner and the designer, the owner shall be reimbursed by the contractor. A change order will be issued to reflect a reduction in the contract sum.

ARTICLE 23 - TIME OF COMPLETION, DELAYS, EXTENSION OF TIME

- a. The time of completion is stated in the Supplementary General Conditions and in the Form of Construction Contract. The Project Expediter, upon notice of award of contract, shall prepare a construction schedule to complete the project within the time of completion as required by Article 14.
- b. The contractors shall commence work to be performed under this agreement on a date to be specified in a written Notice to Proceed from the designer and shall fully complete all work hereunder within the time of completion stated. Time is of the essence and the contractor acknowledges the Owner will likely suffer financial damage for failure to complete the work within the time of completion. For each day in excess of the above number of days, the contractor(s) shall pay the owner the sum stated as liquidated damages reasonably estimated in advance to cover the losses to be incurred by the owner by reason of failure of said contractor(s) to complete the work within the time specified, such time being in the essence of this contract and a material consideration thereof.
- c. In the event of multiple prime contractors, the designer shall be the judge as to the division of responsibility between the contractor(s), based on the construction schedule, weekly reports and job records, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them.
- d. If the contractor is delayed at any time in the progress of his work solely by any act or negligence of the owner, the designer, or by any employee of either; by any separate contractor employed by the owner; by changes ordered in the work; by labor disputes at the project site; by abnormal weather conditions not reasonably anticipated for the locality where the work is performed; by unavoidable casualties; by any causes beyond the contractor's control; or by any other causes which the designer and owner determine may justify the delay, then the contract time may be extended by change order only for the time which the designer and owner may determine is reasonable.

Time extensions will not be granted for rain, wind, snow or other natural phenomena of normal intensity for the locality where work is performed. For purpose of determining extent of delay attributable to unusual weather phenomena, a determination shall be made by comparing the weather for the contract period involved with the average of the preceding five (5) year climatic range during the same time interval based on the National Oceanic and Atmospheric Administration National Weather Service statistics for the locality where work is performed and on daily weather logs kept on the job site by the contractor reflecting the effect of the weather on progress of the work and initialed by the designer's representative. No weather delays shall be considered after the building is dried in unless work claimed to be delayed is on the critical path of the baseline schedule or approved updated schedule. Time extensions for weather delays, acts of God, labor disputes, fire, delays in transportation, unavoidable casualties or other delays which are beyond the control of the Owner do not entitle the Contractor to compensable damages for delays. Any contractor claim for compensable damages for delays is limited to delays caused solely by the owner or its agents. Contractor caused delays shall be accounted for before owner or designer caused delays in the case of concurrent delays.

- e. Request for extension of time shall be made in writing to the designer, copies to the owner and SCO, within twenty (20) days following cause of delay. In case of continuing cause for delay, the Contractor shall notify the Designer to the designer, copies to the owner and SCO, of the delay within 20 days of the beginning of the delay and only one claim is necessary.
- f. The contractor shall notify his surety in writing of extension of time granted.
- g. No claim for time extension shall be allowed on account of failure of the designer to furnish drawings or instructions until twenty (20) days after demand for such drawings and/or instructions. See Article 5c. Demand must be in written form clearly stating the potential for delay unless the drawings or instructions are provided. Any delay granted will begin after the twenty (20) day demand period is concluded.

ARTICLE 24 - PARTIAL UTILIZATION/BENEFICIAL OCCUPANCY

- a. The owner may desire to occupy or utilize all or a portion of the project prior to the completion of the project.
- b. Should the owner request a utilization of a building or portion thereof, the designer shall perform a designer final inspection of area after being notified by the contractor that the area is ready for such. After the contractor has completed designer final inspection punch list and the designer has verified, then the designer shall schedule a beneficial occupancy inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office. If beneficial occupancy is granted by the State Construction Office, in such areas the following will be established:
 - 1. The beginning of guarantees and warranties period for the equipment necessary to support. in the area.
 - 2. The owner assumes all responsibilities for utility costs for entire building.
 - 2. Contractor will obtain consent of surety.
 - 3. Contractor will obtain endorsement from insurance company permitting beneficial occupancy.
- c. The owner shall have the right to exclude the contractor from any part of the project which the designer has so certified to be substantially complete, but the owner will allow the contractor reasonable access to complete or correct work to bring it into compliance with the contract.
- d. Occupancy by the owner under this article will in no way relieve the contractor from his contractual requirement to complete the project within the specified time. The contractor will not be relieved of liquidated damages because of beneficial occupancy. The designer may prorate liquidated damages based on the percentage of project occupied.

ARTICLE 25 - FINAL INSPECTION, ACCEPTANCE, AND PROJECT CLOSEOUT

- a. Upon notification from the contractor(s) that the project is complete and ready for inspection, the designer shall make a Designer final inspection to verify that the project is complete and ready for SCO final inspection. Prior to SCO final inspection, the contractor(s) shall complete all items requiring corrective measures noted at the Designer

final inspection. The designer shall schedule a SCO final inspection at a time and date acceptable to the owner, contractor(s) and State Construction Office.

- b. At the SCO final inspection, the designer and his consultants shall, if job conditions warrant, record a list of items that are found to be incomplete or not in accordance with the contract documents. At the conclusion of the SCO final inspection, the designer and State Construction Office representative shall make one of the following determinations:
 - 1. That the project is completed and accepted.
 - 2. That the project will be accepted subject to the correction of the list of discrepancies (punch list). All punch list items must be completed within thirty (30) days of SCO final inspection or the owner may invoke Article 28, Owner's Right to Do Work.
 - 4. That the project is not complete and another date for a SCO final inspection will be established.
- c. Within fourteen (14) days of final acceptance per Paragraph b1 or within fourteen (14) days after completion of punch list per Paragraph b2 above, the designer shall certify the work and issue applicable certificate(s) of compliance.
- d. Any discrepancies listed or discovered after the date of SCO final inspection and acceptance under Paragraphs b1 or b2 above shall be handled in accordance with Article 42, Guarantee.
- f. The final acceptance date will establish the following:
 - 1. The beginning of guarantees and warranties period.
 - 2. The date on which the contractor's insurance coverage for public liability, property damage and builder's risk may be terminated.
 - 3. That no liquidated damages (if applicable) shall be assessed after this date.
 - 4. The termination date of utility cost to the contractor.
- g. **Prior to issuance of final acceptance date, the contractor shall have his authorized representatives visit the project and give full instructions to the designated personnel regarding operating, maintenance, care, and adjustment of all equipment and special construction elements. In addition, the contractor shall provide to the owner a complete instructional video (media format acceptable to the owner) on the operation, maintenance, care and adjustment of all equipment and special construction elements.**

ARTICLE 26 - CORRECTION OF WORK BEFORE FINAL PAYMENT

- a. Any work, materials, fabricated items or other parts of the work which have been condemned or declared not in accordance with the contract by the designer shall be promptly removed from the work site by the contractor, and shall be immediately replaced by new work in accordance with the contract at no additional cost to the owner. Work or property of other contractors or the owner, damaged or destroyed by virtue of such faulty work, shall be made good at the expense of the contractor whose work is faulty.

- b. Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the designer, and shall make satisfactory progress, as determined by the designer, until completed.
- c. Should the contractor fail to proceed with the required corrections, then the owner may complete the work in accordance with the provisions of Article 28.

ARTICLE 27 - CORRECTION OF WORK AFTER FINAL PAYMENT

See Article 35, Performance Bond and Payment Bond, and Article 42, Guarantee. Neither the final certificate, final payment, occupancy of the premises by the owner, nor any provision of the contract, nor any other act or instrument of the owner, nor the designer, shall relieve the contractor from responsibility for negligence, or faulty material or workmanship, or failure to comply with the drawings and specifications. Contractor shall correct or make good any defects due thereto and repair any damage resulting there from, which may appear during the guarantee period following final acceptance of the work except as stated otherwise under Article 42, Guarantee. The owner will report any defects as they may appear to the contractor and establish a time limit for completion of corrections by the contractor. The owner will be the judge as to the responsibility for correction of defects.

ARTICLE 28 - OWNER'S RIGHT TO DO WORK

If, during the progress of the work or during the period of guarantee, the contractor fails to prosecute the work properly or to perform any provision of the contract, the owner, after seven (7) days' written notice sent by certified mail, return receipt requested, to the contractor from the designer, may perform or have performed that portion of the work. The cost of the work may be deducted from any amounts due or to become due to the contractor, such action and cost of same having been first approved by the designer. Should the cost of such action of the owner exceed the amount due or to become due the contractor, then the contractor or his surety, or both, shall be liable for and shall pay to the owner the amount of said excess.

ARTICLE 29 - ANNULMENT OF CONTRACT

If the contractor fails to begin the work under the contract within the time specified, or the progress of the work is not maintained on schedule, or the work is not completed within the time above specified, or fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work, or shall perform the work unsuitably or shall discontinue the prosecution of the work, or if the contractor shall become insolvent or be declared bankrupt or commit any act of bankruptcy or insolvency, or allow any final judgment to stand against him unsatisfied for a period of forty-eight (48) hours, or shall make an assignment for the benefit of creditors, or for any other cause whatsoever shall not carry on the work in an acceptable manner, the owner may give notice in writing, sent by certified mail, return receipt requested, to the contractor and his surety of such delay, neglect or default, specifying the same, and if the contractor within a period of seven (7) days after such notice shall not proceed in accordance therewith, then the owner shall, declare this contract in default, and, thereupon, the surety shall promptly take over the work and complete the performance of this contract in the manner and within the time frame specified. In the event the surety shall fail to take over the work to be done under this contract within seven (7) days after being so notified and notify the owner in writing, sent by certified mail, return receipt requested, that he is taking the same over and stating that he will diligently pursue and complete the same, the owner shall have full power and authority, without violating the contract, to take the prosecution of the work out of the hands of said contractor, to appropriate or use any or all contract materials and equipment on the grounds as may be suitable and acceptable and may enter into an agreement, either by public letting or negotiation, for the completion of said contract according to the terms and provisions thereof

or use such other methods as in his opinion shall be required for the completion of said contract in an acceptable manner. All costs and charges incurred by the owner, together with the costs of completing the work under contract, shall be deducted from any monies due or which may become due said contractor and surety. In case the expense so incurred by the owner shall be less than the sum which would have been payable under the contract, if it had been completed by said contractor, then the said contractor and surety shall be entitled to receive the difference, but in case such expense shall exceed the sum which would have been payable under the contract, then the contractor and the surety shall be liable and shall pay to the owner the amount of said excess.

ARTICLE 30 - CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE THE CONTRACT

- a. Should the work be stopped by order of a court having jurisdiction, or by order of any other public authority for a period of three months, due to cause beyond the fault or control of the contractor, or if the owner should fail or refuse to make payment on account of a certificate issued by the designer within forty-five (45) days after receipt of same, then the contractor, after fifteen (15) days' written notice sent by certified mail, return receipt requested, to the owner and the designer, may suspend operations on the work or terminate the contract.
- b. The owner shall be liable to the contractor for the cost of all materials delivered and work performed on this contract plus 10 percent overhead and profit and shall make such payment. The designer shall be the judge as to the correctness of such payment.

ARTICLE 31 - REQUEST FOR PAYMENT

- a. Not later than the fifth day of the month, the contractor shall submit to the designer a request for payment for work done during the previous month. The request shall be in the form agreed upon between the contractor and the designer, but shall show substantially the value of work done and materials delivered to the site during the period since the last payment, and shall sum up the financial status of the contract with the following information:
 1. Total of contract including change orders.
 2. Value of work completed to date.
 3. Less five percent (5%) retainage, provided however, that after fifty percent (50%) of the contractor's work has been satisfactorily completed on schedule, with approval of the owner and the State Construction Office and written consent of the surety, further requirements for retainage will be waived only so long as work continues to be completed satisfactorily and on schedule.
 4. Less previous payments.
 5. Current amount due.
- b. The contractor, upon request of the designer, shall substantiate the request with invoices of vouchers or payrolls or other evidence.
- c. Prior to submitting the first request, the contractor shall prepare for the designer a schedule showing a breakdown of the contract price into values of the various parts of the work, so arranged as to facilitate payments to subcontractors in accordance with Article 17, Contractor and Subcontractor Relationships. The contractor(s) shall list the

value of each subcontractor and supplier, identifying each minority business subcontractor and supplier as listed in Affidavit C, if applicable.

- d. When payment is made on account of stored materials and equipment, such materials must be stored on the owner's property, and the requests for payments shall be accompanied by invoices or bills of sale or other evidence to establish the owner's title to such materials and equipment. Such payments will be made only for materials that have been customized or fabricated specifically for this project. Raw materials or commodity products including but not limited to piping, conduit, CMU, metal studs and gypsum board may not be submitted. Responsibility for such stored materials and equipment shall remain with the contractor regardless of ownership title. Such stored materials and equipment shall not be removed from the owner's property. Should the space for storage on-site be limited, the contractor, at his option, shall be permitted to store such materials and/or equipment in a suitable space off-site. Should the contractor desire to include any such materials or equipment in his application for payment, they must be stored in the name of the owner in an independent, licensed, bonded warehouse approved by the designer, owner and the State Construction Office and located as close to the site as possible. The warehouse selected must be approved by the contractor's bonding and insurance companies; the material to be paid for shall be assigned to the owner and shall be inspected by the designer. Upon approval by the designer, owner and SCO of the storage facilities and materials and equipment, payment therefore will be certified. Responsibility for such stored materials and equipment shall remain with the contractor. Such stored materials and equipment shall not be moved except for transportation to the project site. Under certain conditions, the designer may approve storage of materials at the point of manufacture, which conditions shall be approved by the designer, the owner and the State Construction Office prior to approval for the storage and shall include an agreement by the storing party which unconditionally gives the State absolute right to possession of the materials at anytime. Bond, security and insurance protection shall continue to be the responsibility of the contractor(s).
- e. In the event of beneficial occupancy, retainage of funds due the contractor(s) may be reduced with the approval of the State Construction Office to an equitable amount to cover the list of items to be completed or corrected. Retainage may not be reduced to less than two and one-half (2 1/2) times the estimated value of the work to be completed or corrected. Reduction of retainage must be with the consent and approval of the contractor's bonding company.

ARTICLE 32 - CERTIFICATES OF PAYMENT AND FINAL PAYMENT

- a. Within five (5) days from receipt of request for payment from the contractor, the designer shall issue and forward to the owner a certificate for payment. This certificate shall indicate the amount requested or as approved by the designer. If the certificate is not approved by the designer, he shall state in writing to the contractor and the owner his reasons for withholding payment.
- b. No certificate issued or payment made shall constitute an acceptance of the work or any part thereof. The making and acceptance of final payment shall constitute a waiver of all claims by the owner except:
 - 1. Claims arising from unsettled liens or claims against the contractor.
 - 2. Faulty work or materials appearing after final payment.
 - 3. Failure of the contractor to perform the work in accordance with drawings and specifications, such failure appearing after payment.

4. As conditioned in the performance bond and payment bond.
- c. The making and acceptance of final payment shall constitute a waiver of all claims by the contractor except those claims previously made and remaining unsettled (Article 20(c)).
- d. Prior to submitting request for final payment to the designer for approval, the contractor shall fully comply with all requirements specified in the “project closeout” section of the specifications. These requirements include but not limited to the following:
 1. Submittal of Product and Operating Manuals, Warranties and Bonds, Guarantees, Maintenance Agreements, As-Built Drawings, Certificates of Inspection or Approval from agencies having jurisdiction. (The designer must approve the Manuals prior to delivery to the owner).
 2. Transfer of Required attic stock material and all keys in an organized manner.
 3. Record of Owner’s training.
 4. Resolution of any final inspection discrepancies.
 5. Granting access to Contractor’s records, if Owner’s internal auditors have made a request for such access pursuant to Article 52.
- e. The contractor shall forward to the designer, the final application for payment along with the following documents:
 1. List of minority business subcontractors and material suppliers showing breakdown of contract amounts and total actual payments to subs and material suppliers.
 2. Affidavit of Release of Liens.
 3. Affidavit of contractors of payment to material suppliers and subcontractors. (See Article 36).
 4. Consent of Surety to Final Payment.
 5. Certificates of state agencies required by state law.
- f. The designer will not authorize final payment until the work under contract has been certified by designer, certificates of compliance issued, and the contractor has complied with the closeout requirements. The designer shall forward the contractor’s final application for payment to the owner along with respective certificate(s) of compliance required by law.

ARTICLE 33 - PAYMENTS WITHHELD

- a. The designer with the approval of the State Construction Office may withhold payment for the following reasons:
 1. Faulty work not corrected.

2. The unpaid balance on the contract is insufficient to complete the work in the judgment of the designer.
 3. To provide for sufficient contract balance to cover liquidated damages that will be assessed.
- b. The secretary of the Department of Administration may authorize the withholding of payment for the following reasons:
 1. Claims filed against the contractor or evidence that a claim will be filed.
 2. Evidence that subcontractors have not been paid.
 - c. The Owner may withhold all or a portion of Contractor's general conditions costs set forth in the approved schedule of values, if Contractor has failed to comply with: (1) a request to access its records by Owner's internal auditors pursuant to Article 52; (2) a request for a plan of action and/or recovery schedule under Article 14.j or provide The Owner; (3) a request to provide an electronic copies of Contractor's baseline schedule, updates with all logic used to create the schedules in the original format of the scheduling software; and (4) Contractor's failure to have its Superintendent on the Project full-time; (
 - d. When grounds for withholding payments have been removed, payment will be released. Delay of payment due the contractor without cause will make owner liable for payment of interest to the contractor in accordance with G.S. 143-134.1. As provided in G.S.143-134.1(e) the owner shall not be liable for interest on payments withheld by the owner for unsatisfactory job progress, defective construction not remedied, disputed work, or third-party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

ARTICLE 34 - MINIMUM INSURANCE REQUIREMENTS

The work under this contract shall not commence until the contractor has obtained all required insurance and verifying certificates of insurance have been approved in writing by the owner. These certificates shall document that coverages afforded under the policies will not be cancelled, reduced in amount or coverages eliminated until at least thirty (30) days after mailing written notice, by certified mail, return receipt requested, to the insured and the owner of such alteration or cancellation. If endorsements are needed to comply with the notification or other requirements of this article copies of the endorsements shall be submitted with the certificates.

a. Worker's Compensation and Employer's Liability

The contractor shall provide and maintain, until final acceptance, workmen's compensation insurance, as required by law, as well as employer's liability coverage with minimum limits of \$100,000.

b. Public Liability and Property Damage

The contractor shall provide and maintain, until final acceptance, comprehensive general liability insurance, including coverage for premises operations, independent contractors, completed operations, products and contractual exposures, as shall protect such contractors from claims arising out of any bodily injury, including accidental death, as well as from claims for property damages which may arise from operations under this contract, whether such operations be by the contractor or by any subcontractor, or by

anyone directly or indirectly employed by either of them and the minimum limits of such insurance shall be as follows:

Bodily Injury: \$500,000 per occurrence
Property Damage: \$100,000 per occurrence / \$300,000 aggregate

In lieu of limits listed above, a \$500,000 combined single limit shall satisfy both conditions.

Such coverage for completed operations must be maintained for at least two (2) years following final acceptance of the work performed under the contract.

c. Property Insurance (Builder's Risk/Installation Floater)

The contractor shall purchase and maintain property insurance until final acceptance, upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the owner, the contractor, the subcontractors and sub-subcontractors in the work and shall insure against the perils of fire, wind, rain, flood, extended coverage, and vandalism and malicious mischief. If the owner is damaged by failure of the contractor to purchase or maintain such insurance, then the contractor shall bear all reasonable costs properly attributable thereto; the contractor shall effect and maintain similar property insurance on portions of the work stored off the site when request for payment per articles so includes such portions.

d. Deductible

Any deductible, if applicable to loss covered by insurance provided, is to be borne by the contractor.

e. Other Insurance

The contractor shall obtain such additional insurance as may be required by the owner or by the General Statutes of North Carolina including motor vehicle insurance, in amounts not less than the statutory limits.

f. Proof of Carriage

The contractor shall furnish the owner with satisfactory proof of carriage of the insurance required before written approval is granted by the owner.

ARTICLE 35 - PERFORMANCE BOND AND PAYMENT BOND

- a. Each contractor shall furnish a performance bond and payment bond executed by a surety company authorized to do business in North Carolina. The bonds shall be in the full contract amount. Bonds shall be executed in the form bound with these specifications.
- b. All bonds shall be countersigned by an authorized agent of the bonding company who is licensed to do business in North Carolina.

ARTICLE 36 - CONTRACTOR'S AFFIDAVIT

The final payment of retained amount due the contractor on account of the contract shall not become due until the contractor has furnished to the owner through the designer an affidavit signed, sworn and notarized to the effect that all payments for materials, services or subcontracted work in connection with his contract have been satisfied, and that no claims or

liens exist against the contractor in connection with this contract. In the event that the contractor cannot obtain similar affidavits from subcontractors to protect the contractor and the owner from possible liens or claims against the subcontractor, the contractor shall state in his affidavit that no claims or liens exist against any subcontractor to the best of his (the contractor's) knowledge, and if any appear afterward, the contractor shall save the owner harmless.

ARTICLE 37 - ASSIGNMENTS

The contractor shall not assign any portion of this contract nor subcontract in its entirety. Except as may be required under terms of the performance bond or payment bond, no funds or sums of money due or become due the contractor under the contract may be assigned.

ARTICLE 38 - USE OF PREMISES

- a. The contractor(s) shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, permits or directions of the designer and owner and shall not exceed those established limits in his operations.
- b. The contractor(s) shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.
- c. The contractor(s) shall enforce the designer's and owner's instructions regarding signs, advertisements, fires and smoking.
- d. No firearms, any type of alcoholic beverages, or drugs (other than those prescribed by a physician) will be permitted at the job site.

ARTICLE 39 - CUTTING, PATCHING AND DIGGING

- a. The contractor shall do all cutting, fitting or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown upon or reasonably implied by the drawings and specifications for the completed structure, as the designer may direct.
- b. Any cost brought about by defective or ill-timed work shall be borne by the party responsible therefor.
- c. No contractor shall endanger any work of another contractor by cutting, digging or other means. No contractor shall cut or alter the work of any other contractor without the consent of the designer and the affected contractor(s).

ARTICLE 40 - UTILITIES, STRUCTURES, SIGNS

- a. The contractor shall provide necessary and adequate facilities for water, electricity, gas, oil, sewer and other utility services which maybe necessary and required for completion of the project including all utilities required for testing, cleaning, balancing, and sterilization of designated plumbing, mechanical and electrical systems. Any permanent meters installed shall be listed in the contractor's name until work has a final acceptance. The contractor will be solely responsible for all utility costs prior to final acceptance. Contractor shall contact all affected utility companies prior to bid to determine their requirements to provide temporary and permanent service and include all costs associated with providing those services in their bid. Coordination of the work of the utility companies during construction is the sole responsibility of the contractor.

- b. Meters shall be relisted in the owner's name on the day following final acceptance of the Project Expediter's work, and the owner shall pay for services used after that date.
- c. The owner shall be reimbursed for all metered utility charges after the meter is relisted in the owner's name and prior to completion and acceptance of the work of **all** contractors. Reimbursement shall be made by the contractor whose work has not been completed and accepted. If the work of two or more contractors has not been completed and accepted, reimbursement to the owner shall be paid by the contractors involved on the basis of assessments by the designer.
- d. Prior to the operation of permanent systems, the Project Expediter will provide temporary power, lighting, water, and heat to maintain space temperature above freezing, as required for construction operations.
- e. All contractors shall have the permanent building systems in sufficient readiness for furnishing temporary climatic control at the time a building is enclosed and secured. The HVAC systems shall maintain climatic control throughout the enclosed portion of the building sufficient to allow completion of the interior finishes of the building. A building shall be considered enclosed and secured when windows, doorways (exterior, mechanical, and electrical equipment rooms), and hardware are installed; and other openings have protection which will provide reasonable climatic control. The appropriate time to start the mechanical systems and climatic condition shall be jointly determined by the contractor(s), the designer and owner. Use of the equipment in this manner shall be subject to the approval of the Designer and owner and shall in no way affect the warranty requirements of the contractor(s).
- f. The electrical contractor shall have the building's permanent power wiring distribution system in sufficient readiness to provide power as required by the HVAC contractor for temporary climatic control.
- g. The electrical contractor shall have the building's permanent lighting system ready at the time the general contractor begins interior painting and shall provide adequate lighting in those areas where interior painting and finishing is being performed.
- h. Each prime contractor shall be responsible for his permanently fixed service facilities and systems in use during progress of the work. The following procedures shall be strictly adhered to:
 - 1. Prior to final acceptance of work by the State Construction Office, each contractor shall remove and replace any parts of the permanent building systems damaged through use during construction.
 - 2. Temporary filters as recommended by the equipment manufacturer in order to keep the equipment and ductwork clean and free of dust and debris shall be installed in each of the heating and air conditioning units and at each return grille during construction. New filters shall be installed in each unit prior to the owner's acceptance of the work.
 - 3. Extra effort shall be maintained to keep the building and the site adjacent to the building clean and under no circumstances shall air systems be operated if finishing and site work operations are creating dust in excess of what would be considered normal if the building were occupied.
 - 4. It shall be understood that any warranty on equipment presented to the owner shall extend from the day of final acceptance by the owner. The cost of warranting the

equipment during operation in the finishing stages of construction shall be borne by the contractor whose system is utilized.

5. The electrical contractor shall have all lamps in proper working condition at the time of final project acceptance.
 - i. The Project Expediter shall provide, if required and where directed, a shed for toilet facilities and shall furnish and install in this shed all water closets required for a complete and adequate sanitary arrangement. These facilities will be available to other contractors on the job and shall be kept in a neat and sanitary condition at all times. Chemical toilets are acceptable.
 - j. The Project Expediter shall, if required by the Supplementary General Conditions and where directed, erect a temporary field office, complete with lights, telephone, heat and air conditioning. A portion of this office shall be partitioned off, of sufficient size, for the use of a resident inspector, should the designer so direct.
 - k. On multi-story construction projects, the Project Expediter shall provide temporary elevators, lifts, or other special equipment for the general use of all contractors. The cost for such elevators, lifts or other special equipment and the operation thereof shall be included in the Project Expediter's bid.
 - l. The Project Expediter will erect one sign on the project if required. The sign shall be of sound construction, and shall be neatly lettered with black letters on white background. The sign shall bear the name of the project, and the names of prime contractors on the project, and the name of the designer and consultants. Directional signs may be erected on the owner's property subject to approval of the owner with respect to size, style and location of such directional signs. Such signs may bear the name of the contractor and a directional symbol. No other signs will be permitted except by permission of the owner.

ARTICLE 41 - CLEANING UP

- a. The contractors shall keep the building and surrounding area reasonably free from rubbish at all times, and shall remove debris from the site on a timely basis or when directed to do so by the designer or Project Expediter. The Project Expediter shall provide an on site refuse container(s) for the use of all contractors. Each contractor shall remove their rubbish and debris from the building on a daily basis. The Project Expediter shall broom clean the building as required to minimize dust and dirt accumulation.
- b. The Project Expediter shall provide and maintain suitable all-weather access to the building.
- c. Before final inspection and acceptance of the building, each contractor shall clean his portion of the work, including glass, hardware, fixtures, masonry, tile and marble (using no acid), clean and wax all floors as specified, and completely prepare the building for use by the owner, with no cleaning required by the owner.

ARTICLE 42 - GUARANTEE

- a. The contractor shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve (12) months following the date of final acceptance of the work or beneficial occupancy and shall replace such defective materials or workmanship without cost to the owner.

- b. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The contractor shall replace such defective equipment or materials, without cost to the owner, within the manufacturer's warranty period.
- c. Additionally, the owner may bring an action for latent defects caused by the negligence of the contractor which is hidden or not readily apparent to the owner at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.
- d. Guarantees for roof, equipment, materials, and supplies shall be stipulated in the specifications sections governing such roof, equipment, materials, or supplies.

ARTICLE 43 - CODES AND STANDARDS

Wherever reference is given to codes, standard specifications or other data published by regulating agencies including, but not limited to, national electrical codes, North Carolina state building codes, federal specifications, ASTM specifications, various institute specifications, etc., it shall be understood that such reference is to the latest edition including addenda published prior to the date of the contract documents.

ARTICLE 44 - INDEMNIFICATION

To the fullest extent permitted by law, the contractor shall indemnify and hold harmless the owner, the designer and the agents, consultants and employees of the owner and designer, from and against all claims, damages, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from the performance or failure of performance of the work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the contractor, the contractor's subcontractor, or the agents of either the contractor or the contractor's subcontractor. Such obligation shall not be construed to negate, abridge or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this article.

ARTICLE 45 - TAXES

- a. Federal excise taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3442(3)).
- b. Federal transportation taxes do not apply to materials entering into state work (Internal Revenue Code, Section 3475(b) as amended).
- c. North Carolina sales tax and use tax, as required by law, do apply to materials entering into state work and such costs shall be included in the bid proposal and contract sum.
- d. Local option sales and use taxes, as required by law, do apply to materials entering into state work as applicable and such costs shall be included in the bid proposal and contract sum.
- e. **Accounting Procedures for Refund of County Sales & Use Tax**

Amount of county sales and use tax paid per contractor's statements:

Contractors performing contracts for state agencies shall give the state agency for whose project the property was purchased a signed statement containing the information listed in G.S. 105-164.14(e).

The Department of Revenue has agreed that in lieu of obtaining copies of sales receipts from contractors, an agency may obtain a certified statement as of April 1, 1991 from the contractor setting forth the date, the type of property and the cost of the property purchased from each vendor, the county in which the vendor made the sale and the amount of local sales and use taxes paid thereon. If the property was purchased out-of-state, the county in which the property was delivered should be listed. The contractor should also be notified that the certified statement may be subject to audit.

In the event the contractors make several purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, the counties, and the county sales and use taxes paid thereon.

Name of taxing county: The position of a sale is the retailer's place of business located within a taxing county where the vendor becomes contractually obligated to make the sale. Therefore, it is important that the county tax be reported for the county of sale rather than the county of use.

When property is purchased from out-of-state vendors and the county tax is charged, the county should be identified where delivery is made when reporting the county tax.

Such statement must also include the cost of any tangible personal property withdrawn from the contractor's warehouse stock and the amount of county sales or use tax paid thereon by the contractor.

Similar certified statements by his subcontractors must be obtained by the general contractor and furnished to the claimant.

Contractors are not to include any tax paid on supplies, tools and equipment which they use to perform their contracts and should include only those building materials, supplies, fixtures and equipment which actually become a part of or annexed to the building or structure.

ARTICLE 46 - EQUAL OPPORTUNITY CLAUSE

The non-discrimination clause contained in Section 202 (Federal) Executive Order 11246, as amended by Executive Order 11375, relative to equal employment opportunity for all persons without regard to race, color, religion, sex or national origin, and the implementing rules and regulations prescribed by the secretary of Labor, are incorporated herein.

ARTICLE 47 - EMPLOYMENT OF INDIVIDUALS WITH DISABILITIES

The contractor(s) agree not to discriminate against any employee or applicant for employment because of physical or mental disabilities in regard to any position for which the employee or applicant is qualified. The contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified individuals with such disabilities without discrimination based upon their physical or mental disability in all employment practices.

ARTICLE 48 - ASBESTOS-CONTAINING MATERIALS (ACM)

The State of North Carolina has attempted to address all asbestos-containing materials that are to be disturbed in the project. However, there may be other asbestos-containing materials in the work areas that are not to be disturbed and do not create an exposure hazard.

Contractors are reminded of the requirements of instructions under Instructions to Bidders and General Conditions of the Contract, titled Examination of Conditions. Statute 130A, Article 19, amended August 3, 1989, established the Asbestos Hazard Management Program that controls asbestos abatement in North Carolina. The latest edition of *Guideline Criteria for Asbestos Abatement* from the State Construction Office is to be incorporated in all asbestos abatement projects for the Capital Improvement Program.

ARTICLE 49 - MINORITY BUSINESS PARTICIPATION

GS 143-128.2 establishes a ten percent (10%) goal for participation by minority businesses in total value of work for each State building project. The document, *Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts* including Affidavits and Appendix E are hereby incorporated into and made a part of this contract.

ARTICLE 50 – CONTRACTOR EVALUATION

The contractor's overall work performance on the project shall be fairly evaluated in accordance with the State Building Commission policy and procedures, for determining qualifications to bid on future State capital improvement projects. In addition to final evaluation, interim evaluation may be prepared during the progress of project. The document, *Contractor Evaluation Procedures*, is hereby incorporated and made a part of this contract. The owner may request the contractor's comments to evaluate the designer.

ARTICLE 51 – GIFTS

Pursuant to N.C. Gen. Stat. § 133-32, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, subcontractor, supplier, vendor, etc.), to make gifts or to give favors to any State employee. This prohibition covers those vendors and contractors who: (1) have a contract with a governmental agency; or (2) have performed under such a contract within the past year; or (3) anticipate bidding on such a contract in the future. For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review G.S. Sec. 133-32.

During the construction of the Project, the Contractor is prohibited from making gifts to any of the Owner's employees, Owner's project representatives (architect, engineers, construction manager and their employees), employees of the State Construction Office and/or any other State employee that may have any involvement, influence, responsibilities, oversight, management and/or duties that pertain to and/or relate to the contract administration, financial administration and/or disposition of claims arising from and/or relating to the Contract and/or Project.

ARTICLE 52 – AUDITING-ACCESS TO PERSONS AND RECORDS

In accordance with N.C. General Statute 147-64.7, the State Auditor shall have access to Contractor's officers, employees, agents and/or other persons in control of and/or responsible for the Contractor's records that relate to this Contracts for purposes of conducting audits under the referenced statute. The Owner's internal auditors shall also have the right to access and copy the Contractor's records relating to the Contract and Project during the term of the Contract and within two years following the completion of the Project/close-out of the Contract to verify accounts, accuracy, information, calculations and/or data affecting and/or

relating to Contractor's requests for payment, requests for change orders, change orders, claims for extra work, requests for time extensions and related claims for delay/extended general conditions costs, claims for lost productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, and/or any other type of claim for payment or damages from Owner and/or its project representatives.

ARTICLE 53 – NORTH CAROLINA FALSE CLAIMS ACT

The North Carolina False Claims Act ("NCFCA"), N.C. Gen. Stat. § 1-605 through 1-618, applies to this Contract. The Contractor should familiarize itself with the entire NCFCA and should seek the assistance of an attorney if it has any questions regarding the NCFCA and its applicability to any requests, demands and/or claims for payment its submits to the State through the contracting state agency, institution, university or community college.

The purpose of the NCFCA "is to deter persons from knowingly causing or assisting in causing the State to pay claims that are false or fraudulent and to provide remedies in the form of treble damages and civil penalties when money is obtained from the State by reason of a false or fraudulent claim." (Section 1-605(b).) A contractor's liability under the NCFCA may arise from, but is not limited to: requests for payment, invoices, billing, claims for extra work, requests for change orders, requests for time extensions, claims for delay damages/extended general conditions costs, claims for lost productivity, claims for loss efficiency, claims for idle equipment or labor, claims for price/cost escalation, pass-through claims of subcontractors and/or suppliers, documentation used to support any of the foregoing requests or claims, and/or any other request for payment from the State through the contracting state agency, institution, university or community college. The parts of the NCFCA that are most likely to be enforced with respect to this type of contract are as follows:

- A "claim" is "[a]ny request or demand, whether under a contract or otherwise, for money or property and whether or not the State has title to the money or property that (i) is presented to an officer, employee, or agent of the State or (ii) is made to a contractor ... if the money or property is to be spent or used on the State's behalf or to advance a State program or interest and if the State government: (a) provides or has provided any portion of the money or property that is requested or demanded; or (b) will reimburse such contractor ... for any portion of the money or property which is requested or demanded." (Section 1-606(2).)
- "Knowing" and "knowingly." – Whenever a person, with respect to information, does any of the following: (a) Has actual knowledge of the information; (b) Acts in deliberate ignorance of the truth or falsity of the information; and/or (c) Acts in reckless disregard of the truth or falsity of the information. (Section 1-606(4).) Proof of specific intent to defraud is not required. (Section 1-606(4).)
- "Material" means having a natural tendency to influence, or be capable of influencing, the payment or receipt of money or property. (Section 1-606(4).)
- Liability. – "Any person who commits any of the following acts shall be liable to the State for three times the amount of damages that the State sustains because of the act of that person[:]. ... (1) Knowingly presents or causes to be presented a false or fraudulent claim for payment or approval. (2) Knowingly makes, uses, or causes to be made or used, a false record or statement material to a false or fraudulent claim. (3) Conspires to commit a violation of subdivision (1), (2) ..." (Section 1-607(a)(1), (2).)

- The NCFCA shall be interpreted and construed so as to be consistent with the federal False Claims Act, 31 U.S.C. § 3729, et seq., and any subsequent amendments to that act. (Section 1-616(c).)

Finally, the contracting state agency, institution, university or community college may refer any suspected violation of the NCFCA by the Contractor to the Attorney General's Office for investigation. Under Section 1-608(a), the Attorney General is responsible for investigating any violation of NCFCA, and may bring a civil action against the Contractor under the NCFCA. The Attorney General's investigation and any civil action relating thereto are independent and not subject to any dispute resolution provision set forth in this Contract. (See Section 1-608(a).)

ARTICLE 54 – TERMINATION FOR CONVENIENCE

Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment.

**SUPPLEMENTARY GENERAL CONDITIONS
(SGC's) OF THE CONTRACT**

**STANDARD FORM FOR CONSTRUCTION
CONTRACTS**

**NORTH CAROLINA STATE
UNIVERSITY**

NC State University Design and Construction Guidelines

Supplementary General Conditions

SUPPLEMENTARY GENERAL CONDITIONS (SGC's) OF THE CONTRACT

The use or reproduction of this document or any part thereof is authorized for and limited to use on projects of North Carolina State University, and is distributed by, through and at the discretion of the University for that distinct and sole purpose. This document supplements but does not alter in any way the requirements of the General Conditions of the Contract.

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1.0 SGC Article 1 – Definitions

- A. As defined in Article 1 of the General Conditions, the Supplementary General Conditions are considered part of the contract documents.
- B. The Owner is the State of North Carolina through North Carolina State University.
- C. Provide shall mean purchase, deliver, and install, new, clean, and completely operational, fully tested and ready for use.

2.0 SGC Article 14 – Construction Supervision and Schedule

- A. The contractor(s) shall employ an engineer or a land surveyor licensed in the State of North Carolina to lay out the work and to establish a benchmark nearby in a location where same will not be disturbed and where direct instruments sights may be taken.
- B. The designer shall designate a Project Expediter on projects involving two or more prime contracts. The Project Expediter shall be the General Contractor unless determined otherwise by the designer. The Project Expediter shall have the responsibilities described in Article 14.f. of the General Conditions.
- C. Project Construction Schedule. North Carolina State University requires a CPM schedule for all projects, regardless of size and/or dollar amount. Bar Chart schedules may be allowed on a case-by-case basis. All CPM schedules shall meet the requirements of the General Conditions as well as the following:
 - 1. The CPM Baseline Schedule or Updated Schedule shall consist of the computer files on electronic media necessary to recreate the schedule. Files shall consist of four discrete items:
 - a) The Activity description including the original and remaining durations, and percent complete. Show other computed information such as early and late computed start and finish times and various types of floats.
 - b) The logical predecessor and successor relationships that connect the various activities together to form a CPM network. All activities shall be linked with no

NC State University Design and Construction Guidelines

Supplementary General Conditions

constraints placed on any activity unless critical milestone dates are dictated in the contract.

- c) Constraints listing if any must exist.
 - d) All hidden codes or constraints assigned to activities by the Scheduler, which help define the intended workflow or project organization.
2. Each schedule submittal shall include a cover letter, a narrative, a hard copy of the schedule and the schedule files on electronic media. The schedule update narrative should state what activity changes happened on the project, including missing data, upcoming changes, documented delays, potential delays and other facts.
 3. Contractors and subcontractors shall include a minimum of five (5) full days in their base bid for their project superintendent and project manager to attend a preliminary scheduling meeting with the project expediter. Each contractor shall attend additional scheduling meetings as required until an acceptable construction schedule conforming to the contract time is completed and approved via signing of the printed schedule by the single or each prime contractor (project manager and superintendent). Copies of the signed schedule shall be given to the Designer, Owner and each signatory; the original shall be displayed at the jobsite. The submitted schedule shall show the contract project completion date.
 4. The schedule shall be updated monthly or at the Designer and/or Owner's request. The project expediter shall make all updates, adjustments, corrections, etc., with input provided from the other prime or subcontractors. It will be the responsibility of each prime and/or subcontractor to either agree or disagree with the updated schedule via signing and dating the schedule submitted by the project expediter or providing a written summary of schedule exceptions and/or inaccuracies.
 5. Project expediter is required to provide an updated construction schedule with each monthly payment application. It will be the responsibility of each prime and/or subcontractor to either agree or disagree with the updated schedule via signing and dating the schedule submitted by the project expediter or providing a written summary of schedule exceptions and/or inaccuracies. Payment requests received without one or the other of the above will be considered incomplete and will be returned as being incomplete. The only contractor required to submit a copy of the updated progress schedule with his monthly payment application is the project expediter.
 6. A completion or finish schedule is required at 80% project completion, illustrating tasks remaining to complete the project. The designer and Owner are required to approve finish schedule.
 7. Project expediter shall include all relevant testing and inspections on the CPM schedule, including but not limited to: telecom/data wiring tests and as-built drawings, fire alarm system testing, fire suppression system testing, piping pressure testing, all applicable NFPA, DOI, DOL tests and commissioning activities.
 8. The Contractor will schedule as Milestones in the CPM schedule and ensure they are met the following activities: MEPFP Coordination drawings, Casework and Fume Hood Submittals and shop drawings shall be submitted to the design team for review NO LATER than 30 days after the Notice To Proceed.

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Supplementary General Conditions

3.0 SGC Article 23 - Time Of Completion, Delays, Extension of Time

A. For each day in excess of the number of days shown below, the contractor(s) shall pay the owner liquidated damages in the amount of \$_____ per consecutive calendar day. [Designer and Owner to jointly determine amount of LD's based on specific project requirements.]

This project does not include Commissioning

B. The time of completion for this project is _____ consecutive calendar days and begins on the date stated in the Designer's Notice to Proceed letter issued to the contractor.

This project includes Commissioning

B. The time of completion to SUBSTANTIAL COMPLETION for this project is _____ consecutive calendar days and begins on the date stated in the Designer's Notice to Proceed letter issued to the contractor. SUBSTANTIAL COMPLETION for this project is defined as the General Contractor and its subcontractors having completed the following:

1. GC's Pre-Final Punch List
2. Testing Adjusting and Balancing (TAB) is complete per the project specifications.
3. Pre-Functional Testing shall be complete and the completed report shall be issued to the design team prior to SUBSTANTIAL COMPLETION.

For a period not to exceed _____ weeks following immediately after SUBSTANTIAL COMPLETION, the Owner's agents will perform Enhanced Start UP of MEP systems and punch list generation and back punch activities. The contractor will be responsible for assisting in all testing and punch activities including the completion of all adjusting, balancing, repairing, correcting, replacing and completing unacceptable or otherwise incomplete work identified by the design team.

NC State University Design and Construction Guidelines

Supplementary General Conditions

4.0 SGC Article 40 – Utilities, Structures, Signs

- A. UTILITIES FOR NEW BUILDINGS - The Project Expediter will make arrangements with the appropriate utility service providers to provide temporary utilities to the site. The Project Expediter shall bear the costs of providing all temporary utilities to the site and all charges for temporary utilities during the project duration.
- B. UTILITIES FOR EXISTING BUILDINGS – The Project Expediter will make arrangements with either the appropriate utility service providers or with NCSU (if the existing building is already metered) to provide temporary utilities to the site. The University will bear the cost of all temporary utilities except the use of supplemental generators for power. The contractor may use what is available on site without affecting the ongoing operations of the Owner in any way, but may not request additional services that are not already present. Anything additional required by the contractor will be procured and paid for by the contractor

Electricity: \$ _____/KWH (kilo-watt hour)

Water: \$ _____/CCS (hundred cubic feet)

Steam: \$ _____/thousand pounds

Natural gas: \$ _____/deca-therm

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GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN STATE CONSTRUCTION CONTRACTS

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods, on State construction projects in the amount of \$300,000 or more. The legislation provides that the State shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the State of North Carolina, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

SECTION B: DEFINITIONS

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
 - a. Black, that is, a person having origins in any of the black racial groups in Africa;
 - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
 - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
 - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
 - e. Female
2. Minority Business - means a business:
 - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
 - b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.
3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".
4. Public Entity - means State and all public subdivisions and local governmental units.
5. Owner - The State of North Carolina, through the Agency/Institution named in the contract.
6. Designer – Any person, firm, partnership, or corporation, which has contracted with the State of North Carolina to perform architectural or engineering, work.
7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship or any modification thereof obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.
10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

- a. Identify those areas of work for which there are minority businesses, as requested.
- b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
- c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

- (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
- (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State Construction Office and other public entities.
- (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
- (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
- (5) The HUB Office also oversees the minority business program by:
 - a. Monitoring compliance with the program requirements.
 - b. Assisting in the implementation of training and technical assistance programs.
 - c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
 - d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. State Construction Office

The State Construction Office will be responsible for the following:

- a. Furnish to the HUB Office a minimum of twenty-one days prior to the bid opening the following:
 - (1) Project description and location;
 - (2) Locations where bidding documents may be reviewed;
 - (3) Name of a representative of the owner who can be contacted during the advertising period to advise who the prospective bidders are;
 - (4) Date, time and location of the bid opening.
 - (5) Date, time and location of prebid conference, if scheduled.
- b. Attending scheduled prebid conference, if necessary, to clarify requirements of the general statutes regarding minority-business participation, including the bidders' responsibilities.

- c. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal, that must be complied with, if the bid is to be considered as responsive, prior to award of contracts. The State reserves the right to reject any or all bids and to waive informalities.
- d. Reviewing of minority business requirements at Preconstruction conference.
- e. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
- f. Provide statistical data and required reports to the HUB Office.
- g. Resolve any protest and disputes arising after implementation of the plan, in conjunction with the HUB Office.

3. Owner

Before awarding a contract, owner shall do the following:

- a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and non-minority businesses.
- b. Attend the scheduled prebid conference.
- c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
 - 1. A description of the work for which the bid is being solicited.
 - 2. The date, time, and location where bids are to be submitted.
 - 3. The name of the individual within the owner's organization who will be available to answer questions about the project.
 - 4. Where bid documents may be reviewed.
 - 5. Any special requirements that may exist.
- d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
- e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award to the State Construction Office.
- g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award to State Construction Office.
- h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
- i. Make documentation showing evidence of implementation of Owner's responsibilities available for review by State Construction Office and HUB Office, upon request

4. Designer

Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:

- a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
- b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
- c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
- d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with

corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

- e. During construction phase of the project, review “MBE Documentation for Contract Payment” – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the State Construction Office.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by State Construction Office and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime bidding, construction manager at risk and alternative contracting methods, contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
 - (1) A description of the work for which the subbid is being solicited.
 - (2) The date, time and location where subbids are to be submitted.
 - (3) The name of the individual within the company who will be available to answer questions about the project.
 - (4) Where bid documents may be reviewed.
 - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
- e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
- f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by State Construction Office and HUB Office, upon request.
- g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
- h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, State Construction Office, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

- k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
- l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.

6. Minority Business Responsibilities

While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

SECTION 4: DISPUTE PROCEDURES

It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

SECTION 5: These guidelines shall apply upon promulgation on state construction projects. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: www.nc-sco.com

SECTION 6: In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing minority business participation in the state construction program.

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from the Department of Administration, State Construction Office, (physical address) 301 North Wilmington Street, Suite 450, NC Education Building, Raleigh, North Carolina, 27601-2827, (mail address) 1307 Mail Service Center, Raleigh, North Carolina, 27699-1307, phone (919) 807-4100, Website: <http://www.nc-sco.com>

MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide Affidavit C, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal.

OR

Provide Affidavit D, that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

OR

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the State for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the State that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the State whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the State will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

- (1) Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed.
- (2) Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due.
- (3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
- (4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- (5) Attending any prebid meetings scheduled by the public owner.
- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
- (7) Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- (8) Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- (9) Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- (10) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

APPENDIX E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* INDICATE TYPE OF MBE	AMOUNT PAID THIS MONTH	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A), American Indian (I), Female (F), Social and Economically Disadvantage (D)

Date: _____ Approved/Certified By: _____

Name

Title

Signature

SUBMIT WITH EACH PAY REQUEST & FINAL PAYMENT

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

SECTION 010100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specifications Sections, apply to this section.

1.2 PROJECT DESCRIPTION

- A. The project entails standpipe upgrades at Poe Hall.
 - 1. Provide new fire line into building, interconnecting with existing combined fire/domestic service with back flow prevention.
 - 2. Separation of domestic service with back flow prevention.
 - 3. Selective demolition of the existing mechanical room which includes removal of the existing chiller and associated pumps and electrical services.
 - 4. Relocation of controls air compressor.
 - 5. Creation of a new fire pump room.
 - 6. Installation of a new fire pump, jockey pump, associated controllers and piping.
 - 7. Removal and replacement of all existing standpipes.
 - 8. Replacement of the existing fire alarm control panel and integration of new and existing devices.

1.3 SEQUENCE OF WORK

- A. The Owner, Contractor and Designer will work together to determine the exact sequence of work. A detailed Phasing/ Sequence of Work Plan shall be provided by the Contractor to the Owner and Designer for review.
- B. Beneficial Occupancy inspections will occur at completion of the new sprinkler installation work, and completion of the new fire alarm work. One final inspection will be made at the completion of the project after final demolition has taken place.

1.4 CONTRACTS

- A. These documents form the Contract Documents for a Single Prime Contract with the Owner as follows:
 - 1. General Contract: The Agreement; all Addenda; the General Conditions of the Contract; the Supplementary General Conditions; Specification Divisions 1 through 28; All Drawings in the Set.

1.5 WORK IN OR ON EXISTING BUILDING

- A. While the contractor is working in building common areas during all hours, the contractor shall provide temporary barriers, signage, etc. denoting that occupancy is not possible in areas of work.

Poe Hall – Fire Protection System Improvements

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Raleigh, North Carolina

- B. During demolition and new construction in the existing buildings, Contractors will need to exercise caution to minimize noise and vibrations. Materials shall not be allowed to fall in areas where it could impact Owner's equipment or any vehicles parked in the deck.
- C. **TO THE EXTENT POSSIBLE, life safety devices must remain operational during construction except as noted on the Drawings.** This includes, but is not limited to, sprinkler system, egress lighting, exit lighting, fire alarm A/V devices, UNLESS temporary measures are installed by the Contractor and approved by both the Designer and Owner. All paths of egress and exit doors must remain free of obstructions as well. Coordination meetings with agency staff will be required to properly plan work activities that impact life safety systems, features, and policies. **THE CONTRACTOR WILL PROVIDE ALL FIRE WATCH ACTIVITIES AS NECESSARY.**

1.6 PROTECTION

- A. No alterations shall be made which will be detrimental to any of the work, proposed or existing. The Contractor shall not endanger any work by cutting, digging, fitting, or in any other manner.

PART 2 - PRODUCTS *(Not Applicable)*.

PART 3 - EXECUTION *(Not Applicable)*.

END OF SECTION 010100

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

SECTION 010110 – NCSU GENERAL REQUIREMENTS

1.1 Purpose

- A. The following guidelines apply to North Carolina State University's ("NC State") requirements specific to the needs of NC State. It is the goal of NC State to identify specific needs relevant to working on a public university campus that will help the Contractor gain more knowledge and be fully aware of NC State's expectations while working on campus.
- B. References include the following:
 - 1. NC State University Design and Construction Guidelines – [Division 01 Contractor Safety Guidelines](#)
 - 2. NC State Transportation's Contractor Parking Policies:
<http://www2.acs.ncsu.edu/trans/parking/specialty.html>
 - 3. NC State University, Environmental Health and Public Safety, Fire Protection Department Hot Work Permit Procedures. Contractor shall access the following website to obtain hot work permits: http://www.ncsu.edu/ehs/fire/hot_work.htm

2.1 General Requirements

- A. The Owner's Representative - NC State will designate a Project Manager to act as the Owner's Representative in all matters pertaining to construction contracts. All official contacts, decisions, directions, problem resolution, coordination and other liaison activities required from NC State will be through the Project Manager. This requirement does not modify the responsibilities of the Designer as stated in the General Conditions of the Contract.
- B. Contractor, at its expense, shall conduct a background check for each of its employees, as well as for the employees of its subcontractors, who will perform any function or activity under this Agreement. NC State may withhold consent for any of Contractor's employees to be placed on a NC State assignment at its sole discretion.
- C. Behavior policy - All construction personnel shall be respectful of all members of the NC State community. Any incidents of disrespect, verbal abuse, threatening statements, unwelcome comments, unwelcome interaction or any form of harassment from any construction personnel toward any member of NC State community is strictly prohibited. Any such act shall constitute sufficient cause for NC State to remove any individual permanently from the project and all NC State property. In addition, any of the Contractor(s) project personnel who ignore or refuse to take action on any requirements of the contract documents or ignore or refuse to take immediate action to correct any endangerment to the health and safety of the public (as solely determined by NC State) shall be permanently removed from the project and NC State property. If in the sole determination of NC State it is in the best interest of the project and NC State to have any of the Contractor(s) personnel removed from the project, then the Contractor shall do so upon request by NC State. Such actions taken by NC State shall not constitute grounds for a delay claim. NC State will not be responsible for any delays caused to the project due to any individual being removed from the project by NC State.
- D. Contractor Safety expectations while on this NC State project:

Poe Hall – Fire Protection System Improvements

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Raleigh, North Carolina

1. Reference Division 01 – Contractor Safety Requirements for items identified in this section.
 2. Designation of Competent Persons as noted in Section 4.0/C shall be included in the jobsite contact list.
 3. Submit a Contractor Site-Specific Safety Plan (SSSP) to the NC State Project Manager (reference Contractor Safety Guidelines 4.0/I).
 4. The Safety Representative, as defined by Section 4.0/D must complete, at a minimum, the OSHA Construction Safety Course as defined in Section 4.0/D/1/b.
- E. Protection of Work, Property, and Public:
1. The single prime Contractor, Construction Manager at Risk or Project Expediter (on a multi prime project), henceforth referred to as “the Contractor,” shall ensure that campus streets connecting to the project are protected from mud, sand, and stones/gravel. Streets and adjacent property sites shall be kept free from run-off, litter and/or debris in any form from the project site. Mud, litter and/or debris from the construction site that appears on adjacent property sites shall be removed immediately. All mud collected on vehicle tires shall be removed before leaving the construction area. Should any mud or debris from the project site collect on the streets, it shall be removed immediately to prevent any hazards to vehicular or pedestrian traffic as well as from entering the storm sewer system. In any event, all streets and property sites adjacent to the project site shall be cleaned of construction related debris, dust, litter and mud daily. The Contractor, in the preparation of bids, shall account for the daily cleaning of adjacent streets and property sites. The Contractor(s) is prohibited from discharging any waste products from concrete trucks or from concrete coring work, or any other unsuitable materials, fluids or other products on the site or into the storm sewer system. Should the Contractor fail to comply with these requirements, NC State reserves the right, with twenty-four (24) hours prior notice to the Contractor, to clean and or remove mud, trash, litter, debris or any unauthorized discharge from the project site and/or the adjacent streets or properties. In such case, the cost of the cleaning and/or removal or mobilization for cleaning and/or removal shall be deducted from the Contractor's contract.
 2. The Contractor shall repair any damage (including but not limited to: scratches, cuts, dings, holes, track marks, etc.) of any kind made to existing hardscapes (asphalt/concrete roadway and drives, curb and gutter, brick sidewalks, etc.) by heavy equipment or other causes. Repairs shall consist of a complete, full depth removal and replacement of the affected asphalt, concrete or brick hardscapes at the Contractor's expense, or as otherwise determined by the Owner, to include the full width of the road, parking lot, walk or curb that is affected. The Contractor is strongly encouraged to be mindful of this while working around and off-loading equipment in areas of new construction adjacent to existing areas, which are not in the original scope of work to be renovated or repaved. In general, equipment shall be off-loaded inside of assigned staging areas, and the Contractor shall take protective measures as needed, including protective plywood or other means to prevent damage of the hardscape surface. The slightest damage will result in full hardscape replacement at the Contractor's expense.
 3. Blasting on NC State property is prohibited.
 4. Each Contractor doing excavation work is responsible for locating all existing

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- underground utilities prior to commencing excavation. The Contractor shall be responsible for the associated cost of any utility interruption and repair due to his excavation if utility location was not requested, location procedures performed and followed prior to commencing excavation. The Contractor shall immediately notify NC State and restore the service of any utility disrupted due to excavation or any Contractor action whatever the circumstance. NC State reserves the right to immediately restore the service of any utility disrupted due to actions of the Contractor and deduct the cost of such restoration from the Contractor's contract.
5. For emergency situations during construction, the Contractor shall furnish NC State with the names, pager numbers, and telephone numbers (day and night) of the Contractor's project manager and superintendent prior to beginning work. The numbers shall remain current or be updated as required for the duration of the project. The Contractor shall contact NC State via cell phone immediately in the event of an emergency. NC State will only provide security, as it deems prudent and necessary for its own protection. The Contractor shall be responsible for the security and safety of the project within the project limits. NC State must approve any "watchman" service instituted by the Contractor.
 6. NC State will conduct normal operations during the duration of the project. The Contractor shall coordinate with NC State to minimize any disruptions to the functions of NC State.
- F. Working Hours - The Contractor may establish a work schedule of his own choosing. The Contractor shall submit to NC State and to the Designer his regular daily work schedule and shall notify NC State in writing one week in advance of any deviations from the schedule. There are no restrictions regarding work hours. NC State reserves the right to limit the Contractor's activities when they conflict with NC State operations. These operations include but are not limited to the following: examination periods (typically for two weeks in December and two weeks in May), graduation (typically for one weekend in December and May), athletic events, and student move in/move out days. During these times, the Contractor may be required to cease all construction activities, limit activities to on-site only, modify working hours or restrict noise-making activities as determined by NC State.
- G. Contractor Daily Reports - The Contractor shall keep construction daily reports and provide, at NC State's request or on a minimum weekly basis, copies of these daily reports. The Contractor shall either use the company's standard daily report or use a template provided by NC State. The daily report shall at a minimum include the following information:
1. Project name, SCO Project ID#, NC State Project #
 2. Report #
 3. Date and time report was generated
 4. Weather data: overhead conditions, precipitation (if so, how much), temperature (high and low), impact on progress
 5. Document Daily Safety Briefing (refer to Contractor Safety Guidelines 4.0/E)
 6. Report Daily Safety Inspections (refer to Contractor Safety Guidelines 4.0/F)
 7. Sediment and erosion control
 8. Work performed (include all major trades)

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9. Number of workers on site
 10. Major equipment deliveries
 11. Major equipment working on site
 12. Difficulties encountered that may cause delay
 13. Days of no work and reason
- H. Meetings - The contractor shall at a minimum conduct weekly coordination meeting to review construction progress and any issues that need to be resolved. Contractor shall invite NC State and Designer as well as any required subcontractors.
- I. Inspection of the work - NC State will conduct the following inspections, as applicable, which shall be included in the construction schedule: in-wall inspections, above ceiling inspections, generator test, fire pump test, fire sprinkler main drain tests, pre-final inspections, 100% test of the fire detection and alarm system, third-party materials testing/special inspections/commissioning and a final inspection for project acceptance. Any inspections that are not satisfactory shall be repeated at no cost to NC State and shall not be cause for a time extension. All inspections will be conducted by NC State at the same time as the Designer's inspection and a punch list generated. The Contractor shall give the Designer and NC State a minimum of fourteen (14) calendar days prior notice that the systems have been verified by the Contractor to be complete, fully functional and ready for inspection. The following general guidelines apply to the above ceiling inspections:
1. The systems must be complete, including but not limited to controls, insulation, labeling, tagging, fireproofing, fire stopping, wiring, light fixtures installed, and all piping in place.
 2. Ceiling grid may be installed as required, framing for hard ceilings shall be in place, and access door locations shall be framed and noted
 3. Under no circumstance shall any ceiling or wall area be covered prior to the above ceiling inspection. All punch list items generated from the inspections shall be completed by the Contractor and verified by the Designer and NC State. Any re-inspection costs, including but not limited to Designer, NC State, State Construction Office (SCO) or third party personnel, that result from punch list items not being 100% complete shall be at the expense of the Contractor.
- J. Use of the Premises - Parking is extremely limited at NC State. Parking for personal vehicles on campus is not provided. Contractors must limit parking of company vehicles and storage of materials to within the limits of the construction site and staging area. The Contractor is required to follow NC State Transportation's Contractor Parking Policies (see web link on page one of this document).
- K. Utilities - It is imperative that all campus utilities and all other campus services are maintained at all times except for scheduled interruptions. Required utility interruptions shall be scheduled with and requested through NC State at least fourteen (14) days in advance for minor outages and thirty (30) days in advance for major outages. NC State is the sole determiner of the utility outage being major or minor. Major outages include but are not limited to those that affect an entire floor of a building, all of a building, all or parts of several buildings, all or parts of an area, and any high voltage outage. No utility interruption, regardless of the advance notice given, shall be undertaken without expressed, specific approval from NC State. If requested by NC State, utility outages

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shall be performed after hours and/or at night, or over the weekend, or during holidays. No extra payment will be made for such work. NC State personnel will perform certain activities in connection with utility outages such as operating existing electrical switches, turning existing water and steam valves, placing existing building systems back in operation, operating existing fire alarm systems, etc. NC State will bear the expense of the work of their personnel. When the Contractor requires an additional or extra outage to complete their work because of a shortage of or improper materials, shortage of labor, poor coordination, failure to finish the work during the outage scheduled length of time, the Contractor will pay all expenses incurred for NC State's services for an additional outage(s). No service disruptions shall take place until barricades (if applicable) and signs are in place to notify and/or protect the public. Barricades must be maintained at all times and signs shall be neat and legible, hand-made signs are not acceptable. Signs for utility outage notice shall be written and placed as directed by NC State seven (7) workdays prior to the outage. NC State may determine the utility service cannot be interrupted for the length of time or frequency requested by the Contractor. In such case the Contractor shall include in his bid provisions for temporary utility services for the duration of the outage at no cost to NC State.

- L. Survey of New and Existing Sub-surface Utilities - Perform field location surveys of new utilities installed as well as existing utilities uncovered during the construction phase. Conventional survey standards are to be utilized during the collection of field data. All work shall be performed by qualified personnel under the supervision of a Professional Land Surveyor. Accuracy Standards: horizontal and vertical location shall be +/- 0.25'. Survey (NAD83-North Carolina State Plane Coordinates) shall tie to NC State's horizontal & vertical control monuments.

1. Utility Drawing Set (Hard Copy)
 - a) Cover Sheet - All projects require a cover sheet with the following information -
 - (1) NC State Project Name
 - (2) NC State Project Number
 - (3) NC State Building Name (s)
 - (4) NC State Building Number or Utility Zone Number (s)
 - (5) Project Phase (i.e. Schematic Design, Design Development, 100% Bid Documents, or Record Set)
 - (6) Sheet Name with discipline letter preceding sheet number (i.e. A100 for an Architectural Plan).
 - (7) Drawing Index
 - (8) Site Map
 - (9) For interior renovations, a hatched key plan indicating the extent of work
 - b) Drawing Sizes – sheet sizes shall not exceed 36" x 48" and shall not be less than 24" x 36" in size.
 - c) Include licensing seal and certification on 100% bid documents and record set documents.
2. Utility Drawing Set (Electronic Copy)
 - a) Format shall be .pdf.
 - b) Submission is required at each project phase.

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- c) File naming shall be as follows:
 - (1) Typical file naming shall be as follows -
bldg #_ncsu project number_date_phase.pdf
or utility zone #_ncsu project number_date_phase.pdf
 - (2) Example: 799Z_201300001_10-31-12_sd.pdf
 - (3) For projects with multiple buildings or utility zones, the lowest number shall be used in file name.
3. Electronic Source CADD Files (Record Set and first Construction Document Submittal)
 - a) Electronic files of all drawings shall include source drawings, font libraries, custom line styles/codes, plot style tables and other digital CADD related information.
 - b) The files shall be in AutoCAD .dwg format; the AutoCAD version shall be within the last 2 years of the current release.
 - c) Drawings shall be drawn at a scale of 1 to 1 in model space. Interior spaces shall be in Architectural inches. Exterior space shall be in US survey foot.
 - d) For exterior projects use NAD 83 North Carolina State plane coordinates.
 - e) All external references shall be bound as inserts or inserted directly as a block into the drawing. X-refs of any kind are not acceptable.
 - f) Remove licensing seals from drawing files.
 - g) Drawings shall be purged and audited.
 - h) Submission shall not include backup .bak files or .zip files.
 - i) Site, Civil, and Survey drawings shall use the NC State mapping drawing template, which includes NC State standard layers, linetypes and block symbols. The current version can be downloaded at www.ncsu.edu/facilities/con_guidelines/NCSU_CIV-SRV_TEMPLATE.dwg
4. Utility Submission
 - a) Hard Copy - The Drawing Set shall be submitted on bond paper.
 - b) Electronic Files for the Record Drawing Set and Source CADD Files shall be accompanied by a transmittal with a listing of the included documents and the following information:
 - (1) NC State Project Number
 - (2) NC State Project Name
 - (3) NC State Building Number(s)
 - (4) NC State Building Name (s)
 - (5) NC State Project Manager's Name and Phone Number
 - (6) Submitting Professional's Name and Address
 - c) Electronic Files shall be submitted on a CD or DVD
 - (1) A .pdf file of the transmittal shall be included on each disk.

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- M. The following outline lists the utilities to be located and the data to be collected. Photographs shall be at a minimum resolution of 2200 x 1700. Digital photographs can be submitted in TIFF, JPG, or RAW file formats. File naming shall be all lower case text. File naming shall be as follows: bldg#_ncsu project number_util_photo#.file extension. For example: 135_201300001_util_1.jpg
1. Steam Tunnel and Lines
 - a) Location and elevations of the tunnel slab and top of tunnel centerlines.
 - b) Location and size of steam and condensation pipes in the tunnel, including changes in directions, expansion loops and anchors.
 - c) Top of pipe of any direct buried steam and condensation pipes, including changes in directions, expansion loops and anchors.
 - d) List the construction material for the tunnels.
 - e) Provide digital photographs of the tunnel, piping and expansions areas.
 2. Water Lines - (Domestic, Fire Main, Chilled, Hot Water, & Reuse Waterlines)
 - a) Locations, size and elevations at the top of installed water lines, including changes in direction.
 - b) Locations of valves and a valve type designation, meters, fire department connections, post indicator valves, hydrants, reducers, manholes, and backflow device.
 - c) Provide digital photographs of bends and valves.
 3. Electric and Communication Duct Banks and Direct Buried Conduit
 - a) Location and elevations of the duct bank top and bottom.
 - b) Location and elevations of conduit runs in the duct bank.
 - c) Location and elevations of any direct buried conduit or concrete duct bank.
 - d) Location and elevations of manhole rims, transformers, pedestals, switches, poles, overhead lines, junction boxes, panels, generators, and meter boxes.
 - e) Provide digital photographs of the tunnel and conduit configuration.
 4. Gas
 - a) Location and elevations of top of pipe and any change in direction.
 - b) Location and elevations of meters, pressure reducing stations, test stations, generators, and valves.
 5. Storm and Sanitary Sewer
 - a) Provide invert elevations for incoming and outgoing piping at manholes.
 - b) Provide top elevation of manhole cover.
 - c) Note if manhole rims are in the center of the structure or not. Measure the offset, pipe sizes, material types and the direction of the flow.
 - d) Provide digital photographs of structures.
 6. Existing Utilities
 - a) Locate and provide elevations consistent with new utility requirements of any existing utilities exposed during excavation of trenches for new utilities.
 - b) Provide digital photographs of the crossing or conflict.

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7. Deliverables for Surveys
 - a) The subsurface location data and platting shall be continuous throughout the project.
 - b) All data and plats are due to NC State within two-weeks of the backfilling of utilities or completion of the associated construction task.

- N. Traffic Movement and Interruptions - Road and sidewalk blockages shall be scheduled fourteen (14) days in advance and made only after NC State has approved them. Appropriate detours shall be planned, subject to approval by NC State, giving consideration to the handicapped access. No excavations shall take place prior to placing proper barricades, lighting, and other devices as shall be required. The Contractor shall install warning signs, barricades and detour information signs to maintain traffic flow as directed by NC State. If required, flagmen shall direct traffic around the construction area or detour area. Contractors are reminded of the presence on campus of handicapped students, staff and faculty. All barricades, temporary walkways, excavations, and stockpiled materials shall be placed and/or constructed in such a manner as to accommodate, adequately warn, and protect this segment of the campus population. The Contractor shall make requests for approval for any street, alley, driveway or any access way to be closed at least fourteen (14) work days prior to the date for the desired closing. The Contractor shall close no street, alley, driveway or access-way without prior approval by NC State. Pedestrian and vehicle traffic way-finding around the construction limits must be maintained in a clean and safe condition at all times.

- O. Fire Alarm Shutdowns - When requesting fire alarm shutdowns to support construction activities, the contractor shall provide advanced notice as determined by the NC State Project Manager. The contractor shall also be required to reimburse NC State for all costs associated with the fire alarm shutdown as follows:
 1. During normal business hours (Monday – Friday, 7:00 AM – 5:00 PM): \$75.00 per disconnect and \$75.00 per reconnect for a total of \$150.00.
 2. After normal working hours (Monday – Friday, 5:01 PM – 6:59 AM; Saturday – Sunday): \$150.00 per disconnect and \$150.00 per reconnect for a total of \$300.00.
 3. If at any time the fire alarm system is not in operation after normal working hours then the contractor shall be required to employ a Fire Watch for the unprotected portion of the building, using NC State Fire Marshal's approved Fire Watch company (hourly rates vary but should not exceed \$35.00 per hour.)

- P. Hot Work Permits - When the Contractor is performing work that produces heat, flame, or sparks on or in an existing building or other structure the Contractor is required to obtain a "hot work" permit from NC State Environmental Health and Public Safety, Fire Protection Department. The department's requirements for the hot work program and permit can be found at the web link on the first page of this document.

- Q. Cleanliness and Site Maintenance - The Contractor(s) shall be responsible for keeping the project limits area, the project site, and the project itself clean and free of accumulated construction debris and trash. To that extent, the Contractor(s) shall be responsible for cleaning their work areas weekly at a minimum and the proper disposal of their construction debris and trash. The construction site and staging areas shall be cleaned as previously noted; however, should trash, litter or debris from the project site migrate to any adjacent campus areas it shall be removed immediately. Grass in the

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construction site shall be mowed as often as required to maintain a neat appearance or as requested by NC State but in no case less than once per month. Should the Contractor(s), in the sole judgment of NC State fail to comply with these requirements, then NC State reserves the right to proceed with cleaning within the project limits area, immediate project site, the interior of the project or, if applicable, the adjacent areas to the project as it deems necessary. The cost of the cleaning and/or the mobilization cost of cleaning will be deducted from the Contractor(s) contract.

- R. Storage of construction materials and equipment - Storage of construction materials and equipment shall be limited to the staging area. Should the Contractor fail to remove any material stored or equipment outside the staging area within twenty-four (24) hours of notification received from NC State, NC State shall have the right to remove and dispose of such materials from the campus. NC State will deduct the cost of such removal and disposal from the Contractor(s) contract. The offending Contractor(s) shall be responsible for any delay to the project resulting from NC State having to remove and dispose of such materials or equipment.

- S. Construction site - A construction fence shall be installed around the perimeter of the project limits. The fence shall be constructed of heavy-duty chain link material, have a minimum height of six feet and shall have a continuous top tubular rail. Swing gates shall be included at every access to the enclosed area. The fence shall have an integral visual barrier or shall have shading type material applied and maintained for the duration of the project. Locks for the gates shall be interlocked with a padlock provided by NC State in order to allow access by NC State or other emergency personnel in case of an emergency.

- T. Inspection and Audit - Contractor's "records" shall upon reasonable notice be open to inspection and subject to audit and/or reproduction during normal business working hours. An NC State representative or an outside representative engaged by NC State may perform such audits. NC State or its designee may conduct such audits or inspections throughout the term of this contract and for a period of three years after final payment or longer if required by law.
 - 1. Contractor's records as referred to in this contract shall include any and all information, materials and data of every kind and character, including without limitation, records, books, documents, subscriptions, recordings, agreements, purchase orders, leases, contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in NC State's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Document. Such records shall include (hard copy, as well as computer readable data if it can be made available): written policies and procedures; time sheets; payroll registers; payroll records; cancelled payroll checks; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets; correspondence; change order files (including documentation covering negotiated settlements); back charge logs and supporting documentation; invoices and related payment documentation; general ledger entries detailing cash and trade discounts earned; insurance rebates and dividends; and any other Contractor records which may have a bearing on matters of interest to NC State in connection with the Contractor's dealings with NC State (all foregoing hereinafter referred to as

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“records”) to the extent necessary to adequately permit evaluation and verification of:

- a) Contractor compliance with contract requirements,
- b) Compliance with NC State’s business ethics policies, and
- c) Compliance with provisions for pricing change orders, invoices or claims submitted by the Contractor or any of his payees.

U. Changes in the Work - Overhead shall also include all general conditions of the contract and all general requirements such as project management, scheduling, home office expense, engineering and layout, reproduction expenses, shop drawing processing and coordination, supervision, coordination, small tools, all vehicle expenses, temporary facilities, safety provisions, as built drawings, estimating, and general overhead.

1. The change order cost break down shall include: labor (number of hours and \$/hr) and material (quantity and \$/unit), including such breakdowns for work performed by the general contractor and all subcontractors. Unit prices shall only be allowed as stipulated in Article 19 of the contract General Conditions.

Cost extensions shall be clearly shown for the labor and material prior to any mark-ups. The cost extensions shall be added into a labor and material subtotal. The labor shall then show a percentage for labor burden, while the materials shall show the applicable sales tax. These subtotals shall then be shown as a total for labor and material costs. The labor and material cost shall then show the allowed mark-up, and a final total. Subcontractor quotes shall be presented in the same format on the subcontractor’s letterhead. Each item totaled on the Contractor’s summary sheet shall be separated in the back up documentation by a colored sheet of paper. For change orders that delete any part of the work within the change order and/or contain deductive costs, the back up shall show the original material and labor for the deleted work or costs. If the change order contains both adds and deducts for the same type of work then the material unit and labor unit costs shown on the back up for the deleted work and the added work shall be the same and the net difference shown. Deductive change orders shall show the proper reduction in OH&P and the bond. The Contractor shall also provide HUB utilization information on NC State’s Hub Utilization form. Failure by the Contractor to provide the information requested in this paragraph shall result in rejection of the change order by the designer and a request for re-submittal.

Delay in the processing of the change order due to lack of proper submittal by the Contractor in accordance with this paragraph, or due to errors in the change order calculations shall not constitute grounds for a time extension or basis for a claim.

2. For all proposed change orders, the procedure will be for the designer to request proposals for the change order work in writing. The Contractor will provide such proposal and supporting data in suitable format and as required in General Condition Article 19 – Changes in the Work, paragraph “c”, “d”, and “e”. The designer shall verify correctness and determine that the Contractor’s proposed costs are equitable. After receipt of the Contractor’s proposal and if the proposal is correct and it is agreed to by the designer and NC State that the cost is equitable then NC State shall prepare a change order and forward it to the Contractor for his signature. If the change order proposal is incorrect, or the cost has not been agreed upon by the designer and NC State then the designer shall notify the Contractor that the proposal is rejected and the proposal shall be re-

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- submitted. If the proposal is rejected because the cost are deemed not to be equitable then the contracting parties shall negotiate and agree upon the equitable value of the change and the proposal shall be resubmitted with costs determined under General Condition Article 19 – Changes in the Work Paragraph “e”.
3. Once proposed change orders have been reviewed and approved by the Contractor, Designer and NC State, the change order shall be processed for signatures electronically through the State Construction Office (SCO) web-based Interscope program. Directions for using Interscope shall be provided at the Pre-construction Conference.
 4. If for whatever reason Interscope cannot be used for processing change orders, change orders shall be processed in hard copy format in accordance with General Condition Article 19 – Changes in the Work. The change order shall contain a brief description of the work on the 1st page of the SCO form and again on the second sheet of the form under “DESCRIPTION OF CHANGE”. On the second sheet there shall also be a brief description of the reason for the change along with a cause code listed. Each item totaled on the Contractor’s summary sheet shall be separated in the back up documentation by a colored sheet of paper. After receipt of the change order executed by the Contractor, the designer shall, certify the change order by his signature and forward the change order and all supporting data to NC State for signature. NC State shall execute the change order and forward to the State Construction Office for final approval. The State Construction Office shall review and upon approval execute the change order and keep one copy. The remaining copies are sent to the designer for distribution to NC State (two copies with original signatures) and to the Contractor (two copies). The Contractor shall forward a copy to his Surety. In the case of an emergency or extenuating circumstances, the approval of the changes may be obtained verbally by telephone or field order approved by all parties.
 5. The Contractor shall also provide HUB utilization information on NC State’s Hub Utilization form.
 6. Failure by the Contractor to provide the information requested in this paragraph shall result in rejection of the change order by the designer and a request for re-submittal. Delay in the processing of the change order due to lack of proper submittal by the Contractor in accordance with this paragraph or due to errors in the change order calculations shall not constitute grounds for a time extension or basis for a claim.
- V. A time extension due to Weather - A rain day is defined as any day that rain exceeds one tenth of one inch (0.1"). The Contractor may only be entitled to extension of the contract period for the number of rain days that exceed the normal number of rain days for any given month. For the purpose of determining extent of delay attributable to unusual weather, a determination shall be made by comparing the weather for the contract period with the preceding five (5) year climatic range average during the same time interval based on statistics kept at NC State's Marine, Earth and Atmospheric Sciences department located on NC State's campus and on daily weather logs kept on the jobsite by the Contractor, reflecting the effect of the weather on progress of the work and initialed by the designer's representative. Time extensions for weather delays do not entitle the Contractor to “extended overhead” recovery and are in all other ways non-compensable.
- Notwithstanding the immediately proceeding paragraph, not all rain days above the

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normal number of rain days will warrant a contract time extension. Justification for the request for rain related contract time extensions must also be based on the effect of the rain on critical path work activity in progress during the period of the request and additionally be predicated on the Contractor's diligent prosecution of the work. No additional rain days shall be granted for building projects after the building has been "dried-in" as determined by the designer. The contract time extension request must incorporate work logs kept at the jobsite by the project superintendent showing the effect of the weather on the progress of the critical path work and the critical path schedule, both initialed by the designer's project representative.

Requests for contract time extensions based on rain days must be received by the designer on or before the 20th day of the month immediately following the month in which the rain occurred. The request must include all required documentation. All parties to this contract agree that the Contractor has no right to claim a contract time extension if the request is not received by the designer in strict accordance with the procedure set forth in this paragraph.

For other types of weather delays, the Contractor is granted one (1) day of contract extension for each day NC State is closed due to weather.

W. Final Inspection and Acceptance

1. In addition to all other contract inspection requirements, the following items shall be completed prior to scheduling a final inspection:
 - a) Training of NC State's Facilities Operations personnel shall be conducted with approved Operation and Maintenance Manuals (O&M's) provided at the training sessions.
 - b) Deliver to NC State one copy of all approved shop drawings (submittals) for the project.
 - c) Stairs: prior to final inspection, the Contractor shall submit to the Designer and NC State for review and approval as-built survey drawings of each set of stairs (exterior and interior) constructed as part of this contract. As-built survey drawings shall include dimensions of each riser and each tread and shall bear the seal of a licensed surveyor registered in the State of North Carolina. The Designer shall determine that the stairs are in full compliance with the current State of North Carolina Building Code, and if not in compliance, the Contractor, at his expense, shall make all required corrections, resurvey and resubmit as-builts for re- review and approval by the Designer and NC State.
2. The Contractor shall complete the following list, indicating the date of completion, prior to scheduling a final inspection and recommending acceptance of the project to NCSU. Items 1 and 2 must be completed prior to "substantial completion" as defined in Supplementary General Conditions 3.0 Article 23 "Time of completion - the Contractor shall coordinate with NC State the completion of some items on the list as required:

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Project Acceptance Checklist (also to be used for Beneficial Occupancy when applicable)

Project Name:

Code: Item:

Note: All items must be checked off with dates & initialed accordingly

I. Pre-final Inspections	Initial & Date
A. Critical Items Check List:	
1. NCSU Environmental Health Safety Department certification of fume hoods	
2. NCSU Fire Marshall's inspection of life safety systems (FAS, Sprinkler System, Emergency Generator, Fire Pumps etc)	
3. Fire Extinguishers installed or delivered to NC State	
4. Roof & window water tests (when required)	
5. Date to coordinate NCSU Fac Ops Lock Shop to install locks and test in conjunction with Life Safety	
6. State Construction Office electrical inspection(s) complete	
7. Fire alarm inspection and certification by installer and design engineer complete	
8. Fire alarm inspected & approved by NCSU Electronics Shop & Fire Marshall	
9. Elevator inspection by Dept. of Labor, approval to operate the elevator obtained	
10. Demonstration of operation of fire pumps to NCSU Fire Marshall	
11. Operation of emergency and stand by power circuits verified	
12. Operation of emergency generator verified	
13. Dept. of Health water test results and approvals delivered to designer	
14. Dept. of Labor pressure vessel inspections and certificates issued and displayed.	
15. Endorsement of surety for beneficial occupancy (if applicable)	
16. Endorsement of Contractor' s insurance company for beneficial occupancy (if	
17. Approval of SCO for beneficial occupancy (if applicable)	
18. Date for insurance transfers established	
II. Training and instruction of Facility Operations Personnel on Equipment	
A. Record of Instruction Sessions:	
Plumbing	
HVAC/ Controls	
Electrical	
Fire Alarm	
B. NC State O & M Manuals and pressure vessels info delivered to NC State	
III. Pre-Final Inspection	
A. Pre-final Punch list Certified as Complete by the Designer:	
General	
Mechanical	
Plumbing	
Electrical (including fire alarm system)	
IV. Final Inspections with SCO	
A. Date of Final Acceptance Inspection with SCO	
1. Date SCO punch list items complete	

All items complete and verified by the Designer

Signed _____ Date: _____

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- X. Request for Payment – In addition to General Conditions Article 31 – Requests for Payments, Contractor payment applications shall have the following information clearly shown on the front page: NC State project number, Code & Item, State Construction Office Project Identification Number. No payment may be made for stored materials that are not stored within the project limits or on property owned by the State of North Carolina. Exception may be considered for material stored in a third-party, bonded warehouse with all appropriate documentation provided to NC State. Designer must verify that material is stored in a bonded warehouse and that the stored material is identified as NC State property. No payment shall be certified/approved by the Designer and forwarded to NC State for payment if not accompanied by the following:
1. A letter from the surety company consenting to the progress payment in the amount requested. The amount of the payment shall be shown on the letter.
 2. A completed sales tax statement and form.
 3. An updated CPM schedule.
 4. MBE Appendix “E” Form with accurate subcontract amounts and amounts paid.
 5. NC State project code, item number, project number and the State Construction Office ID number on the 1st sheet.
 6. Pay applications without the information listed shown shall be considered incomplete and cannot be approved.
 7. "Schedule of values" shall include payment line items for various commissioning activities.

No final payment shall be approved by the Designer and/or forwarded to NC State if not accompanied by the following:

8. Certificate of Compliance signed by the Designer of Record.
9. Certificate of Completion signed by the Designer of Record.
10. Completed Tax Statement and Form.
11. Consent of Surety for Final Payment.
12. Contractor's Affidavit of Payment of Debts and Claims.
13. Contractor's Affidavit for Release of Liens.
14. Contractor's General Guarantee.
15. Contractor's statement of any special or extended warranties.
16. MBE Appendix “E” Form with accurate subcontract amounts and amounts paid.

* NC State shall have 30 days from the time that correct and complete payment requests are received to pay the Contractor.

END OF SECTION 010100

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SECTION 010120 – CONTRACTOR SAFETY REQUIREMENTS

Safety Measures pertaining to COVID-19 Transmission

North Carolina State University is committed to preventing transmission of COVID-19 in our community. Safety protocols have been implemented throughout the university for faculty, staff, and students to prevent the spread of COVID-19. These protocols were developed based on guidance from the Centers for Disease Control and Prevention, the Occupational Safety and Health Administration, and the State of North Carolina. Contractors shall comply with any NC State, federal, state, or local mandates relative to the pandemic. The most stringent requirement shall be enforced, including those established by any contractor's corporate policy in place.

Face Coverings – Student Health Services and CVM Areas

Face coverings must be worn, tightly covering the mouth and nose, inside all buildings (even those under construction). Until further notice, NC State Student Health Services and the College of Veterinary Medicine (CVM) will require face coverings to be worn by contractors while indoors in any facility until further notice. Minimum expectation is that face coverings must be properly worn at all times while indoors; face coverings may be removed only while eating and/or drinking.

1.1 Purpose

- A. The purpose of this guideline is to define NC State contractor safety requirements. This guideline is intended to be a supplement to the General Conditions of the contract.
- B. The Designer shall incorporate this document into the Project Manual in its entirety.
- C. Contractors and subcontractors are responsible for the safety of their employees and all persons on and around a work site. Contractors are solely responsible for the development and implementation of their safety programs. This document does not relieve the duty and responsibility of contractors, subcontractors, their agents, employees, and other persons performing portions of the work on a project to comply with federal, state, and/or local laws or regulations that relate to work site safety.

2.1 Scope

- A. This document provides contractors with the University's specific requirements that must be incorporated into the contractor's Site-Specific Safety Plan. This document is not designed or intended to replace the contractor's safety program, nor to address every possible safety, environmental, or health hazard associated with the contractor's work. In the event that the contractor's safety program includes a requirement or practice that is more stringent than set forth herein, the more stringent shall be followed. This document does not relieve the contractor of this obligation to: (1) control the means and methods by which its employees, and any subcontractors perform work, and (2) independently ascertain what health and safety practices are necessary for the performance of the work.
- B. No specific requirements herein shall be construed to limit, replace or supersede applicable provisions of federal, state, or local laws or regulations. [Occupational Safety and Health Administration \(OSHA\) Regulations; Standard Number 29 CFR 1926](#) are the foundation of these Guidelines.
- C. Deliverables
 1. Competent Person Designation (see attached form) (4.0/C)
 2. Verification of OSHA 30 or OSHA 10 compliance, based on project requirements. (4.0/D/1/b)

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3. Contractor Site Specific Safety Plan (SSSP). (4.0/I)
4. Summary of the Daily Safety Inspections documented as part of regular project meeting minutes. (4.0/F/1)
5. Monthly Safety Reports. (4.0/F/2)

3.1 Reference Materials

- A. The following reference materials are required to be available upon request at every job site:
1. OSHA Regulations published by NC Department of Labor (DOL) (Available at: (800) NC-LABOR, <http://www.nclabor.com/pubs.htm>).
 2. Safety Data Sheets (SDS) for all chemical products the contractor has brought to the worksite.
 3. The written Safety Plan of the Contractor or Subcontractor.
 4. Site inspection documentation.
 5. Worksite employee training records.
 6. Mishap reports and investigations.

4.1 General Responsibilities

- A. The contractor must notify the NC State Project Manager in writing at least 10 days prior to:
1. Utilizing powder-actuated tools
 2. Starting operations that will produce excessive odor, dust, noise affecting occupied buildings or work near air intakes
 3. Using a combustion engine indoors
 4. Using a mobile crane or tower crane (50-day notice is required)
 5. Breaking ground for an excavation or trench
 6. Using a laser
 7. Using any source of radioactive material
 8. Working with lead or asbestos containing materials
 9. Performing energized electrical work
 10. Working on or near active underground utility infrastructure (steam, chilled water, natural gas, water, etc.)
 11. Entering electrical distribution assets

Violation of any safety, security, or environmental requirement may result in the permanent removal of the contractor or their employees from the NC State premises.

- B. Construction Management
1. Contractor is responsible for compliance with all federal, state, and local laws, regulations, standards, executive orders, etc. applicable in part or whole pertaining to the scope of work.
 2. Contractors are responsible for compliance with all applicable NC State safety practices, procedures, policies, standards, and requirements.
 3. Contractors are responsible for providing qualified and competent personnel to perform activities under the scope of work. Contractors must provide documentation of training prior to beginning work on-site.
 4. Contractors are responsible for ensuring that subcontractors, their agents, employees,

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visitors, and other persons performing portions of the work on a project comply with federal, state, and/or local laws or regulations that relate to work site safety.

5. Contractors are responsible for ensuring that subcontractors are informed of and comply with all applicable requirements within the scope of work.

C. Competent Person Designation

1. Contractors shall designate a competent person for activities as specified in OSHA 29 CFR 1926. Such activities include, but are not limited to, the following activities, as applicable to the job:

- a) general provisions
- b) ionizing/non-ionizing radiation
- c) gases, vapors, fumes, mists, dusts
- d) ventilation
- e) hazard communication
- f) lead
- g) asbestos
- h) personal protective equipment
- i) hearing conservation
- j) respiratory protection
- k) rigging and material handling equipment
- l) welding, cutting, brazing
- m) electrical
- n) scaffold
- o) fall protection
- p) cranes (overhead and mobile)
- q) motor vehicles and equipment
- r) excavations
- s) concrete and masonry
- t) steel erection
- u) demolition
- v) stairways and ladders
- w) toxic and hazardous substances.

2. OSHA 29 CFR 1926.32(f) "Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

D. Contractor Safety Personnel

1. Safety Representative

- a) For all projects contractors must designate a Safety Representative prior to the start of the project. The Safety Representative may be the Project Superintendent, and as such, must be onsite during any and all construction operations.
- b) For projects bid through Capital Project Management, the Safety Representative must have completed, at a minimum, an OSHA 30-hour Construction Safety Course. For projects bid through Construction Services, the safety representative must have completed, at a minimum, an OSHA 10-hour Construction Safety Course.
- c) The Safety Representative must actively monitor the jobsite for safety issues on a daily basis. The safety representative may have additional site duties outside

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the scope of safety; when the safety representative is not on the project site, a competent designee must be assigned to monitor safety on the site.

2. Safety Professional
 - a) When appropriate, the contractor shall provide a full-time safety professional assigned to the project. The duties of the full-time safety professional must be strictly limited to safety-related activities, with no additional job site duties.
 - b) Safety professionals must have one or more of the following credentials: a professional certification (beyond an OSHA 30-hour course), a college or professional degree related to safety and health, or significant previous experience and skills necessary to thoroughly understand the health and safety hazard and controls relevant to the project. The designation and adequacy of qualifications of the full-time safety professional shall be reviewed and accepted by the University prior to commencement of the work.
 - c) Project-specific requirements for a full-time safety professional will be addressed in the contract documents and discussed during the Pre-Bid Meeting.
- E. Daily Pre-Job Meetings.
 1. A pre-job meeting (i.e. "Tailgate" or "toolbox" meeting) shall be held at the beginning of each work period (normally in the morning before leaving the yard or work staging area). The pre-job meeting should include a discussion of the scope of work to be completed, associated hazards, and means and methods to mitigate the hazards. The pre-job meeting must be led by the supervisor or other competent person.
- F. Safety Inspections.
 1. Daily Inspections: The Contractor shall perform daily job inspections and correct any unsafe conditions or actions. A summary of these inspections will be reviewed as a portion of and captured in the minutes of the weekly Owner, Designer, Contractor job meetings.
 2. Monthly Inspections: For projects with a duration of more than one calendar month (4 weeks), the safety inspection must be documented and include, at a minimum, the name of the person performing the inspection, the date, a checklist of items observed, any identified safety concerns, and actions taken to address identified concerns.
 3. University Project Visits: The NC State Project Manager, or other owner representative, may perform unscheduled visits to project sites to address adherence to the Contractor Safety Requirements or Site-Specific Safety Plans. Any safety concerns identified will be reported to the responsible contractor for prompt mitigation.
- G. Mishap Reporting: All mishaps occurring on the project site must be investigated to determine causes and actions must be taken to prevent recurrence. Mishaps resulting in injury requiring medical treatment or damage to NC State property must be reported in writing to the NC State Project Manager as soon as possible but no later than 24 hours from occurrence; the Project Manager shall be notified immediately of mishaps resulting in life-threatening injury.
- H. The Contractor shall address safety concerns at regularly scheduled meetings with subcontractors.
- I. Contractor Site-Specific Safety Plan - The Contractor must develop and implement a Site-Specific Safety Plan (SSSP) The SSSP is a comprehensive safety plan for his or her employees, which covers all aspects of onsite construction operations and activities associated with the contract. This plan must comply with all applicable health and safety regulations and any project-specific requirements. The Safety Plan must be submitted to, reviewed and accepted by NC State prior to beginning any on-site work activities.
 1. As applicable to the project, these items must be included in the Safety Plan:
 - a) Scope of Work
 - b) Emergency Procedures

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- c) 24-hour emergency points of contact
- d) Identification of Designated Competent On-Site Personnel (per OSHA requirements)
- e) Designated On-Site Safety Personnel
- f) Safety orientation program
- g) Site logistics Plan: address public (student, faculty, staff, visitor) safety, traffic plan, equipment and lay-down areas, site security, dust containment, etc.
- h) Minimum PPE requirements
- i) Hazard Assessment (for defined project tasks) - include hazard identification and mitigation
- j) Mishap reporting and investigation procedures
- k) Safety inspection/audit procedures
- l) Sub-contractor requirements

5.1 General Requirements

- A. Asbestos - If asbestos-containing materials are uncovered during construction, NC State must be notified *immediately*. Do *not* attempt to remove the material. Contractors shall comply with provision of the [State Construction Office Asbestos Abatement Guidelines and Policies](#) and the [NC State Asbestos Management Plan](#).
 - 1. If asbestos containing material is present in any building material and is in good condition (i.e. non-friable) and will not be disturbed during construction, the material may be left in place. If asbestos containing material is disturbed during construction activities, then it shall be removed; removal shall be performed by appropriately qualified and accredited personnel and in accordance with federal, state and local regulations.
- B. Compressed Gas Cylinders
 - 1. Compressed gas cylinders shall be properly used, stored, and maintained as per federal, state, and local requirements.
 - 2. Cylinders shall not be stored in a location in which they are subject to mobile equipment traffic (including vehicles) unless adequately protected.
- C. Confined Space Entry
 - 1. Contractors required to enter a confined space at NC State must have and implement a written confined space entry program in accordance with OSHA 1926 Subpart AA Confined Spaces in Construction or OSHA 1910.146 permit required confined spaces, as applicable.
 - 2. Controlling contractors (those with overall responsibility for construction at the work site) must ensure space entry coordination when more than one entity will enter the space.
 - 3. Each contractor must have a competent person that will identify confined spaces associated with the scope of their work. Before entry into a permit required confined space, contractors must obtain the following information from the controlling contractor (when there is no controlling contractor, the contractor will obtain the information from the NC State Project Manager):
 - a) The location of each known permit space associated with the project scope;
 - b) The known hazards or potential hazards that make it a permit space;
 - c) Any precautions needed to be taken based on the known hazards or potential hazards.
 - 4. Each contractor performing work in a permit space must perform a hazard assessment specific to the work to be performed and establish corresponding hazard controls.
 - 5. A competent person from each contractor performing work in a permit space must

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- complete and sign [Appendix F](#) to the [NC State Confined Space Entry Program](#).
- D. Contaminated Soil - If soil or any materials appear to be contaminated, the NC State Project Manager must be notified immediately. The NC State Project Manager will contact NC State EHS for assistance (919) 515-7915.
 - E. Electrical Power Lines (Overhead) - The contractor shall have a trained and knowledgeable observer (signal person) within sight of the operator and the overhead lines that will effectively provide guidance and clearance information to the operator as the equipment may approach the minimum approach distances. Advising the operator shall be the signal person's one and only task. When conducting any work with a crane, derrick or hoist in the vicinity of any overhead electric power transmission or distribution line, the contractor shall observe all clearance requirements dictated by all applicable OSHA rules, as specifically contained within 29 CFR 1910 - Standards for General Industry, CFR 1926 - Standards for Construction, IEEE C2 - NEC, NFPA 70 - NEC, the NCSBC, ANSI standards and other applicable NC State safety guidelines and requirements. Further, no crane, derrick or hoist operator or contractor shall conduct any operation at any distance closer than 20 feet to any electric power line lower than 200 kV or closer than 35 feet to any electric power transmission line at voltages higher than 200 kV and lower than 250 kV, unless the requirements of OSHA 1926 Sub CC for preventing encroachment/electrocution are strictly followed.
 - F. Elevators/Material Hoists
 1. Any persons operating elevators/hoists must be trained to do so. Documentation shall be kept onsite.
 2. No elevator/hoist with a defect shall be used.
 3. Elevator/hoist safety devices shall not be overridden or made inoperable.
 - G. Emergency Equipment- The following shall not be moved, blocked, disabled or rendered inaccessible unless authorized by NC State:
 1. Fire equipment
 2. First aid equipment, fire blankets, stretchers, eyewash fountains and safety showers
 3. Fire protection, hydrants, and detection systems
 - H. Emergency Medical Treatment - To receive immediate assistance for emergency medical treatment call 911.
 - I. Environmental and Chemical Requirements
 1. Contractors must provide NC State with a list of all chemicals to be used on NC State property and maintain a copy on site of the SDS for each chemical prior to being brought on site. Each chemical container must be labeled clearly with the identity of the chemical and any associated hazards in accordance with the OSHA Hazard Communication Standard (1910.1200).
 2. Contractors must follow the safety procedures recommended by the manufacturer or seller of any chemicals, tools, equipment, or other materials. Contractors are to remove all empty containers, excess chemicals and chemical waste from NC State property.
 3. For all chemical incidents, contractors shall call 911 and also notify the NC State Project Manager.
 - J. Excavation and Trenches - Before doing any excavation work, the Contractor must locate all utilities by calling the local utility locator service and NC State.
 - K. Excavations
 1. Underground Facilities Locate. Contractors shall ensure underground installations and facilities are identified by calling 811 (Call Before You Dig) before performing any excavating activity. Note: excavation includes movement or removal of earth, rock, or other materials in or on the ground by use of manual or mechanized equipment. This is required for any project with earth-moving activities before you dig so that

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underground facilities can be identified and avoided. Detailed instructions and requirements can be found at nc811.org.

2. **Competent Person.** Trench and excavation work must be performed under the direction of a competent person. Responsibilities include: classifying soil, inspecting protective systems, monitoring water removal and conducting site inspections.
3. **Cave-In Protective Systems.** A protective system is required by OSHA-1926 Subpart P for trenches and excavations that are 5 feet or more in-depth OR if the competent person has examined the ground and finds indication of a potential cave-in. Protective systems typically include: sloping/benching, shoring or shielding. In order to determine what protective systems are appropriate, the competent person must first determine the soil type: Stable Rock, Type A, Type B or Type C soil. Type C soil is the least cohesive and therefore, the least stable. No work shall be permitted in excavations where water has accumulated unless the integrity of the excavation has been protected.
4. Excavations >20 feet in depth or which cannot comply with OSHA requirements require written approval by a Registered Professional Engineer (RPE).
5. A ladder, stairway, ramp or other means of access must be provided within the excavation, when excavations are >4 feet in depth.
6. Barricades (stop-logs) shall be provided where vehicles or mobile equipment are used near or adjacent to excavations.
7. Spoil piles must be placed a minimum of 2 feet from the edge of the excavation.
8. Air monitoring must be performed if the excavation is >4 feet in depth and there is a potential for a hazardous atmosphere to exist.

L. Exit Routes

1. Exit routes must be maintained at all times during construction.
2. Lighting and marking must be adequate and appropriate.
3. Exit routes must be kept free of explosive or highly flammable furnishings.
4. Exit routes must be free and unobstructed. No materials or equipment may be placed, either permanently or temporarily, within the exit route. The exit access must not go through a room that can be locked, such as a bathroom, to reach an exit or exit discharge, nor may it lead into a dead-end corridor. Stairs or a ramp must be provided where the exit route is not substantially level. No materials shall be stored in a stairwell.

M. Explosives: Blasting on university property is prohibited.

N. Fall Prevention. A fall hazard is any condition on a walking-working surface that exposes an employee to a risk of fall on the same level or to a lower level. Examples of fall hazards include, but are not limited to: floor openings, hoist area, roofs, leading edge, scaffolding, ramps, etc.

1. Preventing or protecting falls from height may be necessary at any height given the circumstances, but is required when an employee is at a height of 6 feet or more above a lower level.
2. Contractor work generally falls within construction industry applications, where acceptable methods depend on the type of work being performed: unprotected sides or edges, roof work, leading edge, etc. In all cases, contractors shall comply with the respective OSHA standards.
3. Contractors shall ensure that every employee required to work at unprotected heights (greater than 6 feet) are trained in fall hazard recognition and prevention.
4. **Guardrail System.** A guardrail system provides the highest level of protection and is always preferred. The system must be capable of supporting 200 lbs. in any direction and still maintain its integrity. The individual heights of the components must conform to the following minimum standards:

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- a) The top rail of the system must be at a height of 42" (+ or – 3");
- b) the mid rail must be at a height of 21" with a 3" variation possible;
- c) the toe board must have a minimum vertical height of 3.5".

Note: building code has more stringent requirements for permanent installations.

5. Personal Fall Protection Systems. At times, it is necessary to work in areas where guardrails cannot be constructed; in these instances, a personal fall protection system must be used. Personal Fall Protection Systems are systems (including all components) that provide protection from falling or that safely arrest a fall. Examples include travel restraint and personal fall arrest. All components of this system shall meet the applicable design requirements as specified in OSHA 1910, 1926, or ANSI Z359. All components shall be inspected by the wearer prior to each use and at least annually by a competent person. No employee may use a personal fall protection system without proper training and an understanding of proper use and safe application of the system.

a) Travel Restraint System. A travel restraint system is a combination of an anchorage, anchorage connector, lanyard (or other means of connection) and body support that the wearer uses to eliminate the possibility of going over the edge of a walking-working surface. Anchorages for travel restraint systems shall have a strength capable of sustaining static loads of at least 1,000 lbs. (per person) or two times the foreseeable forces for certified anchorages. Anchorage connectors, lanyards (or other means of connection) and body support devices shall be used in accordance with the manufacturer's requirements. The system shall be installed so that a fall cannot occur; therefore, a rescue plan is not required.

b) Personal Fall Arrest System. A personal fall arrest system is a system used to safely arrest a user in a fall from a walking-working surface. It includes an anchorage, anchorage connector and a full body harness. The means of connection may include a lanyard, deceleration device, lifeline or a suitable combination of these. Equipment must be worn and used in accordance with the manufacturer's requirements. Anchorages for personal fall arrest systems shall have a strength capable of sustaining static loads of at least 5,000 lbs. (per person) or two times the maximum arresting force for certified anchorages. The system shall be installed so that should a fall occur, the wearer will not contact the lower level or any other obstruction. Since there is a potential for a fall to occur, a rescue plan written by a qualified person is required.

c) Warning Line System. A warning line may be used for construction roofing work when closer to the fall hazard than 15ft, but no closer than 6ft and in conjunction with one of the following: a guardrail system, a safety net system, a personal fall protection system, or a safety monitoring system. A warning line system shall conform to regulatory requirements and enclose all authorized employees conducting work protected by the Warning Line System. Refer to OSHA 1926.502(f).

0. Fire Protection and Prevention

1. The contractor shall be responsible for the development and maintenance of an effective fire protection and prevention program at the job site throughout all phases of the construction. Contractors shall perform inspections on fire extinguishers monthly. Contractors shall immediately replace fire extinguishers that do not pass inspection.
2. Fire cutoffs shall be retained in buildings undergoing alterations or demolition until operations necessitate their removal.
3. If work requires the disabling of Fire Protection Devices, then the Contractor must request a Fire Alarm Disconnect; through the appropriate NC State process; beginning

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with the Project Manager. No alarm shall be disabled at any time by the Contractor.

- P. Hand and Power Tools
1. All hand and power tools and similar equipment, whether furnished by the employer or the employee, shall be maintained in a safe condition. Any tool found not in proper working order, or that develops a defect during use, shall be immediately removed from service and not used until properly repaired.
 2. All tools shall be used, operated and maintained in accordance with OSHA and manufacturer requirements.
- Q. Hot Work Permits - A Hot Work Permit is required when any indoor or outdoor work will involve hot work, defined as operations including cutting, welding, thermite welding, brazing, soldering, grinding, thermal spraying, thawing pipe, installation of torch-applied roof systems or other similar activities. Requirements for Contractors performing this work are contained in the NC State Hot Work Permit Program that is a part of the specifications package and can also be found at [Hot Work Permit Form](#).
- R. Housekeeping
1. The Contractor must maintain a clean and orderly project job site. The Contractor shall maintain NC State's pathways free of rocks, mud, and other miscellaneous construction debris. The Contractor shall prevent the accumulation of dirt, dust, and/or other debris on NC State's roadways. The Contractor shall clean the travel ways on a daily basis. (Refer to project specifications for requirements.)
 2. Waste material and debris must be removed from the work and access areas at least once a day. Waste material and debris should not be thrown from one level to another but should be carried down, lowered in containers or deposited in a disposal chute.
 3. Materials must be neatly piled, stacked or otherwise stored to prevent tipping or collapsing. Materials must be carefully stacked and located so they do not block aisles, doors, fire extinguishers, safety showers and eyewash stations, fixed ladders or stairways.
 4. Material to be lifted by crane or other hoisting devices must not be stored under overhead power lines.
 5. No materials may be stored on penthouses, roofs, or other areas until a specific area is assigned by NC State for a specific project.
 6. Adverse Weather: If NC State becomes aware of an adverse weather event, the NC State Project Manager shall notify the construction superintendent, and the contractor shall perform a job site review to ensure any debris or construction materials are secured and protected from the elements.
- S. Illumination - Construction areas, ramps, runways, corridors, offices, shops, and storage areas shall be lit to not less than the minimum illumination intensities required by OSHA.
- T. Ladders - All ladders must meet OSHA requirements.
- U. Lasers
1. Lasers must comply with the OSHA Construction Industry Standards.
 2. Lasers must be low power (<5mw) devices with visible beams. Lasers to be used must bear a label indicating this maximum power output. Lasers that do not bear this label shall not be used.
 3. "Laser in use" signs shall be posted according to OSHA requirements.
 4. Lasers must be used in a manner that will not risk exposure to others.
- V. Lead
1. Lead may be found in certain painted surfaces. A check for lead presence should be conducted prior to certain activities such as grinding, sanding, or burning over painted surfaces. If lead containing paint is disturbed or a material is questionable the NC State Project Manager must be notified *immediately*. Do *not* attempt to remove the

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material.

2. Hot Work over lead painted surfaces is generally not permitted.

W. Lock Out/Tag Out

1. All contractors that work on energized equipment with any hazardous energy source are required to have a hazardous energy control (i.e. lockout tagout) program. The program shall specify policy and procedures for deenergizing, verifying deenergized, and secure the source potential using energy isolating devices and applying locks/tags or implement other forms of hazardous energy control as specified in OSHA standards. Types of potential energy sources include, but are not limited to:
 - a) Electrical (refer to section of these requirements titled “Electrical”) Pneumatic
 - b) Hydraulic,
 - c) Thermal
 - d) Kinetic (motion)
 - e) Hazardous gas, liquid, air
 - f) Radiation
 - g) Lasers
2. When multiple contractors are performing work on the same project, hazardous energy control procedures shall be coordinated by the controlling entity which includes establishing device standardization.
3. Contractors shall ensure site personnel are trained on the hazardous energy control program.
4. Central [Utility Plant \(CUP\) - Lockout Tagout Procedure](#).
 - a) Contractors with the need to perform LOTO operations within the operating CUP shall be trained in accordance with the procedure and comply with applicable sections of the procedure. The contractor is responsible for providing this training; a copy of this procedure will be provided to the contractor.
 - b) Contractor management shall ensure that authorized personnel are assigned to perform work in which they are qualified.
 - c) Contractor management shall comply with applicable sections of the procedure.

X. Mobile Cranes, Tower Cranes, etc. (Reference OSHA 1926 Subpart CC).

1. Prior to the set up or operation of any crane on university property, the NC State Project Manager (or other point of contact) shall be notified; notification must be made with as much lead time as possible, but no fewer than fifty (50) working days
2. Cranes shall be set up and operated in compliance with the manufacturer and applicable OSHA requirements.
3. Contractors are responsible for ensuring ground conditions are capable of supporting the equipment and load, which will include performing underground facilities/utilities location (i.e. 811 call) as well as factual confirmation of necessary compaction capacities. This confirmation is to be by third party inspection services, at the expense of the contractor.
4. No lifts may occur over occupied spaces unless a registered structural engineer evaluates and certifies that the building can withstand the impact of load being dropped on the building as a worst-case scenario. If it is determined that the building cannot withstand the impact without compromising the structure, areas of the building within the load fall zone must be evacuated during the duration of the lift. This evacuation process must be a part of the lift plan and managed by the contractor.
5. The crane contractor shall provide equipment documentation, including the annual inspection and last monthly inspection. Documentation must be signed.
6. Crane operators shall be certified by an Accredited Crane Operator Certification Agency for the type of equipment operated. Examples of such agencies, include, but

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are not limited to:

- a) National Commission for the Certification of Crane Operators (NCCCO)
- b) National Center for Construction Education and Research (NCCER)
- c) Operating Engineers Certification Program (OECF)
- d) Electrical Industry Certifications Association (EICA)

Additionally, the crane operator's employer must attest that the operator was evaluated to verify the operator demonstrates skills and knowledge to safely operate the equipment as well as the ability to recognize and avert risk, as required under 29CFR1926.1427(f).

7. All rigging personnel and signal persons shall be qualified in accordance with OSHA 1926 Subpart CC.
8. Crane Lift Plan. A lift plan is required for any lift in a location not under the exclusive control of the contractor, including lifts affecting NC State property, structures, employees, students, or visitors. Each lift plan must be developed by a qualified person and include at least the following:
 - a) The identity of the controlling entity, meaning the employer with the overall responsibility for construction operations associated with the crane lift.
 - b) Identify a lift director (i.e. primary signal person) and method of communication (hand signals, radio, etc.).
 - c) Contractors conducting crane operations are required to obtain required FAA permits according to 14CFR Part 77; to be submitted with the lift plan.
 - d) Equipment positioning locations, including load staging and movement and paths to and from the working position
 - e) Equipment specifications including load and reach capacities
 - f) Current qualifications, certifications, and licenses of operators and riggers
 - g) For lifts involving more than one crane, the lift plan shall encompass all cranes.
 - h) Fall Zone: The contractor shall identify the Fall Zone. The Fall Zone is the area (including but not limited to the area directly beneath the load) in which it is reasonably foreseeable that partially or completely suspended materials could fall. Spaces within the Fall Zone (including buildings, foot traffic, vehicle traffic, etc.) shall be barricaded to control access. The Fall Zone shall be cleared of personnel not participating in the lift.
 - i) Wind limitations
 - j) Ground and subsurface stability at crane and load placement locations. The contractor must ensure a qualified person evaluates the crane set-up location to ensure ground conditions are sufficient. (See X., 3. above)
 - k) Other conditions or factors that may affect the safety of the lift
 - l) A pre-lift meeting must be completed immediately before the lift and shall include all personnel involved with the lift and a thorough review of the elements and specifics of the lift plan and personnel assignments.
 - m) Specify distance to closest energized lines and applicable minimum approach distance of any lift component.
 - n) Where items positioned by a crane lift are rigged at heights above easy reach height, the lift plan shall include safe attachment and de-attachment procedures and the control of exposure to fall hazards.
 - o) The contractor must provide documentation of annual and monthly inspections for the previous 3 months. 1926.1412(f) & .1412(e)

Y. Electrical

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1. Electrical Contractor shall ensure that their personnel using electrically powered equipment are trained to recognize electrical hazards, inspect and maintain electrically powered equipment, and on safe work procedures to prevent exposure to electric shock.
 2. Premises Electrical Equipment. All electrical installations must comply with the National Electrical Code® (NEC®). Work associated with electrical equipment installed in accordance with the NEC® will be conducted in accordance with NFPA 70E® Standard for Electrical Safety in the Workplace. NC State's goal is to minimize exposure to shock and arc flash hazards during the installation, repair, maintenance, and operation of electrical equipment, components, and systems.
 - a) Electrical power sources shall be deenergized, verified, and locked out prior to working on electrical equipment except when de-energization creates a greater hazard and a properly executed Energized Electrical Work Permit (EWP) has been completed.
 - b) Contractors performing electrical work must have their own energized electrical work program that includes a permit process.
 3. Power Generation & Distribution: Work by Qualified Persons and Unqualified Persons working on or near power generation or distribution equipment is addressed in OSHA 29CFR1910.269. It includes work on or directly associated with installations used for the generation, control, transformation, transmission, and distribution of electricity. Any work involving the NC State distribution system shall be coordinated by the NC State Project Manager (or other university contact person) in collaboration with the Facilities Division Power Systems group.
 - a) Work involving the NC State electrical distribution system shall only be performed after authorization by the Facilities Division Power Systems group in accordance with the Power Systems Switching Procedure.
 - b) System Check In/Out: Prior to entering any primary enclosure (substation, transformer, manhole, switch, switching station, etc.) of the NC State Power System the NC State Project Manager or other designated person shall send a text or email to group-powersystementry@ncsu.edu with the work location and brief description of the tasks to be performed (photos are welcomed). When exiting the enclosure, check out with NC State Power Systems using the same method. This is only for unescorted access. For example, if you're with a member of the Power Systems team there's no need to check-in/out, but if that team member has to leave your work site, you're expected to check-in and check-out.
 4. Contractor will follow all requirements as noted in NFPA 70E.
- Z. Mobile Elevating Work Platforms (MEWPs)
1. General Requirements.
 - a) MEWPs shall be operated in accordance with the manufacturer's requirements and specifications.
 - b) Employees must always stand firmly on the floor of the MEWP and must not sit or climb on the edge of guardrails, or use planks, ladders or other devices for a work position. The guardrail system of the platform must not be used to support materials, other work platforms, or employees.
 - c) A personal fall arrest/restraint system shall be used in accordance with the manufacturer's requirements. A scissor lift with approved guardrails may be used without a personal fall arrest system when specified by the manufacturer, however, if there are designated anchor points, the use of a fall arrest/restraint system is required.
 - d) The MEWP must be used only in accordance with the manufacturer's operating instructions and safety rules.

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- e) The designed rated capacity for a given angle of elevation must not be exceeded.
- f) At least 10 ft distance must be maintained away from overhead power lines with a nominal voltage of 50kV or less; 20 ft for power lines over 50kV (or if voltage is unknown). Note: qualified workers using appropriately insulated MEWPs may approach closer than 10 ft when following provisions specified in OSHA 1910.268, 1910.269, and 1926 Subpart V, as applicable.
- g) The manufacturer's rated load capacity must not be exceeded. The load and its distribution on the platform must be in accordance with the manufacturer's specifications. The rated load capacity must not be exceeded when loads are transferred to the platform at elevated heights. Only employees, their tools, and necessary materials must be on or in the platform.
- h) A trained spotter with no other job duties is required when a MEWP is driven; the spotter will assess conditions that could pose a hazard to the operation (for example, drop-offs, holes, slopes, inadequate surface and support, obstructions, pedestrians, vehicles, debris, electric lines, etc.) and stop operations and alert the operator. The operator shall halt operations until hazards are adequately controlled.

2. Training

- a) Only personnel who have received training to operate the specific type(s) of MEWPs are authorized to operate them on NC State property.
- b) Training must include inspection, application, and operation of MEWPs (including recognition and avoiding hazards associated with their operation). Operators are only authorized to use MEWPs of the specific model for which they are trained and evaluated.
- c) Training must be provided by a person who has knowledge regarding the laws, regulations, safe use practices, manufacturer's requirements, and recognition and avoidance of hazards, and is familiar with the specific type(s) of MEWPs. Note: Personnel may not operate rented equipment unless qualified to operate the specific equipment; the rental provider or other authorized evaluator must provide familiarization training to satisfy this requirement.

3. Inspection, Maintenance, and Testing

- a) Each MEWP must be inspected, maintained, repaired, and kept in proper working condition in accordance with the manufacturer's operating or maintenance and repair manual or manuals. Maintenance inspections shall be completed at intervals no less frequent than annual.
- b) Before use, visual equipment inspections and a functional check must be performed before each shift in accordance with the manufacturer's operating manual. Any MEWP found not to be in a safe operating condition must be removed from service until repaired. All repairs must be made by an authorized person in accordance with the manufacturer's operating or maintenance and repair manual or manuals.
- c) Before and during use, visual worksite inspections must be performed and include workplace risk assessment. The workplace risk assessment includes identifying and evaluating hazards (for example, drop-offs, holes, slopes, inadequate surface and support, obstructions, pedestrians, vehicles, debris, electric lines, etc.) and establishing effective control measures. Uncontrolled hazardous situations must be corrected prior to initial or continued use of the MEWP.

AA. Noise/Vibration

- 1. Noise producing equipment, such as power drills, jackhammers, welders, etc., can create sound levels of 80dB(A) or greater in and around a construction area. Notify the NC State Project Manager in advance to determine the appropriate times to

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operate high noise/vibration equipment for that project's location.

2. Appropriate personal protective equipment shall be used when working around high noise/vibration equipment.

BB. Overhead Work

1. Work must not be performed above other personnel, including other contractor employees. Affected areas must be roped off or barricaded and marked to prohibit traffic.
2. Contractors must not climb on the heating and air-conditioning ductwork, plumbing steam piping, sprinkler piping, electrical cable trays, fixtures, or furniture or use as work platforms.
3. Contractors are expected to comply with OSHA fall protection requirements. CC. Paints and Solvents - Contractors must provide the following safeguards:
 1. Adequate ventilation must be maintained at all times when paints or solvents are being used. Refer to NC State Odor Prevention and Dust Control in Occupied Buildings for additional information.
 2. Contractor personnel must use proper respiratory protection and protective clothing when toxicity of the material requires such protection.
 3. Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.
 4. Flammable paints and solvents must be stored in an approved flammable liquid storage cabinet when storage is required inside buildings. Acids and flammables must never be stored together. If an approved flammable liquid storage cabinet is not available, flammable paints and solvents must be removed from the building.
 5. Flammable liquids must be dispensed in a safety can with a flash screen bearing a Factory Mutual or Underwriters Laboratory (UL) approval.

- DD. Personal Protective Clothing and Equipment - Contractor shall determine this minimum level of protective equipment to be worn on the jobsite (example: hard hat, eye protection, safety vest, gloves and safety shoes); NC State expects contractors to conform to industry accepted minimum PPE standards, for example, hard hats, safety glasses, and protective toe footwear. Any additional safety equipment required by a specific activity shall also be worn and shall meet or exceed OSHA standards. (Refer to NC State Community Standards for specific COVID-19 related PPE).

EE. Powder-Actuated Tools

1. Powder-actuated tools are not to be used on NC State property unless specific approval is obtained from NC State prior to usage.
2. If approved, powder-actuated tools must be used in accordance with OSHA and manufacturer regulations.

FF. Power Vehicle Equipment

1. Only trained operators are allowed to use power vehicles on NC State property. Contractor management will be expected to provide proof of training if requested.
2. Generally, LP gas powered trucks are not to be used inside NC State buildings. Prior approval from NC State is required.
3. The design of the LP gas fueled industrial truck for use within NC State buildings must comply with the following:
 - a) LP gas fueled industrial trucks must comply with NFPA 505-1982.
 - b) If trucks are in continuous use in a populated area, they must be equipped with a catalytic converter.
 - c) LP gas containers must not exceed the nominal 45 pounds LP gas.

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4. The following conditions and requirements will govern the use of LP gas fueled vehicles inside the confines of NC State buildings and structures:
 - a) LP gas fueled trucks must be removed from the building and parked at the end of each workday and not left unattended while in use. When the job requiring the truck is complete, the truck must be removed from the job site.
 - b) Trucks and tanks must not be refueled inside buildings.
 - c) All areas where LP gas fueled trucks are used must be well ventilated.
 5. All LP cylinders must be stored outside and secured by a chain in an upright position.
- GG. Roof Safety
1. The contractor shall request authorization from NC State prior to accessing a roof.
 2. During all rooftop operations, the contractor must provide fall protection measures in accordance with OSHA.
 3. A Hot Work Permit and at least two appropriate fire extinguishers of the correct ABC type are required when performing hot work on roofs. Other persons acting as a Fire Watch shall be in place on the roof and on the floor(s) directly below operation.
- HH. Sanitation
1. Drinking Water - An adequate supply of water, meeting the U.S. Public Health Service Drinking Water Standards, shall be provided.
 2. Washing Facilities
 - a) The contractor shall provide adequate washing facilities for employees engaged in the application of paints, coating, herbicides, or insecticides, or in other operations where contaminants may be harmful to the employees. Such facilities shall be in near proximity to the worksite and shall be so equipped as to enable employees to remove such substances. (Refer to NC State Community Standards for specific COVID-19 related washing requirements).
 - b) Hand soap or similar cleansing agents shall be provided.
 - c) Individual hand towels, cloth or paper, warm air blowers or clean individual sections of continuous cloth toweling, shall be provided.
 3. Toilet facilities shall be provided for employees according to the OSHA requirements.
- II. Scaffolding
1. Contractor shall erect, use and dismantle scaffolding in accordance with OSHA and manufacturer regulations.
 2. Competent Person. Scaffolds must be erected and dismantled under the direction of a competent person. Responsibilities include, but are not limited to:
 - a) supervise and direct scaffold erection, moving, dismantling, or alteration.
 - b) determine the feasibility and safety of providing fall protection for employees erecting or dismantling supported scaffolds. Employers are required to provide fall protection for employees erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.
 - c) inspect scaffold and scaffold components for visible defects before each work shift and after any occurrence which could affect a scaffolds structural integrity and ensure identified deficiencies are corrected,
 - d) determine if it is safe for employees to work on scaffolds during storms or high winds.
 3. Access. When scaffold platforms are more than 2 feet (0.6 m) above or below a point of access, portable ladders, hook-on ladders, attachable ladders, stair towers (scaffold stairways/towers), stairway-type ladders (such as ladder stands), ramps, walkways,

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integral prefabricated scaffold access, or direct access from another scaffold, structure, personnel hoist, or similar surface shall be used. Crossbraces shall not be used as a means of access.

4. Fall Protection. Each employee on a scaffold more than 10 feet (3.1 m) above a lower level shall be protected from falling to that lower level; each employee on a suspended scaffold shall be protected by a personal fall arrest system attached to an independent anchorage.
 5. Falling Object Protection. Where potential for tools, materials, or other equipment could fall from a scaffold, the area below must be barricaded, and personnel not permitted to enter the area OR effective means shall be implemented to prevent objects from falling.
- JJ. Signs, Tags, and Barricades (references 1926 Sub G and ANSI Z535)
1. Signs and Tags: Each sign and tag must include a signal word, symbol, and text.
 - a) Signal words:
 - (1) DANGER = the hazard will most likely result in serious injury or death;
 - (2) WARNING = the hazard could possibly result in serious injury or death;
 - (3) CAUTION = the hazard would not likely result in serious injury or death;
 - (4) NOTICE = indicates important information, but not directly hazard-related.
 - b) Symbols or graphics are used to bridge language barriers and draw attention to the message.
 - c) Text is used to convey the safety message in a clear, concise manner.
 2. Barricades. Barricades must be installed for situations where a physical obstruction is necessary to deter the passage of people, vehicles, or equipment. When used, barricades must be installed at all points of access.
 - a) Barricades associated with traffic control in a public roadway must comply with the Federal Manual of Uniform Traffic Control Devices and the North Carolina Supplement. Coordinate with the NC State Transportation Office.
 - b) Barricades may take many forms on construction sites, but when used, they must clearly indicate the intent of the barricade. All barricades are required to include a sign that includes the name of the person responsible for the barricaded area, method for contacting the responsible person (ex. phone number), and clear and concise text describing the purpose of the barricade.
 - (1) CAUTION Tape Barricades should be used when the hazardous condition is not likely to cause serious physical harm but could result in injury. Standard CAUTION Tape must be used, which includes yellow tape with the word "CAUTION" in black letters. Personnel may enter the barricaded area only when implementing precautions to address the identified hazard.
 - (2) DANGER Tape Barricades are used when a serious or imminent danger may exist. Standard DANGER Tape must be used, which includes red tape with the word "DANGER" in black letters. Only personnel specifically authorized by the person responsible for the barricaded area may enter the barricaded area.
- KK. Silica (Respirable Crystalline Silica) – The following requirements apply to all operations involving exposure to respirable crystalline silica. Examples of such operations include: cutting, grinding, drilling, or crushing brick, block, concrete, stone, rock, mortar, and other materials that contain crystalline silica.
1. Contractors shall comply with OSHA standard 29 CFR 1926.1153 including taking all necessary steps to comply with the established exposure limits.
 2. Contractors must have a written Exposure Control Plan specific to their operations in

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accordance with 29 CFR 1926.1153 that includes specific detail for controlling exposure to NC State personnel and the public. A copy of this plan shall be made available to NC State EHS and/or the university Project Manager upon request.

3. Tasks performed indoors or in an enclosed area, shall have effective exhaust ventilation to minimize the accumulation of visible airborne dust. In situations where ventilation is exhausted in an area with potential to expose people to dust must incorporate effective HEPA filtration; such areas include but are not limited to, inside a building or outside where people may be present.
4. When a building ventilation system services an area where work with the potential for generating respirable crystalline silica exists, the building air returns shall be blanked or closed while such work is in progress. Contractors must coordinate this with the university project manager.
5. Contractors must establish a “Temporary Restricted Area” for tasks that require the use of respiratory protection in accordance with 29 CFR 1926.1153.
 - a) *Temporary Restricted Area* means an area demarcated by the employer where an employee is required to wear respiratory protection.
 - b) *Temporary Restricted Areas* must be designated with signs, barriers, or other effective means that will ensure unauthorized persons do not enter.

If such work is performed in *occupied* buildings, dust barriers shall be installed as necessary to isolate the restricted area. Refer to [NC State Odor Prevention and Dust Control in Occupied Buildings](#) for additional information.

LL. Smoking and Open Flames

1. Smoking is not allowed in any NC State buildings, including roofs, penthouses, electrical/mechanical rooms and basements.
2. The use of open flames is strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled or processed.
3. The use of open flames, where allowed, requires a Hot Work Permit.

MM. Tarpaulins - When tarpaulins are required for the deflection of hot slag, dust, paint drippings, etc., or as a security barrier, they must be flame resistant and in good condition, free of holes and worn edges.

NN. Tar Pots (tar kettles) - Tar Pots are not allowed on roofs. The contractor must notify the NC State Project Manager prior to using tar pots and obtain a Hot Work permit.

OO. Temporary Heating - When heaters are used in confined spaces, special care shall be taken to provide sufficient ventilation in order to ensure proper combustion, maintain the health and safety of workmen, and limit temperature rise in the area.

PP. Temporary Lighting - Contractor shall submit a lighting plan for night work, underground work, and any other worksites without adequate lighting.

QQ. Temporary Traffic Control

1. All traffic control shall be approved by NC State and meet the Institute for Transportation Research and Education (ITRE) Work Zone Safety Guidelines for Construction, Maintenance and Utility Operations. Should this be referencing the federal [Manual on Uniform Traffic Control Devices](#) and the [North Carolina Supplement to the Manual on Uniform Traffic Control Devices](#)?
2. The contractor shall provide warning signs, barriers, barricades, etc., in accordance with the construction plans and specifications or whenever such protection is needed.
3. Where signs and barricades do not provide adequate protection, particularly along a

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road, walkway, or main aisle, flagmen shall be used.

4. Review with the crew, each person's responsibility regarding the traffic control set-up (e.g. sign installation, lane closure setup, etc.).
5. Review traffic control devices to be used at the site. Assure that traffic control set-up is properly installed. Installer shall document what traffic control set-up was used (including the sign types and sign locations) and how it was installed.

RR. Vehicle Operation

1. All equipment shall have operational backup alarms. Equipment shall not be utilized until such device is functioning properly.
 2. All vehicles shall be operated in accordance with OSHA and manufacturer regulations.
- SS. Vertical Lifts** - All contractors' platforms or vertical lifts must meet OSHA and manufacturer requirements.

END OF SECTION 010120

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SECTION 010350 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification sections, apply to this section.

1.2 SUMMARY

- A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 01 Section "Submittals" for requirements for the Contractor's Construction Schedule.

1.3 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued in accordance with the N.C. Construction Manual.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Designer, with a detailed description of the proposed change and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Designer are for information only. Do not consider them instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the proposal request, within 7 days of receipt of the proposal request, submit to the Designer for the Owner's review an estimate of cost necessary to execute the proposed change.
 - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Designer.

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1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 2. Include a list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Comply with requirements in Section "Product Substitutions" if the proposed change in the Work requires the substitution of one product or system for a product or system specified.
- C. Proposal Request Form: Use forms provided by the N.C. Construction Manual for Change Order Proposals and other documentation.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Designer may issue a Construction Change Directive on AIA Form G714, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Designer will issue a Change Order for signatures of the Owner and Contractor on N.C. Construction Manual, Section 310 - Form of Change Order.

PART 2 - PRODUCTS *(Not Applicable)*

PART 3 - EXECUTION *(Not Applicable)*

END OF SECTION 010350

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SECTION 01 23 00 – ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-I Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for Alternates and Unit Prices.
- B. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.
- C. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project. Costs of related coordination, modifications or adjustment must be included in the cost for each alternate.
- D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.

1.3 DESCRIPTION OF BASE BID

- A. The project entails standpipe upgrades at Poe Hall.
 - 1. Provide new fire line into building, interconnecting with existing combined fire/domestic service with back flow prevention.
 - 2. Separation of domestic service with back flow prevention.
 - 3. Selective demolition of the existing mechanical room which includes removal of the existing chiller and associated pumps and electrical services.
 - 4. Relocation of controls air compressor.
 - 5. Creation of a new fire pump room.
 - 6. Installation of a new fire pump, jockey pump, associated controllers and piping.
 - 7. Removal and replacement of all existing standpipes.
 - 8. Replacement of the existing fire alarm control panel and integration of new and existing devices.

1.4 DESCRIPTION OF ALTERNATES

- A. Alternate No. 1:

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1. Shall be a add Alternate to provide the fire pump, fire pump controller, jockey pump, jockey pump controller and all associated electrical and fire alarm.

B. Alternate No. 2:

1. Preferred Brand Alternate: Mechanical Door Hardware shall be:
 - a. Mortise locks, key in levers, cylindrical deadbolts by: Best, Schlage US26D Finish.
 - b. Panic Hardware and Strikes by: Von Duprin.

PART 2 - PRODUCTS *(Not Applicable)*.

PART 3 - EXECUTION *(Not Applicable)*.

END OF SECTION 01 23 00

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SECTION 013000 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements by the Project Expediter for submittals required for performance of the Work, including;
 - 1. Submittal Procedures.
 - 2. Contractor's construction schedule.
 - 3. Submittal schedule.
 - 4. Schedule of Inspections and Tests.
 - 5. Daily construction reports.
 - 6. Weekly Meeting Minutes.
 - 7. Schedule of Values.
 - 8. Payment Requests.
- B. Administrative Submittals: Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits.
 - 2. Licenses.
 - 3. Certifications.
 - 4. Applications for payment.
 - 5. Performance and payment bonds.
 - 6. Insurance certificates.
 - 7. List of Contractors.
 - 8. Inspection reports.
 - 9. Releases.
 - 10. Jurisdictional settlements.
 - 11. Notices
 - 12. Receipts for fee payments.
 - 13. Judgements.
 - 14. Records established in conjunction with compliance with standards and regulations bearing upon the performance of the work.
- C. Submittal of Shop Drawings, Product Data and Samples is included under Section "Shop Drawings, Product Data and Samples".

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

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1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. Allow two (2) weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Designer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow one (1) weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Designer sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name and project numbers as listed on the drawings cover sheet.
 - b. Date.
 - c. Name and address of Designer.
 - d. Name and address of Contractor.
 - e. Name and address of Contractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Designer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
1. On the transmittal Record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
 2. Transmittal Form: Use the sample form at the end of this Section for transmittal of submittals.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar- chart type Contractor's construction schedule. Submit within 15 days of the date established for "Commencement of the Work".

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1. Provide a separate time bar for each significant construction activity to be performed by all Prime Contractors. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values".
 2. Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the Work from all Prime Contractors and all parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work.
 5. Coordinate the Contractor's construction schedule with the Schedule of Values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules.
 6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Designer's procedures necessary for certification of Substantial Completion.
- B. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.
- C. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.
- D. Distribution: Following response to the initial submittal, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute 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 construction activities.
- E. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently at each monthly progress meeting and bi-weekly as requested by the Designer.

1.5 SUBMITTAL SCHEDULE

- A. Along with the development and acceptance of the Contractor's construction schedule, the Project Expediter shall prepare a complete schedule of submittals for all prime contracts. Submit the schedule within 10 days of the date required for establishment of the Contractor's construction schedule.
1. Coordinate submittal schedule with the list of subcontracts, Schedule of Values and the list of products as well as the Contractor's construction schedule.
 2. Prepare the schedule in chronological order; include submittals required during the first 30 days of construction. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category.
 - d. Name of subcontractor.

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- e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal.
 - g. Scheduled date the Designer's final release or approval.
- B. Distribution: Following response to initial submittal, print and distribute copies to the Designer, Owner, other prime contractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
1. When revisions are made, distribute 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 construction activities.
- C. Schedule Updating: Revise the submittal schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with the minutes of each meeting.

1.6 SCHEDULE OF INSPECTIONS AND TESTS

- A. Prepare a schedule of inspections, tests and similar services required by the Contract Documents. Submit the schedule with the Contractor's Construction Schedule.
- B. Form: The Schedule shall be in tabular form and shall include but not be limited to the following data:
1. Specification Section number.
 2. Description of the test.
 3. Identification of applicable standards.
 4. Identification of test methods.
 5. Number of tests required.
 6. Time Schedule or time span for tests.
 7. Entity responsible for performing tests.
 8. Requirements for taking Samples.
 9. Unique characteristics of each service.
- C. Distribution: Distribute the Schedule to the Owner, Designer, other prime contractors, and each party involved in performance of portions of the Work, where inspections and tests are required.

1.7 DAILY CONSTRUCTION REPORTS

- A. The Project Expediter shall prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Designer at week intervals:
1. List of contractors at the site.
 2. Approximate count of personnel at the site.
 3. High and low temperatures, general weather conditions.
 4. Accidents and unusual events.
 5. Meetings and significant decisions.
 6. Stoppages, delays, shortages, losses.
 7. Meter readings and similar recordings.
 8. Emergency procedures.
 9. Orders and requests of governing authorities.
 10. Change Orders received, implemented.
 11. Services connected, disconnected.

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12. Equipment or system tests and start-ups.
13. Partial Completions, occupancies.
14. Substantial Completions authorized.

1.8 WEEKLY MEETING MINUTES

- A. The Project Expediter shall schedule, hold and prepare minutes of the weekly construction coordination meetings, recording information concerning events at the site; and submit copies to all attendees, the Designer and the Owner. Minutes must be prepared and distributed within 48 (forty-eight) hours after the meeting.

1.9 SCHEDULE OF VALUES

- A. General: Each Prime Contractor shall prepare a Schedule of Values, as required by the General Conditions, in conjunction with the preparation of the progress schedule. Correlate line items with the forms required for the work, including the progress schedule, and payment request form. Provide break down of the Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports. Break down principal subcontract amounts into several line items, relative to distinct or separate portions of the work, i.e. labor and materials. Round off to the nearest whole dollar, but with the total equal to the Contract Sum.
 1. Time Coordination: In coordination of initial submittals and other administrative "start-up" activities, submit the Schedule of Values to the Designer at the earliest feasible date, but in no case later than 7 days before the initial payment request is to be submitted.
 2. Listing: Arrange the schedule with columns to indicate the generic name of item, the Prime Contractor, subcontractor, supplier, manufacturer or fabricator, change orders (numbers) which have affected the value, the dollar value of the item, and the percentage of the Contract Sum to nearest one-hundredth percent and adjusted to total 100 percent.
 3. Margins of Cost: Show line items of indirect costs, and margins on actual costs, only to the extent such items will be individually listed in payment requests. In general, each item in the Schedule of Values and in payment requests shall be complete with its total expenses and proportionate share of the general overhead and profit margin. Except as otherwise indicated, those major cost items that are not directly the cost of actual work-in-place, such as distinct temporary facilities, may be either shown as line items in the Schedule of Values or may be distributed as general overhead expense.
 4. Schedule Updates: Update and resubmit the Schedule of Values when change orders affect the listing and when the actual performance of the work involves necessary changes of substance to the values previously listed. When change orders are returned to Contractor fully approved, add to schedule as separate line items for each change order.

1.10 PAYMENT REQUESTS

- A. Project Expediter: Shall prepare and submit a single payment request combining all prime contracts. The schedule of values breakdown for mechanical work shall be as outlined in this division. Breakdown for other primes (HVAC, Electrical, etc.) shall be at Project Expediter's discretion with a minimum of one line required. However, a schedule of values and payment request breakdown as required by this specification section for each prime contract shall be attached to the Project Expediter's pay request.
- B. General: Except as otherwise indicated, the progress payment cycle is to be regular. Each application must be consistent with previous applications and payments. Certain applications

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for payment, such as the initial applications, the application at substantial completion, and the final payment application involve additional requirements.

- C. **Payment Application Times:** The "date for each progress payment" for each Prime Contractor is as indicated in Owner-Contractor Agreement. The period of construction work covered by each payment request is period indicated in Owner-Contractor Agreement and period starts on day following end of preceding period.
- D. **Payment Application Forms:** AIA Document G702 with G703 and Continuation Sheets, 1983 editions; available from "Publications, a Division of the AIA Service Corporation", 1735 New York Ave., N.W., Washington, D.C. 20006 (also available at the North Carolina AIA chapter office). Also include all applicable invoices and/or packing slips.
- E. **Application Preparation:** Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Designer without action. Entries must match current data of Schedule of Values, progress schedule and reports. Listing must include amounts of change orders issued prior to last day of the "period of construction" covered by application. Original forms will be submitted at each month's submittal, except that extra copies may be xerographically reproduced and individually signed and notarized. Do not obscure Designer's certification blocks with Notary seal; payment applications which cannot be legibly certified by the Designer will be returned for resubmittal. If modifications have to be made, i.e. values adjusted up or down, the request will be returned to the contractor for re-submittal.
- F. **Initial Payment Application:** The principal administrative actions and submittals which must precede or coincide with submittal of each Prime Contractor's first payment application can be summarized as follows, but not necessarily by way of limitation:
 - 1. Schedule of Values (AIA Document G703, 1983 edition).
 - 2. Progress schedule (preliminary if not final).
 - 3. Schedule of unit prices.
 - 4. Listing of Contractor's staff assignments and principal consultants.
- G. **Application at Time of Substantial Completion:** Following Preliminary Final Inspection of each Prime Contractor's work, a payment application may be prepared and submitted by Contractor. The principal administrative actions and submittals which must proceed or coincide with such applications can be summarized as follows, but not necessarily by way of limitation:
 - 1. Occupancy permits and similar approvals or certifications by governing authorities and assuring Owner's full access and use of completed work.
 - 2. Warranties (guarantees), maintenance agreements and similar provisions of contract documents.
 - 3. Test/adjust/balance records, maintenance instructions, meter readings, start-up performance reports, and similar change-over information germane to Owner's occupancy, use, operation and maintenance of completed work.
 - 4. Final cleaning of the work.
 - 5. Application for reduction (if any) of retainage, and consent of surety (AIA Document G707A).
 - 6. Advice to Owner on coordination of shifting insurance coverages, including proof of extended coverages as required.
 - 7. Listing of Contractor's incomplete work.
- H. **Final Payment Application:** The administrative actions and submittals which must precede or coincide with submittal of Project Expediter's final payment application can be summarized as follows, but not necessarily by way of limitation:

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1. Completion of project closeout requirements.
 2. Completion of items specified for completion beyond time of substantial completion.
 3. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay (AIA Document G706A).
 4. Transmittal of required project construction records to Owner.
 5. Proof, satisfactory to Owner, that taxes, fees and similar obligations of Contractor have been paid (AIA Document G706).
 6. Removal of temporary facilities, services, surplus materials, rubbish and similar elements.
 7. Change over of door locks and other provisions for Contractor's access to Owner's property.
 8. List of Subcontractors (AIA Document G805).
 9. Consent of surety for final payment (AIA Document G707)
- I. Application Transmittal: Project Expediter shall submit 5 executed copies of each payment application, complete with attachments. Transmit with a transmittal form listing attachments, and recording appropriate information related to application in a manner acceptable to Designer. Transmit to Designer by means ensuring receipt within 24 hours. Requests delivered immediately prior to weekends or holidays will not be acted upon until the start of business subsequent to such weekends or holidays.

PART 2 - PRODUCTS *(Not Applicable)*.

PART 3 - EXECUTION *(Not Applicable)*.

END OF SECTION 013000

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SECTION 013400 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittal of Shop Drawings, Product Data and Samples to verify that products, materials and systems proposed for use comply with provisions of the Contract Documents.

- B. Shop Drawings include, but are not limited to, the following:

1. Fabrication Drawings.
2. Installation Drawings.
3. Setting diagrams.
4. Shopwork manufacturing instructions.
5. Templates and patterns.
6. Schedules.
7. Design mix formulas.

- a. Standard information prepared without specific reference to the Project is not considered to be Shop Drawings.

8. Coordination Drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require close and careful coordination during fabrication or during installation to fit in the restricted space provided or to function as intended.

- a. Preparation of Coordination Drawings is specified in the "Project Coordination" Section and may include components previously shown in detail on Shop Drawings or Product Data.

- C. Product Data include, but are not limited to, the following:

1. Manufacturer's product Specifications.
2. Manufacturer's installation instructions.
3. Standard color charts.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
6. Standard wiring diagrams.
7. Printed performance curves.
8. Operational range diagrams.
9. Mill reports.
10. Standard product operating and maintenance manuals.

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- D. Samples include, but are not limited to, the following:
1. Partial Sections of manufactured or fabricated components.
 2. Small cuts or containers of materials.
 3. Complete units of repetitively-used materials.
 4. Swatches showing color, texture and pattern.
 5. Color range sets.
 6. Components used for independent inspection and testing.
 7. Field Samples are full-size physical examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the Work will be judged.
 8. Mock-ups are full size assemblies for review of construction, coordination, testing, or operation; they are not Samples.
- E. Administrative Submittals: Refer to other Division 01 Sections and other Contract Documents for requirements for administrative submittals.

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of the Work. Transmit each submittal to the Designer sufficiently in advance of scheduled performance of related construction activities to avoid delay.
1. Coordinate each submittal with other submittals and related activities that require sequential activity including, but not limited to:
 - a. Testing.
 - b. Purchasing.
 - c. Fabrication.
 - d. Delivery.
 2. Coordinate transmittal of different types of submittals for the same element of the Work and different elements of related parts of the Work so that processing will not be delayed by the Designer's need to review submittals concurrently for coordination.
 - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.
 3. Scheduling: The Submittal Schedule listing submittals and indicating time requirements for coordination of submittal activity with related construction operations is included under Section "Submittals."
 4. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 - a. Allow three weeks for the Designer's initial review of each submittal. Where processing must be delayed to permit coordination with subsequent submittals, allow additional time. The Designer will advise the Contractor promptly when a submittal being processed must be delayed for coordination.
 - b. Where necessary to provide an intermediate submittal between the initial and final submittals, process the intermediate submittal in the same manner as the initial submittal.
 - c. Allow three weeks for reprocessing each submittal.

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- d. Advise the Designer when processing time is critical to progress, and the Work may be expedited if processing time might be shortened.
 - e. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Designer sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification.
1. Indicate the name of the firm or entity that prepared each submittal on the label or title block.
 2. Provide a space approximately 4" x 5" on the label or beside the title block to record the Contractor's review and approval markings and the action taken by the Designer.
 3. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of Designer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 - j. Similar definitive information as necessary.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Designer, and to other destinations, as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender without action.
1. Record relevant information and requests for data on the transmittal form. On the form, or an attached separate sheet, record deviations from requirements of the Contract Documents, including minor variations and limitations.
 2. Include the Contractor's signed certification stamped on the submittal stating that information submitted complies with requirements of the Contract Documents. Submittals received from the Contractor without the signed certification will be returned to the sender without action.

1.4 SPECIFIC SUBMITTAL REQUIREMENTS

- A. Shop Drawings: Submit newly prepared information, drawn to accurate scale. Do not reproduce Contract Documents or copy standard printed information as the basis of Shop Drawings.
1. Include the following information on Shop Drawings:
 - a. Refer to specification section for which the Shop Drawing is being submitted.
 - b. Dimensions.
 - c. Identification of products and materials included.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.

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2. Submit Coordination Drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.
 3. Highlight, encircle or otherwise clearly indicate deviations from the Contract Documents on the Shop Drawings.
 4. Do not permit Shop Drawing copies without an appropriate final stamp or other marking indicating the action taken by the Designer to be used in connection with construction.
 5. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 30" x 40".
 6. Initial Submittal: Submit one correctable translucent reproducible print and one blue- or black-line print for the Designer's review; the reproducible print will be returned.
 7. Initial Submittal: Submit 2 blue- or black-line prints for the Designer's review; one will be returned.
 8. Final Submittal: Submit 4 blue- or black-line prints; submit 6 prints where prints are required for maintenance manuals. 2 prints will be retained; the remainder will be returned.
 - a. One of the prints returned shall be marked-up and maintained by the Contractor as a "Record Document".
- B. Product Data: Collect Product Data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.
1. Where Product Data have been printed to include information on several similar products, some of which are not required for use on the Project, or are not included in this submittal, mark copies to clearly indicate which information is applicable.
 2. Where Product Data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, submit as "Shop Drawings" not "Product Data".
 3. Include the following information in Product Data:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 4. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 5. Submittals: Submit 4 copies of each required Product Data submittal; submit 2 additional copies where copies are required for maintenance manuals. The Designer will retain one copy, and will return the other marked with the action taken and corrections or modifications required.
 - a. Unless the Designer observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
 6. Product Data Distribution: Furnish copies of final Product Data submittal to manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.

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- a. Do not proceed with installation of materials, products and systems until a copy of Product Data applicable to the installation is in the installer's possession.
 - b. Do not permit use of unmarked copies of Product Data in connection with construction.
- C. Samples: Submit Samples physically identical with the material or product proposed for use; submit full-size, fully fabricated Samples, cured and finished in the manner specified.
 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Designer's Sample where so indicated. Include the following information:
 - a. Generic description of the Sample.
 - b. Size limitations.
 - c. Sample source.
 - d. Product name or name of manufacturer.
 - e. Compliance with recognized standards.
 - f. Compliance with governing regulations.
 - g. Availability.
 - h. Delivery time.
 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variations in color, pattern, texture or other characteristics are inherent in the material or product represented by a Sample, submit sets of multiple units of the Sample (not less than 3 units), which show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other Specification Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be in an undamaged condition at time of use. On the transmittal form, indicate such special requests regarding disposition of Sample submittals.
 3. Submittals: Except for Samples intended to illustrate assembly details, workmanship, fabrication techniques, connections, operation and other characteristics, submit 4 sets of Samples; one set will be returned marked with the action taken.
 - a. Maintain sets of Samples, as returned by the Designer, at the Project site, available for quality control comparisons throughout the course of construction activity.
 - b. Unless the Designer observes noncompliance with provisions of the Contract Documents, the submittal may serve as the final submittal.
 - c. Sample sets may be used to obtain final acceptance of the construction associated with each set.
 4. Distribution of Samples: Prepare and distribute additional sets of Samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for performance of the Work. Show distribution on transmittal forms, and submit a copy to the Designer.

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5. Field Samples specified in individual Specification Sections are special types of Samples. Comply with Sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.5 DESIGNER'S ACTION

- A. Except for submittals for the record, for information and similar purposes, where action and return on submittals is required or requested, the Designer will review each submittal, mark to indicate the action taken, and return promptly.
 1. Compliance with specified characteristics is the Contractor's responsibility, and not considered part of the Designer's review and indication of action taken.
- B. Action Stamp: The Designer will stamp each submittal with a uniform, self-explanatory action stamp.

PART 1 - PRODUCTS *(Not Applicable)*.

PART 2 - EXECUTION *(Not Applicable)*.

END OF SECTION 013400

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SECTION 014329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 21-28 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

- A. 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 results in increased maintenance or decreased operational life or safety.
- B. 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 Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

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.

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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.

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.

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. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 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. 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

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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.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 014329

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SECTION 015000 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
- B. Temporary construction and support facilities required include but are not limited to:
 - 1. Temporary Project identification signs and bulletin boards.
 - 2. Waste disposal services.
 - 3. Construction aids and miscellaneous services and facilities.
- C. Security and protection facilities required include but are not limited to:
 - 1. Barricades, warning signs, lights.
 - 2. Environmental protection.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Utility company regulations.
 - 4. Police, Fire Department and Rescue Squad rules.
 - 5. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
 - 2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service.
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

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1.4 PROJECT CONDITIONS

- A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

1.5 SUBMITTALS – GENERAL

- A. Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification. Where a submitted item does not comply fully with each and every requirement of the specifications, the submittal shall clearly indicate such deviations and may be subject to rejection. Identification requirements for non-complying features of items are very specific.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials; if acceptable to the Designer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

2.2 EQUIPMENT

- A. General: Provide new equipment; if acceptable to the Designer, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- C. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.
- E. First Aid Supplies: Comply with governing regulations and OSHA requirements as a minimum.
- F. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
 - 1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. 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.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities as directed by the Owner.
 - 1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion.
- B. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner. **Owner will designate locations for dumpsters.**
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities. **Owner will designate locations for temporary toilets.**
- D. Construction Power: The contractor may utilize existing house outlets in the area of construction for their needs; any special power requirements must be provided by the Contractor.
- E. Pipe Cutting Activities: The Owner will designate one (1) area on site for pipe cutting activities where large pipe (2" and larger) is to be cut/reamed for installation in the building. This will be near the existing Physical Plant. Smaller pipe may be cut at a location outside the building near the entrance for the phase of work on-going at that time. Contractor shall protect the ground and surroundings at all times and all equipment must be removed at the end of the work day and area thoroughly cleaned.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
- B. **Building and Site Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental**

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regulations, and minimize the possibility that the interior environment might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful vibration or create excess dust.

PART 4 - SPECIAL NCSU REQUIREMENTS

- A. Project Signs – Project signs are not allowed. Directional signs for material deliveries are allowed within the construction area, if required, and shall be 4' wide x 2' high maximum, black and white only. The NCSU Project Manager shall approve the design of the sign and the sign text. **[Designer shall coordinate with NCSU PM for a sample layout of temporary construction sign.]**
- B. **[Designer shall provide detailed pedestrian detour plans as part of the contract documents** and show quantity, location, and layout of pedestrian detour signs on the detour plan.] Sidewalks shall remain open and accessible during construction. Should sidewalks require closure, an accessible and safe temporary (concrete, asphalt or plywood) pedestrian path around construction shall be required if an alternative accessible route is not close by. Temporary paths shall be shown on the contract documents clearly showing path and type of construction.
- C. The construction site shall be secured. Contract documents shall clearly indicate limits of construction and location of the construction fence. The fence shall be constructed of heavy-duty chain link material, have a minimum height of six feet and shall have a continuous top tubular rail. Swing gates shall be included at every access to the enclosed area and shall be lockable. The fence shall have an integral visual barrier or shall have shading type material applied and maintained for the duration of the project. Locks for the gates shall be interlocked with a padlock provided by NCSU in order to allow access by NCSU or other emergency personnel in case of emergency.
- D. Walks, Root Zones, and Lawn Protection - A permit, issued by NC State Grounds Management, is required for vehicular access to brick and landscape areas. For single loads up to 9000 lbs., a ¾" minimum plywood base shall be placed over brick paving, root zones of trees, and lawn areas to be protected from vehicular work traffic at a construction site. For single loads over 9000 lbs., two layers of ¾" plywood is required. Root zones and lawn areas shall not be covered with plywood for more than 3 consecutive days.
- E. For projects of duration longer than 3 days or requiring multiple heavy loads into a construction landscape protection zone, a construction entry road shall be included in the contract documents **[Designer must show on the contract drawings, including a detailed cross section]** to indicate access route for heavy loads into the site. This construction entry shall consist of 10' x 16' oak logging mats on 6" coarse, chipped, hardwood placed on a permeable structural, filter fabric, top-dressed with an additional 10" of hardwood mulch. Mulch and logging mats shall be supplemented throughout the project to keep the access area structurally functional. At the end of the project the logging mats shall be offered to Facilities Operations for salvage or disposed of off site at the discretion of the Owner.
- F. All pruning of existing plant materials, including roots and limbs, for construction clearances shall be done by a trained, licensed, insured arborist and according to standards set forth in the National Arborist Association publication "Standards for the Pruning for Shade Trees". All pruning shall be coordinated with and inspected by NC State Grounds Management. **[The**

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Designer and University Landscape Architect shall assess the necessity for this work during the design phase and determine whether work will be performed by contractor or NC State Grounds Management. Designer shall identify on contract drawings who will perform pruning.]

- G. Transportation/Parking. **[Designer shall incorporate latest NC State Transportation Guidelines for Parking, Traffic Control and Road Closures.]**

END OF SECTION 015000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. General installation of products.
 - 3. Temporary Egress Planning and Execution
 - 4. Progress cleaning.
 - 5. Starting and adjusting.
 - 6. Protection of installed construction.
 - 7. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

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- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Designer. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 TEMPORARY BARRICADE PLANNING AND EXECUTION

- A. **General: Contractor shall provide, in conjunction with the Owner and Designer, a temporary barricade plan showing how areas of the deck will be barricaded from vehicle traffic during construction activities. Plans will be updated on a weekly basis or as required by the Designer and Owner.**

3.4 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Designer.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

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1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- 3.6 PROTECTION OF INSTALLED CONSTRUCTION
- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

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3.7 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

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SECTION 017500 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work in this Section.

1.2 DESCRIPTION OF REQUIREMENTS

- A. Definitions: Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work, that are to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Project Expediter and the normal termination of the Contract.
 - 1. Specific requirements for individual units of work are included in the appropriate sections in Division 01 through 28.
 - 2. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

1.3 PREREQUISITES TO PRE-FINAL INSPECTION-EACH PHASE

- A. General: Requirements noted here shall apply at each phase of the project.
- B. General: The Designer will schedule a "Pre-Final" visit to develop a punch list after all contractors have submitted written notice that their work is complete and can show a copy of their respective punch lists as prepared by their project manager.
- C. In addition, each Contractor shall complete the following before requesting the Owner/Designer's Pre-Final Inspection, either for the entire Work or for portions of the Work. List all known exceptions in the request.
 - 1. Complete testing of systems, along with the necessary instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups, and similar elements.
 - 2. Inspection Procedures: Upon receipt of each Contractor's properly completed request for Pre-Final Inspection, the Designer will either proceed with Pre-Final Inspection or advise the Contractor of unfulfilled prerequisites.
 - a. Following the Pre-Final Inspection, the Designer will either proceed with the Inspection or will advise the Contractor of work which must be performed before the Final Inspection can be conducted.
 - b. Results of the completed Pre-Final Inspection will form the initial "punch-list" for final acceptance.

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1.4 FINAL INSPECTION-EACH PHASE

- A. Final Inspection Procedure: The Designer and Owner's representatives will inspect the Work upon receipt of each Contractor's notice that the work, including punch-list items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Designer.
1. Written statement from Contractor, that all "Pre-Final" punch list items have been satisfactorily addressed.
 2. Submit copies of certificates of approval by all authorities having jurisdiction over the work, i.e., electrical and plumbing approval certificates, pressure vessel inspections, life safety systems approval, etc.
 3. Provide satisfactory electrical systems test results.
 4. Upon completion of Final Inspection, the Designer, the Owner, and the N.C. Division of State Construction (where applicable) will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance.
 5. If necessary, the reinspection procedure will be repeated.

1.5 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Before the final visit will be scheduled, each Contractor shall complete the following for certification of final acceptance, and final payment as required by the General Conditions and the North Carolina Construction Manual. List known exceptions, if any, in the written request:
1. Written statement from Contractor, that all "Pre-Final" punch list items have been satisfactorily addressed.
 2. Submit copies of certificates of approval by all authorities having jurisdiction over the work, i.e., electrical and plumbing approval certificates, pressure vessel inspections, life safety systems approval, etc.
 3. Provide "Record Document Submittals".
 4. Submit executed copies of any previously outstanding change orders.
 5. Submit three (3) completed copies of the following:
 - a. Final Certificate of Payment.
 - b. Consent of Surety Company to Final Payment.
 - c. All Warranties, Guarantees, and Operating Instructions bound into a manual.
 - d. Contractor's Affidavit of Release of Liens.
 - e. Contractor's Affidavit of Payment of Debts and Claims.
 - f. Builders Risk Insurance Cancellation Notice.
 6. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) occupancy permits, operating certificates, and similar releases.
 7. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner.
 8. Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.

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9. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
10. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
11. Submit final meter readings for utilities, and similar data as of the date of substantial completion, or else when the Owner took possession of and responsibility for corresponding elements of the Work.
12. Submit a final liquidated damages settlement statement, acceptable to Owner.
13. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
14. Any other documentation required to verify completion of the work in accordance with contract documents.

1.6 RECORD DOCUMENT SUBMITTALS

- A. General: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in "submittals" sections.
 1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Designer's reference during normal working hours.
- B. Record Drawings: Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition. Mark the set of record documents to show the actual installation where the installation work varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where Shop Drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.
 1. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of the Work.
 2. Mark-up new information which is known to be important to the Owner, but for some reason was not shown on either Contract Drawings or Shop Drawings.
 3. Note related Change Order numbers where applicable.
 4. Organize record drawing sheets into manageable sets, bind with durable paper over sheets, and print suitable titles, dates and other identification on the cover of each set.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.
 1. Upon completion of the Work, submit record Specifications to the Designer for the Owner's records.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted.

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Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Provide one (1) hard copy and one (1) indexed .pdf file.

1. Upon completion of mark-up, submit complete set of record Product Data to the Designer for the Owner's records.
- E. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Designer and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.
- F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Designer for the Owner's records. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Provide one (1) hard copy and one (1) indexed .pdf file.
- G. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 2-inch, 3-ring vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Provide one (1) hard copy and one (1) indexed .pdf file. Include the following types of information:
1. Name, address, and telephone numbers of suppliers, subcontractors, and manufacturers.
 2. Emergency instructions.
 3. Spare parts list.
 4. Copies of warranties.
 5. Wiring diagrams.
 6. Recommended "turn around" cycles.
 7. Inspection procedures.
 8. Shop Drawings and Product Data.

PART 2 - PRODUCTS *(Not Applicable)*

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper

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operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - c. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - d. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

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- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

- D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 017500

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training videotapes.
- B. See Divisions 21 through 28 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

- A. Instruction Program: Submit **one** copy of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Demonstration and Training Video: Submit **two** copies within **seven** days of end of each training module.

1.3 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, experienced in operation and maintenance procedures and training.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

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1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

3.2 DEMONSTRATION AND TRAINING VIDEO

- A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Format: Provide in a format mutually acceptable to all parties.

END OF SECTION 017900

SECTION 033000 - CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials, as well as requirements on foundation plan for "Athletic Mix" concrete. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness, and concrete protection.

1.5 ACTION SUBMITTALS

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

- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops and vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

- G. Field quality-control reports.
- H. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 318.
 - 2. ACI 301 (ACI 301M)
 - 3. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
 - 3. Overlaid Finnish birch plywood.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Pedestals and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
- G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

- H. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- I. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from galvanized-steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
- B. Zinc Repair Material: ASTM A 780/A 780M.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

- A. Regional Materials: Concrete shall be manufactured within 500 miles (800 km) of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

- B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- C. Cementitious Materials:
 - 1. Portland Cement: ASTM C 150/C 150M, Type I, gray.
 - 2. Fly Ash: ASTM C 618, Class F.
 - 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 - 4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.
 - 5. Silica Fume: ASTM C 1240, amorphous silica.
- D. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- E. Lightweight Aggregate: ASTM C 330/C 330M, 1-inch (25-mm) nominal maximum aggregate size.
- F. Air-Entraining Admixture: ASTM C 260/C 260M.
- G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- H. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
- I. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
- J. Water: ASTM C 94/C 94M.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating.
- G. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating,
- H. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. Curing and sealing compounds shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- I. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. Curing and sealing compounds shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent where permitted. Not permitted at "athletic mix" slabs.
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Slag Cement: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Normal-weight concrete.

1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
2. Maximum W/C Ratio: 0.40.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.
6. Steel Reinforcement: according to manufacturer's written instructions and as instructed on contract documents.

B. Slabs-on-Grade: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Minimum Cementitious Materials Content: 470 lb/cu. yd. (279 kg/cu. m).
4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.
6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.
7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
8. Steel Reinforcement: according to manufacturer's written instructions and as instructed on contract documents.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.5 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.
 - B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view.
 - C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- 3.9 FINISHING FLOORS AND SLABS
- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 - B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in one direction.
 1. Apply scratch finish to surfaces indicated.
 - C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated.
 - D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
 - c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
 - d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
 3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).

3.10 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct concrete bases 4 inches ((100 mm) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 - 3. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 - 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.

- c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 2. Do not apply to concrete that is less than three days' old.
 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least [one] [six] month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 24 hours of finishing.

END OF SECTION 033000

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SECTION 042200 - CONCRETE UNIT MASONRY

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

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.
 - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection:
 - 1. Pre-faced CMUs.
 - 2. Colored mortar.
 - 3. Weep holes/vents.

- D. Samples for Verification: For each type and color of the following:
 - 1. Exposed CMUs.
 - 2. Aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties.
 - b. For masonry units, include data and calculations establishing average net-area compressive strength of units.
 - 2. Integral water repellant used in CMUs.
 - 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 4. Mortar admixtures.
 - 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 6. Grout mixes. Include description of type and proportions of ingredients.
 - 7. Reinforcing bars.
 - 8. Joint reinforcement.
 - 9. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
 - 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

2.3 UNIT MASONRY, GENERAL

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

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
- C. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 - 2. Density Classification: Lightweight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
 - 5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.5 MASONRY LINTELS

- A. General: Provide one of the following:

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

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- G. Colored Cement Products: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Colored Portland Cement-Lime Mix:
 - 2. Colored Masonry Cement:
 - 3. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 4. Pigments shall not exceed 10 percent of portland cement by weight.
 - 5. Pigments shall not exceed 5 percent of masonry cement by weight.
- H. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- I. Aggregate for Grout: ASTM C 404.
- J. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- K. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

- L. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- M. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.187-inch diameter.
 - 4. Wire Size for Cross Rods: 0.187-inch diameter.
 - 5. Spacing of Cross Rods: Not more than 16 inches o.c.
 - 6. Provide in lengths of not less than 10 feet.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
 - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 - 4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 - 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
 - 7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Partition Top Anchors: 0.105-inch-thick metal plate with a 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or mortar cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime or mortar cement mortar.
 - 4. For reinforced masonry, use portland cement-lime or mortar cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - 1. For masonry below grade or in contact with earth, use Type M or Type S.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S.
 - 4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 5. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
 - 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
 - 1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

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

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
 - 5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.

6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Install compressible filler in joint between top of partition and underside of structure above.
 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078440 "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Wet joint surfaces thoroughly before applying mortar.
 - 3. Rake out mortar joints for pointing with sealant.
- D. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- G. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

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

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.9 LINTELS

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

3.10 REINFORCED UNIT MASONRY INSTALLATION

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

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.12 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

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SECTION 06 12 13 – SUBFLOOR PANEL

PART 1 - GENERAL

1.1 SUMMARY

- A. Description of Work: Work of this Section includes the following:
 - 1. Framing
 - 2. Fasteners
 - 3. Underlayment and floor coverings
 - 4. Sound attenuation materials

1.2 DEFINITION

- A. Structural Panel - high-strength reinforced concrete or magnesium oxide fibrous reinforced panel for use in non-combustible construction.

1.3 REFERENCES

- A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
- B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
- C. ASTM C1280 – Standard Specification for Application of Gypsum Sheathing.
- D. ASTM D6109 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products.
- E. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- F. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials
- G. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C

1.4 SYSTEM REQUIREMENTS

- A. Performance Requirements: Fabricate and install systems as indicated here and in UL Details.
 - 1. Floor Framing:
 - a. Floor framing shall be designed with a minimum deflection as designated on the structural drawings and coordinated with the UL detail.
 - 2. Fasteners:
 - a. Length, size and type as designated by the the manufacturer for the condition shown, spaced at max. 12" o.c. in the field with screws located 1" and 2" from each edge, and 8" o.c. on the perimeter with a screw located 2" from each edge, located 1/2" from the side edges of the panel.
 - 3. Panel Layout:
 - a. 3/4" thick, with long edges tongue and groove or shiplap. Long dimension panels to be perpendicular to joists with the end joints staggered as recommended by the manufacturer and centered over joists.
- B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery:
 - 1. Deliver material to site promptly without undue exposure to weather.

2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, Brand, type, and grade.

B. Storage:

1. Store above ground in dry, ventilated space.
2. Protect materials from soiling, exposure, and damage.
3. If stored outside, material shall be covered with waterproof tarps.
4. Panels must be stored over stable soil or other surface. Soil or surface must be able to carry the load of the stored pallet(s). Each 20-piece pallet weights 3,500 lbs (1542 kg). It is recommended that the load carrying capacity of the floor or surface be verified before storing panels.
5. Pallets must not be stacked out of alignment by more than +/- 1/2" (13 mm), measured on any side of the pallet.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:

1. When mechanically fastened, do not install structural panels when ambient or conditioned temperature is below 0 °F (-18 °C).
2. Prior to the application of finished flooring, structural panels must be conditioned at the same temperature as required for the finished flooring for at least 48 hours.
3. Do not apply finished flooring over structural panels when wet, frozen or with surface frost.

PART 2 – PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

- A. Structural Panel: Listed products establish standard of quality and are manufactured by United States Gypsum Company, Ameriform LLC, Dragonboard USA or equal.

2.2 MATERIALS

A. Structural Panel:

1. 3/4" structural panels, a noncombustible structural subfloor panel
 - a. Panel Dimensions:
 - i. Thickness: 3/4" (19 mm)
 - ii. Width: 4' (1220 mm)
 - iii. Lengths: 8' (2440 mm)
 - iv. Long Edges: Tongue and Groove or Shiplap
 - b. Panel Properties:
 - i. Noncombustibility: tested in accordance with ASTM E136
 - ii. Surface Burning Characteristics: 0 Flame Spread / 0 Smoke Developed tested in accordance with ASTM E84
 - iii. Mold Resistance: 10 tested in accordance with ASTM D3273
0 tested in accordance with G21

- B. Structural panels recommended fasteners:
 - a. Install using the recommended spacing and distance from the ends and edges of the panel.
 - b. Any length of manufacturer recommended fasteners may be used but do not use a larger size fastener unless specified by the structural engineer.
- C. Floor Coverings and Underlayment:
 - 1. Follow floor covering manufacturers' installation procedures.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
- B. Steel framing to receive the 3/4" structural panels shall be structurally sound, free from bows, twists, or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of structural panels.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Cold-Formed Steel Framing:
 - 1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
 - 2. The attachment flange or bearing edge for cold-formed steel must be a minimum 1-5/8" (41 mm) wide, 2" preferred, with at least 3/4" (19 mm) of the panel bearing on the supporting flange.
 - 3. The size of the cold-formed steel framing flange required will vary based on the specified mil thickness/gauge and fastener selected.
 - 4. Cold-formed steel framing thickness and size is always based on diaphragm capacity but must be a minimum 43 mil (18 gauge) and spaced no greater than 24" (610 mm) o.c. for up to 450 plf. When significant diaphragm capacity is required, 54 mil (16 gauge) may be required.
 - 5. Joist bearing shall be provided at the foundation that is uniform and level.
 - 6. Cold-formed steel joists shall be located directly over bearing studs or a header installed at the top of the bearing wall to distribute the load.
 - 7. Joist framing must be perpendicular to rim joists.
 - 8. On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joist ends are not otherwise restrained from rotation.
 - 9. Additional joists shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
 - 10. All blocking or bridging must be installed prior to the installation of structural panels.
 - 11. Framing must be of good quality, free of bows, twists, or other malformations.
- B. 3/4" Structural Panels:
 - 1. This product may contain respirable crystalline silica. Refer to OSHA Rule 29 CFR 1926.1153 for specific details about limiting worker exposure to respirable silica.

2. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust industrial HEPA vacuum collection device for control of dust and silica. Wear safety glasses and a NIOSH-approved dust mask when cutting the panel. Collected dust shall be disposed in a safe manner and in compliance with local, state, and federal ordinances.
3. 3/4" structural panels shall be installed with the long edges (tongue & groove or shiplap) perpendicular to the framing. If primary framing direction changes, removal of the tongue from the first row of panels oriented in the new direction will be necessary for proper fastening. Care should be taken to ensure sufficient framing flange is available for fastening the panels in the new orientation.
4. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed. Given that panel width is 48" (1,220 mm), plan the layout so the first and last panel row width is a minimum of 24" (610 mm) wide. In the case where the row width is less than 24" (610 mm) wide, panels shall be blocked on all edges by framing (strapping is not sufficient).
5. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist. Place each panel across three or more supports [minimum two-span condition]. Less than full length panels at the end of a row may span a single framing opening. Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
6. 3/4" structural panels shall be fastened following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. Do not fasten all the corners first. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris. Do not gap the panels. Install the second panel and all subsequent panels in a similar manner to complete the row. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. Less than full length panels at the end of a row may be staggered by a single support.
7. Penetrations in the panels should be made before installing the panel whenever possible. If a penetration is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not damaged. Support the ends and edges of any penetrations with framing if they are greater than 6" (153 mm) in any direction.
8. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board.
9. Construction Traffic Protection – prior to floor finishing, place minimum 3/8" (9.525 mm) thick plywood sheathing materials on the floor in high traffic areas over newly installed 3/4" structural panels.

END OF SECTION 061213

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber Blanket.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.

2.2 ACCESSORIES

- A. Insulation Anchors, Spindles, and Standoffs; as recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100

SECTION 07 84 00 FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

Only tested firestop systems shall be used in specific locations as follows:

- A. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
- B. Safing slot gaps between edge of floor slabs and curtain walls.
- C. Openings between structurally separate sections of wall or floors.
- D. Gaps between the top of walls and ceilings or roof assemblies.
- E. Expansion joints in walls and floors.
- F. Openings and penetrations in fire-rated partitions or walls containing fire doors.
- G. Openings around structural members which penetrate floors or walls.

1.4 RELATED WORK OF OTHER SECTIONS

- A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
 - 1. Section 04 22 00 - Concrete Masonry Units
 - 2. Section 07 90 00 - Joint Sealants
 - 3. Section 09 20 00 - Plaster and Gypsum Board
 - 4. Section 13 48 00 - Sound, Vibration and Seismic Control
 - 5. Section 21 00 00 - Fire Suppression
 - 6. Section 22 00 00 - Plumbing
 - 7. Section 23 00 00 - Heating, Ventilating, and Air Conditioning (HVAC)
 - 8. Section 26 00 00 - Electrical
 - 9. Section 27 00 00 - Communications

1.5 REFERENCES

- A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

- B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”
- C. Test Requirements: UL 2079, “Tests for Fire Resistance of Building Joint Systems”
- D. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.
 - 1. UL Fire Resistance Directory:
 - a. Firestop Devices (XHJI)
 - b. Fire Resistance Ratings (BXRH)
 - c. Through-Penetration Firestop Systems (XHEZ)
 - d. Fill, Voids, or Cavity Material (XHHW)
 - e. Forming Materials (XHKU)
 - f. Joint Systems (XHBN)
 - g. Perimeter Fire Containment Systems (XHDG)
- E. Test Requirements: ASTM E 1966, “Standard Test Method for Fire Resistive Joint Systems”
- F. Test Requirements: ASTM E 2307, “Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus”
- G. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops”
- H. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials”
- I. ASTM D6904, “Standard Practice for Resistance to Wind Driven Rain for Exterior Coatings Applied on Masonry”
- J. ASTM C 679, “Standard Test Method for Tack-Free Time of Elastomeric Sealants”
- K. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments
- L. International Building Code (IBC 2015)
- M. NFPA 101 - Life Safety Code
- N. NFPA 70 - National Electric Code

1.6 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide through-penetration fire stop systems and fire-resistive joint systems that comply with specified requirements of tested systems.
- B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
- C. Proposed fire stop materials and methods shall conform to applicable governing codes having local jurisdiction.
- D. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

- E. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.7 SUBMITTALS

- A. Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions to comply with Section 01 30 00.
- B. Manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.
- C. Submit safety data sheets provided with product delivered to job-site.

1.8 INSTALLER QUALIFICATIONS

- A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- B. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.
- C. The work is to be installed by a contractor with at least one of the following qualifications:
 - FM 4991 Approved Contractor
 - UL Approved Contractor
- D. The installer must have no less than 3 years of experience with fire stop installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

- A. Do not use materials that contain flammable solvents.

- B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- C. Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain an inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 12.4 inches. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.
- D. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- E. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - 2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- F. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

- G. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of one (1) or less as tested per ASTM G21.
- H. Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than 1 hour tack free time as tested in accordance with ASTM C 679.
- I. Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.

2.2 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory
- B. Manufacturer:
 - a. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. ClarkDietrich.
 - d. Grabber Construction Products.
 - e. Hilti, Inc.
 - f. Nelson Firestop; a brand of Emerson Industrial Automation.
 - g. NUCO Inc.
 - h. Passive Fire Protection Partners.
 - i. RectorSeal.
 - j. Rockwool International.
 - k. Specified Technologies, Inc.
 - l. Thermafiber, Inc.; an Owens Corning company.
 - m. Tremco, Inc.
 - n. Willseal LLC.

2.3 MATERIALS

- A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- B. Pre-formed firestop devices for use with noncombustible and combustible pipes (closed and open systems), conduit, and/or cable bundles penetrating concrete floors.
- C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).
- D. Sealants or caulking materials for use with sheet metal ducts.
- E. Sealants, sprays, or pre-formed materials for use with fire-rated construction joints and other gaps.
- F. Pre-formed mineral wool designed to fit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material.
- G. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe.
- H. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles.

- I. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles.
- J. Wall opening protective materials for use with U.L. listed metallic and specified nonmetallic outlet boxes.
- K. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems).
- L. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways.
- M. Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways.
- N. Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating gypsum or masonry walls.
- O. Sealants or caulking materials used for openings between structurally separate sections of wall and floors.
- P. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected.
- Q. For single or cable bundles up to one inch diameter penetrating gypsum, masonry, concrete walls or wood floor assemblies.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - 4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 - 5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

- A. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

- D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.3 INSTALLATION

- A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.
- B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
 - 1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
 - 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 - 3. Protect materials from damage on surfaces subjected to traffic.

3.04 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- E. Manufacturer's Field Services: Contractor to ensure a manufacturer's direct representative is on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. Training will be done per manufacturer's written recommendations published in their literature and drawing details. During installation, contractor shall have manufacturer's representative provide periodic visual observations and written documentation of the results.

3.5 IDENTIFICATION & DOCUMENTATION

- A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.
- B. The Documentation Form for through penetrations is to include:
 - 1. A Sequential Location Number
 - 2. The Project Name
 - 3. Date of Installation
 - 4. Detailed Description of the Penetration's Location
 - 5. Tested System or Engineered Judgment Number
 - 6. Type of Assembly Penetrated
 - 7. A Detailed Description of the Size and Type of Penetrating Item
 - 8. Size of Opening
 - 9. Number of Sides of Assemblies Addressed
 - 10. Hourly Rating to be Achieved
 - 11. Installer's Name
- C. The Documentation Form for Construction Joints is to include:

1. A Sequential Location Number
 2. The Project Name
 3. Date of Installation
 4. Detailed Description of the Construction Joint's Location
 5. Tested System or Engineered Judgment Number
 6. Type of Construction Joint
 7. The Width of the Joint
 8. The Lineal Footage of the Joint
 9. Number of Sides Addressed
 10. Hourly Rating to be Achieved
 11. Installer's Name
- D. Copies of these documents are to be provided to the general contractor at the completion of the project.
- E. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
1. The words: "Warning: Through Penetration Firestop System – Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address and phone number.
 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 4. Date of installation.
 5. Through-penetration firestop system manufacturer's name.
 6. Installer's name.
- F. A firestop documentation manager software shall be used to document, track, and maintain the passive firestop systems throughout the construction and maintenance phase of the facility. The software solution shall be used to track and document every firestop system installed on the project and each subsequent addition, change, or removal of the firestop system. The firestop documentation shall be managed with a cloud-based software which allows the installer to use a standard smartphone or tablet device to capture the relevant information for the installation. The following data shall be tracked for each penetration within the facility: product installed, system installed, date of installation, location of the penetration including a notation on the 2D plan image, F-rating, name of installer, photo (pre-installation and post-installation), and inspection status. The Owner and/ or Construction Manager may designate additional items to be tracked. The firestop documentation manager software must perform the following basic functions:
1. Create multiple projects/ facilities, add/create/ remove users for each project, upload documents including UL systems, 2D floor plans, product data, engineering judgments, etc.
 2. Define data to track using pre-defined input fields or creating custom input fields as desired.
 3. Capture multiple photos for each penetration, including a pre-installation and post-installation photo.
 4. Annotate (mark) location of penetration on 2D floor plan.
 5. Create reports by filtering data and utilizing report templates.
 6. Online/ offline (for use in areas where data service is unavailable) synchronization of data between mobile device, online application and cloud-based system.
 7. Ability to transfer ownership of projects from one customer to another from construction phase to facility maintenance.
- G. Permanently attach manufacturer's identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or

firestopping. Labels shall have a unique QR code for each penetration which can be scanned by the firestop documentation software to quickly identify the penetration attributes.

3.6 ADJUSTING AND CLEANING

- A. Remove equipment, materials and debris, leaving the area in an undamaged, clean condition.
- B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 LABOR USE TO INSTALL FIRESTOP SYSTEMS

- A. If firestopping is not assigned to a single-source firestop specialty contractor, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

END SECTION 07 84 00

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SECTION 08 71 00 DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Mechanical door hardware selected for the following:

a. Swinging doors.

B. Products furnished, but not installed, under this Section include the products listed below. Coordinating and scheduling the purchase and delivery of these products remain requirements of this Section.

1. Pivots, thresholds, weather stripping and lock cylinders to be installed under other Sections.

1.2 ACTION SUBMITTALS

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

B. Samples: For each exposed product and for each color and texture specified.

C. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.

b. Content: Include the following information:

- 1) Identification number, location, hand, fire-rating, size, and material of each door and frame.
- 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
- 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, and finish of each door hardware product.

2. Keying Schedule: Prepared by or under the supervision of installer, detailing Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are compatible in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
 - 1. For door hardware, an Architectural Hardware Consultant (AHC) or Door + Hardware Specification Consultant (DHSC) or higher certification.
- C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- D. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3 inch wg of water.
- E. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- F. Accessibility Requirements: Comply with applicable provisions in the DOJ's 2010 ADA Standards for Accessible Design and ICC A117.1-2009 for door hardware on doors on an accessible route.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than ½ inch high.
 - 4. Closers: Adjust door and gate closer sweep periods so that, from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.
 - 5. Spring Hinges: Adjust door and gate spring hinges so that, from an open position of 70 degrees, the time to move the door to the closed position is 1.5 seconds minimum.
- G. Keying Conference: Conduct conference at Project site to comply with requirements of project management and coordination.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys to Owner by registered mail, overnight package service, or other means acceptable to the Owner.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion, except as follows:
 - a. Electromagnetic and Delayed-Egress Locks: Five years from date of Substantial Completion.
 - b. Exit Devices: Two years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.
 - d. Concealed Floor Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in the Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA designation referenced.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware as indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturer's names are abbreviated in Part 3 "Door Hardware Schedule" Article.
 - 2. References to BHMA Designations: Provide products complying with these designations and requirements for descriptions, quality, and function.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock of latch and with strike box or curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strike: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

- B. Mortise Locks: BHMA A156.13I; Operational Grade 1; stamped steel case with steel or brass parts; satin chrome finish; Series 1000.
- C. Manufacturer: Best, Yale, Baldwin or Schlage

2.4 EXIT LOCKS AND EXIT ALARMS

- A. Exit Locks and Alarms: BHMA A156.29, Grade 1.
- B. Surface Bolts: BHMA A156.16.

2.5 MANUAL FLUSH BOLTS

- A. Manual Flush Bolts: BHMA A156.16; minimum $\frac{3}{4}$ inch throw; designed for mortising into door edge.

2.6 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3; satin chrome or satin aluminum clear anodized finish.
- B. Manufacturer: Von Duprin, Dorma, Yale or Sargent

2.7 LOCK CYLINDERS

- A. Lock Cylinders: Small format interchangeable, Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver; satin chrome.
- B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Coordinate number of construction keys with Owner.
- C. Manufacturer: Best, Yale, Baldwin or Schlage

2.8 KEYING

- A. Keying System: Match University Standard System; Best A2 or A4 Patented System.

2.9 OPERATING TRIM

- A. Operating Trim: BHMA A156.6.; stainless steel, unless otherwise indicated.

2.10 CONCEALED CLOSERS

- A. Concealed Closers: BHMA A156.4; bright stainless steel finish; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- B. Manufacturer: LCN, Dorma, Von Duprin or Sargent

2.11 CLOSER HOLDER RELEASE DEVICES

- A. Closer Holder Release Devices: BHMA A156.15; Grade 1; bright stainless steel finish; closer connected with separate or integral releasing and fire- or smoke-detecting device. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by smoke detection system or loss of power.
- B. Manufacturer: LCN, Dorma, Von Duprin or Sargent

2.12 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.

2.13 OVERHEAD STOPS AND HOLDERS

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

2.14 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

2.15 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.16 METAL PROTECTIVE TRIM UNITS

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

2.17 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:

- 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
- 2) Strike plates to frames.
- 3) Closers to doors and frames.

b. Steel Through Bolts: For the following unless door blocking is provided:

- 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.18 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6
- B. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
- C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- D. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- E. Lock Cylinders: install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as directed by Owner.
- F. Key Control System: Match existing building.
- G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements as recommended by manufacturer for condition.
- H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- J. Door Bottom Gasketing: Apply to bottom of door, forming seal with threshold when door is closed.
- K. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.3 DOOR HARDWARE SCHEDULE

- A. Prepare proposed hardware schedule for review and acceptance by Owner and Architect.

END SECTION 08 71 00

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings and soffits.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested according to ASTM E 119.
- B. STC-Rated Assemblies: Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413.
- C. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.2 FRAMING SYSTEMS

A. Resilient Furring Channels.

1. Depth: As indicated on Drawings and UL Details.
2. Configuration: Asymmetrical

2.3 AUXILIARY MATERIALS

- A. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide asphalt saturated organic felt or foam gasket.

PART 3 - EXECUTION

July 2023

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

E. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.2 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying 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."

2.2 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/4, 5/8 inch where indicated.
 - 2. Long Edges: Tapered.

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.

- B. Aluminum Trim: ASTM B 221, Alloy 6063-T5.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

2.5 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Laminating 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."
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.
 - 1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Acoustical joint sealant 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. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
 - 1. Aluminum Trim: Install in locations indicated on Drawings.
 - 2. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- E. Prefill open joints and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

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SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on all exterior substrates unless noted otherwise.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, 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.

1.5 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 specified in Part 3.
 - 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.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. 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 Manual" applicable to substrates and paint systems indicated.

- B. 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.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. 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.

3.4 CLEANING AND PROTECTION

- A. 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.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Alkyd System:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79 or primer, alkyd, quick dry, for metal, MPI #76.
 - b. Prime Coat: Shop primer specified in Division 05 Section where substrate is specified.
 - c. Intermediate Coat: Alkyd, interior, matching topcoat.
 - d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94..

END OF SECTION 099113

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SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete floors – clear sealer.
 - 2. Concrete masonry units (CMU) – paint.
 - 3. Steel – paint.
 - 4. Gypsum board.
 - 5. All exposed electrical boxes and conduit, HVAC ducts, and plumbing and sprinkler piping.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and in each color and gloss of topcoat.
- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, 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.

1.5 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 specified in Part 3.
 - 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Floor Coatings: 100 g/L.
 - 9. Shellacs, Clear: 730 g/L.

- 10. Shellacs, Pigmented: 550 g/L.
- D. Low-Emitting Materials: Interior paints and coatings 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."
- E. Colors: As selected by Architect from manufacturer's full range.

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. Masonry (CMU): 12 percent.
 - 3. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. 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 Manual" applicable to substrates 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.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

- B. 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.

3.4 CLEANING AND PROTECTION

- A. 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.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Traffic Surfaces:

1. Solvent-Based Clear Sealer System:

- a. First Coat: Sealer/ Densifier, solvent based, for concrete floors, MPI #104.
- b. Topcoat: Sealer / Densifier, solvent based, for concrete floors, MPI #104.

B. CMU Substrates:

1. Latex System:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.

C. Steel Substrates:

1. Alkyd System:

- a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79 or primer, alkyd, quick dry, for metal, MPI #76.
- b. Prime Coat: Shop primer specified in Division 05 Section where substrate is specified.
- c. Intermediate Coat: Alkyd, interior, matching topcoat.
- d. Topcoat: Alkyd, interior, semi-gloss (Gloss Level 5), MPI #47.

D. Gypsum Board Substrates:

1. Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.

END OF SECTION 099123

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

SECTION 210513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION 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 general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.
- C. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 210513

Poe Hall – Fire Protection System Improvements

NC State University, SCO ID#: 22-24502-01

Raleigh, North Carolina

SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION 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. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description:
 - 1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 2. Designed to form a hydrostatic seal of 20 psig (137 kPa) minimum.
 - 3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
 - 4. Pressure Plates: Stainless steel, Type 316.
 - 5. Connecting Bolts and Nuts: Stainless steel, Type 316, of length required to secure pressure plates to sealing elements.

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2.3 GROUT

- A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Using grout, seal space outside of sleeves in slabs and walls without sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
- B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

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3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls below Grade:

a. Piping NPS 6 (DN 150) and Larger: Steel pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

END OF SECTION 210517

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SECTION 210523 - GENERAL-DUTY VALVES FOR FIRE PROTECTION 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. Two-piece ball valves with indicators.
 - 2. Iron butterfly valves with indicators.
 - 3. Check valves.
 - 4. Iron OS&Y gate valves.
 - 5. Indicator posts.
 - 6. Trim and drain valves.

1.3 DEFINITIONS

- A. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- B. NRS: Nonrising stem.
- C. OS&Y: Outside screw and yoke.
- D. SBR: Styrene-butadiene rubber.

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 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.

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- 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.
- D. Protect flanges and specialties from moisture and dirt.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. UL Listed: Valves shall be listed in UL's "Online Certifications Directory" under the headings listed below and shall bear UL mark:
 - 1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 1: HCBZ - Indicator Posts, Gate Valve.
 - b. Level 1: HLOT - Valves.
 - 1) Level 3: HLUG - Ball Valves, System Control.
 - 2) Level 3: HLXS - Butterfly Valves.
 - 3) Level 3: HMER - Check Valves.
 - 4) Level 3: HMRZ - Gate Valves.
 - 2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
 - a. Level 1: VQGU - Valves, Trim and Drain.
- B. FM Global Approved: Valves shall be listed in its "Approval Guide," under the headings listed below:
 - 1. Automated Sprinkler Systems:
 - a. Indicator posts.
 - b. Valves.
 - 1) Gate valves.
 - 2) Check valves.
 - a) Single check valves.
 - 3) Miscellaneous valves.
- C. Source Limitations for Valves: Obtain valves for each valve type from single manufacturer.
- D. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B1.20.1 for threads for threaded-end valves.
 - 3. ASME B31.9 for building services piping valves.
- E. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- F. NFPA Compliance: Comply with NFPA 24 for valves.

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- G. Valve Pressure Ratings: Not less than 250 psi.
- H. Valve Sizes: Same as upstream piping unless otherwise indicated.
- I. Valve Actuator Types:
 - 1. Worm-gear actuator with handwheel for quarter-turn valves, except for trim and drain valves.
 - 2. Handwheel: For other than quarter-turn trim and drain valves.
 - 3. Handlever: For quarter-turn trim and drain valves NPS 2 (DN 50) and smaller.

2.2 TWO-PIECE BALL VALVES WITH INDICATORS

- A. Description:
 - 1. UL 1091, except with ball instead of disc and FM Global standard for indicating valves (butterfly or ball type), Class Number 1112.
 - 2. Minimum Pressure Rating: 250 psig.
 - 3. Body Design: Two piece.
 - 4. Body Material: Forged brass or bronze.
 - 5. Port Size: Full or standard.
 - 6. Seats: PTFE.
 - 7. Stem: Bronze or stainless steel.
 - 8. Ball: Chrome-plated brass.
 - 9. Actuator: Worm gear or traveling nut.
 - 10. Supervisory Switch: Internal or external.
 - 11. End Connections for Valves NPS 1 (DN 25) through NPS 2 (DN 50): Threaded ends.
 - 12. End Connections for Valves NPS 2-1/2 (DN 65): Grooved ends.

2.3 IRON BUTTERFLY VALVES WITH INDICATORS

- A. Description:
 - 1. Standard: UL 1091 and FM Global standard for indicating valves, (butterfly or ball type), Class Number 112.
 - 2. Minimum Pressure Rating: 250 psig.
 - 3. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, or polyamide coating.
 - 4. Seat Material: EPDM.
 - 5. Stem: Stainless steel.
 - 6. Disc: Ductile iron, nickel plated and EPDM or SBR coated.
 - 7. Actuator: Worm gear or traveling nut.
 - 8. Supervisory Switch: Internal or external.
 - 9. Body Design: Grooved-end connections.

2.4 CHECK VALVES

- A. Description:
 - 1. Standard: UL 312 and FM Global standard for swing check valves, Class Number 1210.
 - 2. Minimum Pressure Rating: 250 psig.
 - 3. Type: Single swing check.

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4. Body Material: Cast iron, ductile iron, or bronze.
5. Clapper: stainless steel with elastomeric seal.
6. Clapper Seat: stainless steel.
7. Hinge Shaft: stainless steel.
8. Hinge Spring: Stainless steel.
9. End Connections: Flanged, grooved, or threaded.

2.5 IRON OS&Y GATE VALVES

A. Description:

1. Standard: UL 262 and FM Global standard for fire-service water control valves (OS&Y- and NRS-type gate valves).
2. Minimum Pressure Rating: 250 psig.
3. Body and Bonnet Material: Cast or ductile iron.
4. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
5. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.
6. Stem: Brass or bronze.
7. Packing: Non-asbestos PTFE.
8. Supervisory Switch: External.
9. End Connections: Grooved.

2.6 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Description:
 - a. Pressure Rating: 250 psig.
 - b. Body Design: Two piece.
 - c. Body Material: Forged brass or bronze.
 - d. Port size: Full or standard.
 - e. Seats: PTFE.
 - f. Stem: Bronze or stainless steel.
 - g. Ball: Chrome-plated brass.
 - h. Actuator: Handlever.
 - i. End Connections for Valves NPS 1 (DN 25) through NPS 2-1/2 (DN 65): Threaded ends.
 - j. End Connections for Valves NPS 1-1/4 and NPS 2-1/2 (DN 32 and DN 65): Grooved ends.
 - k.

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.

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- 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 GENERAL REQUIREMENTS FOR VALVE INSTALLATION

- A. Comply with requirements in the following Sections for specific valve installation requirements and applications:
 - 1. Section 211100 "Facility Fire-Suppression Water-Service Piping" for application of valves in fire-suppression water-service piping outside the building.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Install valves having threaded connections with unions at each piece of equipment arranged to allow easy access, service, maintenance, and equipment removal without system shutdown. Provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the pipe center.
- F. Install valves in position to allow full stem movement.
- G. Install valve tags. Comply with requirements in Section 210553 "Identification for Fire-Suppression Piping and Equipment" for valve tags and schedules and signs on surfaces concealing valves; and the NFPA standard applying to the piping system in which valves are installed. Install permanent identification signs indicating the portion of system controlled by each valve.
- H. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections.
- I. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

END OF SECTION 210523

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SECTION 210529 - HANGERS AND SUPPORTS FOR FIRE SUPPRESSION 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. Fastener systems.
 - 3. 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:
 - 1. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.
- B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Comply with NFPA 13.
- B. UL Compliance: Comply with UL 203.

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2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: Factory-fabricated components, NFPA approved, UL listed, or FM approved for fire-suppression piping support.
2. Galvanized Metallic Coatings: Pregalvanized or hot-dip galvanized.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.3 FASTENER SYSTEMS

A. Mechanical-Expansion Anchors: NFPA-approved, UL-listed, or FM-approved, 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.

2.4 EQUIPMENT SUPPORTS

A. Description: NFPA-approved, UL-listed, or FM-approved, welded, shop- or field-fabricated equipment support, made from structural-carbon-steel shapes.

2.5 MATERIALS

A. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. 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 078413 "Penetration 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).

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3.2 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with installation requirements of approvals and listings. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. 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. Install in accordance with approvals and listings.
- C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- D. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- E. Install lateral bracing with pipe hangers and supports to prevent swaying.
- F. 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.
- G. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- H. 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.

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 equipment supports.
- 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.

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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 1-1/2 inches (40 mm).

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with NFPA requirements 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 finishes.
- D. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.
- E. Horizontal-Piping Hangers and Supports: Comply with NFPA requirements. 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 noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 2. Steel Pipe Clamps (MSS Type 4): For suspension of NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 3. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 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 4 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.
- F. 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.
- G. Hanger-Rod Attachments: Comply with NFPA requirements.

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- H. Building Attachments: Comply with NFPA requirements. 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. C-Clamps (MSS Type 23): For structural shapes.
 - 3. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- I. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- J. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 210529

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SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION 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. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Valve tags.
 - 5. Warning 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 and the proposed content for each label.
- D. Valve Schedules: Valve numbering scheme.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032 inch (0.8 mm) or stainless steel, 0.025 inch (0.64 mm) thick, with predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black or Red.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
 - 5. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

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6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, with predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black or Red.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths 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.

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 (A4) 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 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, with predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

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- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction according to ASME A13.1.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, 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: At least 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances.
- E. Pipe-Label Colors:
 1. Background Color: Safety Red.
 2. Letter Color: White.

2.4 VALVE TAGS

- A. Description: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping-system abbreviation and 1/2-inch (13-mm) numbers.
 1. Tag Material: Brass, 0.032 inch (0.8 mm) thick, with predrilled holes for attachment hardware.
 2. Fasteners: Brass wire-link chain or S-hook.
 3. Valve-Tag Color: Safety Red.
 4. Letter Color: White.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) 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.

2.5 WARNING TAGS

- A. Description: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 1. Size: 3 by 5-1/4 inches (75 by 133 mm) minimum Approximately 4 by 7 inches (100 by 178 mm).

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2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be installed.
- 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.

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. 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 a view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
- B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes including pipes where flow is allowed in both directions.

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3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in fire-suppression piping systems. List tagged valves in a valve-tag schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below:
 - 1. Valve-Tag Size and Shape:
 - a. Wet-Pipe Sprinkler System: 1-1/2 inches (38 mm), round.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 210553

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SECTION 211000 - WET-PIPE SPRINKLER SYSTEMS

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. This Section specifies wet-pipe sprinkler systems zones for buildings and structures.
- B. Products specified in this Section with installation not in Contract include sprinkler cabinets with spare sprinklers and sprinkler wrenches. Deliver to the Owner's maintenance personnel.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 28 Section "Fire Alarm Systems" for alarm devices not specified in this section.

1.3 DEFINITIONS

- A. Pipe sizes used in this Section are nominal pipe size (NPS) specified in inches. Tube sizes are standard tube size specified in inches. Equivalent or approximate SI (metric) sizes are indicated in millimeters (mm) in parentheses.
- B. Working plans as used in this Section refer to documents (including drawings and calculations) prepared pursuant to requirements in NFPA 13 for obtaining approval of authority having jurisdiction.
- C. Other definitions for fire protection systems are included in referenced NFPA standards.

1.4 SYSTEM DESCRIPTION

- A. Sprinkler System: Fire-suppression system with sprinkler systems. Automatic Sprinkler system is supplied from piping system containing water and connected to water supply so that water discharges immediately from sprinklers when they are opened by fire.
- B. Sprinkler System Protection Limits: All spaces within areas indicated. Include closets, toilet areas, and special applications areas.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Obtain approval from Authority Having Jurisdiction for fire protection systems specified.
- B. The AHJ for Code compliance is the Office of State Construction. The AHJ for construction administration and inspection purposes is the engineer/owner's rep.

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- C. Minimum Pipe Sizes: Not smaller than sizes indicated for connection to water supply piping, standpipes, and branches from standpipes to sprinklers.
- D. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.
- E. Fire Protection Sprinkler Systems: 175 psig.
- F. Ordinary electrical equipment rooms, telephone closets, and similar spaces shall be fully sprinklered. Sprinkler protection is permitted to be omitted in main electrical switchgear and generator rooms provided they have direct outside access for the fire department and are enclosed by 2-hour fire rated construction.
- G. Electrical supervision per NFPA 72 is required for all sprinkler control valves, including the outside post indicator valve (PIV).

1.6 SUBMITTALS

- A. Product data for fire protection system components. Include the following:
 - 1. Valves.
 - 2. Specialty valves, gauges, accessories, and devices.
 - 3. Alarm devices. Include electrical data.
 - 4. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other data.
- B. The sprinkler contractor must submit "working plans or shop/fabrication drawings" to the engineer of record for review, prior to any fabrication or installation work. No fabrication and or installation shall begin without approved submittals from Sigma Engineered Solutions and State Construction Office Plan Review office.
- C. Test reports and certificates as described in NFPA 13. Include "Contractor's Material & Test Certificate for Aboveground Piping" and "Contractor's Material & Test Certificate for Underground Piping."
- D. Maintenance data for each type of fire protection specialty specified, for inclusion in Operating and Maintenance Manual specified in Division 1.
- E. 2 copies of NFPA 25 "Standard for Inspection, Testing and Maintenance of Water Based Fire Protection Systems." Deliver to Owner's maintenance personnel.
- F. 2 copies of NFPA 13A "Recommended Practice for the Inspection, Testing and Maintenance of Sprinkler Systems." Deliver to Owner's maintenance personnel.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and that conform to other requirements indicated.
- B. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

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- C. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Comply with requirements of authority having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections, and testing.
- E. Comply with requirements of the North Carolina Department of Insurance for submittals, approvals, materials, installation, inspections, and testing.
- F. Installer's Qualifications: Firms qualified to install and alter fire protection piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authority having jurisdiction. Submit evidence of qualifications to the Sigma Engineered Solutions upon request. Refer to Division 1 Section "Reference Standards and Definitions" for definition of "Installer."
- G. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
 - 1. NFPA 13 "Standard for the Installation of Sprinkler Systems."
 - 2. NFPA 26 "Recommended Practice for the Supervision of Valves Controlling Water Supplies for Fire Protection."
 - 3. NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Specialty Valves:
 - a. ASCOA Fire Systems, Figgie International Co.
 - b. Central Sprinkler Corp.
 - c. Firematic Sprinkler Devices, Inc.
 - d. Gem Sprinkler Co. Div., Grinnell Corp.
 - e. Globe Fire Sprinkler Corp.
 - f. Reliable Automatic Sprinkler Co., Inc.
 - g. Star Sprinkler Corp.
 - h. Viking Corp.
 - 2. Waterflow Indicators and Supervisory Switches:
 - a. Gamewell Co.
 - b. Gem Sprinkler Co. Div., Grinnell Corp.
 - c. Potter Electric Signal Co.
 - d. Reliable Automatic Sprinkler Co., Inc.

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- e. System Sensor Div., Pittway Corp.
 - f. Victaulic Company of America.
 - g. Watts Regulator Co.
 - h. Potter-Roemer Div., Smith Industries, Inc.
3. Indicator Valves:
- a. Gem Sprinkler Co. Div., Grinnell Corp.
 - b. Grinnell Supply Sales Co., Grinnell Corp.
 - c. Kennedy Valve Div., McWane, Inc.
 - d. Milwaukee Valve Co., Inc.
 - e. Nibco, Inc.
 - f. Sprink-Line by Sprink, Inc.
 - g. Victaulic Company of America.
4. Fire Protection Service Gate and Check Valves:
- a. Gem Sprinkler Co. Div., Grinnell Corp.
 - b. Kennedy Valve Div., McWane, Inc.
 - c. Nibco, Inc.
 - d. Stockham Valves and Fittings, Inc.
 - e. Victaulic Company of America.
5. Grooved Couplings for Steel Piping:
- a. Grinnell Supply Sales Co., Grinnell Corp.
 - b. Gustin-Bacon Div., Tyler Pipe Subsid., Tyler Corp.
 - c. Sprink-Line by Sprink, Inc.
 - d. Stockham Valves and Fittings, Inc.
 - e. Victaulic Company of America.
6. Grooved Couplings for AWWA Ductile-Iron Piping:
- a. Gustin-Bacon Div., Tyler Pipe Subsid., Tyler Corp.
 - b. Victaulic Company of America.

2.2 PIPES AND TUBES

- A. Refer to Part 3 Articles "Piping Installation" for identification of systems where pipe and fitting materials specified below are used.
- B. All piping shall be as follows:
 - 1. 2 1/2" through 8" pipe size: ASTM A135, schedule 10 black steel, grooved or welded joints and fittings.
 - 2. 2" and smaller pipe size: ASTM A135, schedule 40 black steel pipe with standard weight cast iron or malleable iron threaded joints and fittings, or schedule 40 black steel welded joints and fittings. Mechanical tees, grooved or threaded may be used.

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2.3 STEEL PIPE AND FITTINGS

- A. Threaded-End, 2" and smaller shall be schedule 40 Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed threaded ends.
 - 1. Cast-Iron Threaded Flanges: ASME B16.1.
 - 2. Malleable-Iron Threaded Fittings: ASME B16.3.
 - 3. Gray-Iron Threaded Fittings: ASME B16.4.
 - 4. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe hot-dip galvanized where indicated. Include ends matching joining method.
 - 5. Steel Threaded Couplings: ASTM A 865 hot-dip galvanized-steel pipe where indicated.

- B. Plain-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795 hot-dip galvanized-steel pipe where indicated.
 - 1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
 - 2. Steel Flanges and Flanged Fittings: ASME B16.5.

- C. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed, square-cut- or roll grooved ends.
 - 1. Grooved-Joint Piping Systems:
 - a. Manufacturers:
 - 1) Anvil International, Inc.
 - 2) Central Sprinkler Corp.
 - 3) Grinnell Mechanical Products.
 - 4) National Fittings, Inc.
 - 5) Shurjoint Piping Products, Inc.
 - 6) Southwestern Pipe, Inc.
 - 7) Star Pipe Products; Star Fittings Div.
 - 8) Victaulic Co. of America.
 - 9) Ward Manufacturing.
 - b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
 - c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

- D. Plain-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 (DN 125) to 2.5"; and NFPA 13 specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250).
 - 1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.
 - 2. Steel Flanges and Flanged Fittings: ASME B16.5.

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- E. Grooved-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 (DN 125) to 2.5"; and NFPA 13-specified wall thickness in NPS 6 to NPS 10 (DN 150 to DN 250); with factory- or field-formed, roll-grooved ends.
 - 1. Grooved-Joint Piping Systems:
 - a. Manufacturers:
 - 1) Anvil International, Inc.
 - 2) Central Sprinkler Corp.
 - 3) Greinnell Mechanical Products.
 - 4) JDH Pacific, Inc.
 - 5) National Fittings, Inc.
 - 6) Shurjoint Piping Products, Inc.
 - 7) Southwestern Pipe, Inc.
 - 8) Star Pipe Products; Star Fittings Div.
 - 9) Victaulic Co. of America.
 - 10) Ward Manufacturing.
 - b. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.
 - c. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

2.4 JOINING MATERIALS

- A. Flanged Joints for Ductile-Iron Pipe and Ductile-Iron or Cast-Iron Fittings: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
- B. Couplings for Grooved-End Steel Pipe and Grooved-End Ferrous Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron or ASTM A 47 malleable-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design; ASTM A 183 carbon-steel bolts and nuts; and locking pin, toggle, or lugs to secure grooved pipe and fittings.
 - 1. Dry-Pipe-Systems Couplings: UL-listed for dry-pipe service.
- C. Couplings for Grooved-End Ductile-Iron Pipe and Fittings: UL 213, AWWA C606, ASTM A 536 ductile-iron housing, with enamel finish. Include synthetic-rubber gasket with central-cavity, pressure-responsive design, and ASTM A 183 carbon-steel bolts and nuts to secure grooved pipe and fittings.

2.5 FIRE PROTECTION SERVICE VALVES

- A. Valves shall be UL listed or FMG approved, with 175-psig (1200 kPa) minimum pressure rating. Valves shall have 250-psig (1725-kPa) minimum pressure rating if valves are components of high-pressure piping system.
 - 1. Option: Valves for use with grooved piping may be grooved type.

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- B. Gate Valves, 2 Inches and Smaller: UL 262, cast-bronze, threaded ends, solid wedge, outside screw and yoke, rising stem.
- C. Indicating Valves, 2-1/2 Inches and Smaller: Butterfly or ball type, bronze body with threaded ends, and integral indicating device.
 - 1. Indicator: Electrical 115 volts a.c., prewired, 2-circuit, supervisory switch.
- D. Gate Valves, 2-1/2 Inches and Larger: UL 262, iron body, bronze mounted, taper wedge, outside screw and yoke, rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.
- E. Gate Valves, 2-1/2 Inches and Larger for Use with Indicator Posts: UL 262, iron body, bronze mounted, solid wedge disc, non-rising stem with operating nut and flanged ends.
- F. Swing Check Valves, 2-1/2 Inches and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze disc ring and flanged ends.
- G. Butterfly Check Valves, 4 Inches and Larger: UL 312, split-clapper style, cast-iron body with rubber seal, bronze alloy discs, stainless-steel spring and hinge pin.

2.6 SPECIALTY VALVES

- A. Ball Drip Valves: UL 1726, automatic drain valve, 3/4-inch size, spring-loaded, ball check device with threaded ends.

2.7 ALARM DEVICES

- A. Alarm Devices: Types and sizes that will match piping and equipment connections.
- B. Water-Flow Indicator: UL 346, electrical-supervision, paddle-operated-type, water-flow detector with 250-psig (1725-kPa) pressure rating and designed for horizontal or vertical installation. Include two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
 - 1. Manufacturers:
 - a. ADT Security Services, Inc.
 - b. Grinnell Fire Protection.
 - c. ITT McDonnell & Miller.
 - d. Potter Electric Signal Company.
 - e. System Sensor.
 - f. Viking Corp.
 - g. Watts Industries, Inc.; Water Products Div.
- C. Supervisory Switches: UL 753, for valves, electrical-supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than full open position.

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2.8 PRESSURE GAGES

- A. Pressure Gages: UL 393, 3-1/2 to 4-1/2 inches diameter dial with dial range of 0-250 psig.

2.9 PUMP CONTROL VALVE

- A. General: Provide a pump control valve per fire pump isometric.
 - 1. Working Pressure: 250 psig minimum except where indicated otherwise.
 - 2. Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
 - 3. Interior Components: Corrosion-resistant materials.
 - 4. Strainer or inlet, where strainer is indicated.
- B. Manufacturers:
 - 1. CLAVALVE
 - 2. OCV
 - 3. ONICO

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use gate, ball, or butterfly valves.
 - 2. Throttling Duty: Use globe, ball, or butterfly valves.

3.2 JOINT CONSTRUCTION

- A. Grooved-End Pipe and Grooved-End Fitting Joints: Use grooved-end fittings and grooved couplings that are made by the same manufacturer and that are listed for use together. Groove pipe and assemble joints with grooved coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
 - 1. Groove Type: Rolled.
- B. Dissimilar Materials Piping Joints: Make joints using adapters compatible with both piping materials.

3.3 PIPING INSTALLATIONS

- A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping and are provided for informational purposes. Every fitting and length of pipe may not be shown on the contract documents. It is the contractor's responsibilities to review the contract documents and coordinate the fire protection system installation with the building architectural, structural, mechanical and electrical systems. The contractor shall create "working plans or shop/fabrication drawings" showing all pipe sizes, location, routing and elevations that are a result of this coordination effort. Necessary offsets or

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changes in pipe routing from the contract documents that are required to properly install the fire protection system as to take up minimum space shall be furnished and install by the contractor with no additional expense to the owner. Install piping as indicated, as far as practical.

1. Deviations from approved "working plans" for sprinkler piping require written approval from authority with jurisdiction. File written approval with the engineer/owner's representative prior to deviating from approved "working plans."
 - B. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
 - C. Install unions adjacent to each valve in pipes 2 inches and smaller. Unions are not required on flanged devices or in piping installations using grooved couplings.
 - D. Install flanges or flange adapters on valves, apparatus, and equipment having 2-1/2-inch and larger connections.
 - E. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13 and plumb to gang drain. Inspector's Test Connections should be operable from floor level whenever possible. Test Connections are permitted to be locked if vandalism is a concern.
 - F. Install sprinkler piping with drains for complete system drainage, and isolation drainage as shown on the Drawings.
 - G. Install sprinkler zone control valves, test assemblies, and drain headers.
 - H. Install ball drip valves to drain piping between fire department connections and check valves, and where indicated. Drain to suitable drain or outside building.
 - I. Install alarm devices including electric bell in piping systems.
 - J. Hangers and Supports: Comply with NFPA 13. Install according to NFPA 13.
 1. Install hanger and support spacing and locations for steel piping joined with grooved mechanical couplings according to manufacturer's written instructions for rigid systems.
 - K. Install pressure gages on riser or feed main, and at each sprinkler test connection. Include pressure gages with connection not less than 1/4 inch and with soft metal-seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
- 3.4 SPECIALTY SPRINKLER FITTING INSTALLATIONS
- A. Install specialty sprinkler fittings according to manufacturer's written instructions.
- 3.5 VALVE INSTALLATIONS
- A. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and the authority having jurisdiction.

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- B. Gate Valves: Install fire-protection service valves supervised-open, located to control sources of water supply except from fire department connections. Where there is more than 1 control valve, provide permanently marked identification signs indicating portion of system controlled by each valve.

3.6 SPRINKLER APPLICATIONS

- A. Rooms without Ceilings: Upright style sprinklers, sidewall style sprinklers.
- B. Rooms with Ceilings: Concealed type Pendent sprinklers.

3.7 SPRINKLER INSTALLATIONS

- A. Install sprinklers in patterns indicated.
- B. Install sprinklers in suspended ceilings in center of acoustical panels and tiles unless otherwise indicated.
- C. Do not install wet-type sprinklers in areas subject to freezing. Heat tracing is NOT acceptable for dry pipe or preaction valve freeze protection. A heated room or closet must be provided to protect these vital components.

3.8 SERVICE ENTRANCE PIPING

- A. Install post indicating shutoff valve with tamper switch where indicated in building fire service line.

3.9 CONNECTIONS

- A. Connect to specialty valves, hose valves, specialties, and accessories.
- B. Connect water supplies to standpipe and sprinkler systems.
- C. Electrical Connections: Power wiring is specified in Division 26.
- D. Connect alarm devices to fire alarm system is specified in Division 28.

3.10 FIELD QUALITY CONTROL

- A. Perform field acceptance tests of each fire protection system.
 - 1. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."
- B. Replace piping system components that do not pass test procedures specified, then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
 - 1. Report test results promptly and in writing to Engineer and Owner.
 - 2. Report test results promptly and in writing to authority having jurisdiction when required.

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3.11 CLEANING

- A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

3.12 COMMISSIONING

- A. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturer, proceed as follows:
 - 1. Verify that specialty valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.
 - 2. Verify that specified tests of piping are complete.
 - 3. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
 - 4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
 - 5. Check that potable water supplies have correct type of backflow preventer.
 - 6. Check that fire department connections have threads compatible with local fire department equipment and have correct pressure rating.
 - 7. Fill wet-pipe sprinkler systems with water.
 - 8. Energize circuits to electrical equipment and devices.
 - 9. Adjust operating controls and pressure settings.
- B. Coordinate with fire alarm system tests. Operate systems as required.

3.13 PAINTING

- A. Exposed piping, including mechanical rooms shall be painted as directed by architect.

3.14 DEMONSTRATION

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with at least 7 days' advance notice.

END OF SECTION 211000

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SECTION 211119 – FIRE DEPARTMENT CONNECTIONS

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. Exposed wall-type fire-department connections.

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 each fire-department connection.

PART 2 - PRODUCTS

2.1 WALL-TYPE FIRE-DEPARTMENT CONNECTION

- A. Standard: UL 405.
- B. Type: Exposed, wall mounted.
- C. Pressure Rating: 175 psig (1200 kPa) minimum.
- D. Body Material: Corrosion-resistant metal.
- E. Inlets: City of Raleigh standard Storz connection
- F. Caps: Brass, lugged type, with gasket and chain.
- G. Escutcheon Plate: Round, brass, wall type.
- H. Outlet: Back, with pipe threads.
- I. Number of Inlets: One – 5" Storz.
- J. Sleeve: Not required.
- K. Escutcheon Plate Marking: Similar to "STANDPIPE."

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- L. Finish: Polished chrome plated.
- M. Outlet Size: NPS 6 (DN 150).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fire-department connections.
- B. Examine roughing-in for fire-suppression standpipe system to verify actual locations of piping connections before fire-department connection installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wall-type fire-department connections.
- B. Install automatic (ball-drip) drain valve at each check valve for fire-department connection.

END OF SECTION 211119

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SECTION 211200 - FIRE-SUPPRESSION STANDPIPES

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. Pipes, fittings, and specialties.
2. Fire-protection specialty valves.
3. Hose connections.
4. Alarm devices.
5. Pressure gages.

- B. Related Requirements:

1. Section 210523 "General-Duty Valves for Water-Based Fire-Suppression Piping."
2. Section 211119 "Fire-Department Connections" for exposed wall-mounted.
3. Section 284621.11 "Addressable Fire-Alarm Systems" for connections to alarm devices.

1.3 DEFINITIONS

- A. High-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure higher than standard 175 psig (1200 kPa), but not higher than 250 psig (1725 kPa).

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For fire-suppression standpipes.
 1. Include plans, elevations, sections, and attachment details.
 2. Include diagrams for power, signal, and control wiring.
- C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Fire-suppression standpipes, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
- B. Qualification Data: For Installer.
- C. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- D. Welding certificates.
- E. Fire-hydrant flow test report.
- F. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."
- G. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.
 - a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.
- B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14.

1.8 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Suppression Standpipe Service: Do not interrupt fire-suppression standpipe service to facilities occupied by Owner or others unless permitted under the following

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conditions and then only after arranging to provide temporary fire-suppression standpipe service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of fire-suppression standpipe service.
2. Do not proceed with interruption of fire-suppression standpipe service without Owner's written permission.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTIONS

- A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

2.2 PERFORMANCE REQUIREMENTS

- A. High-Pressure, Fire-Suppression Standpipe System Component: Listed for 250-psig (1725-kPa) minimum working pressure.
- B. Delegated Design: Design fire-suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1. Available fire-hydrant flow test records indicate the following conditions: Per SCO guidelines static and residual pressures shall be reduced by 10 psi and flow reduced by 10%.

- a. Date: 01-18-2023
- b. Time: 1:00 pm
- c. Performed by: NCSU Utilities.
- d. Location of Residual Fire Hydrant R: Hydrant #21, SE corner of Poe Hall
- e. Location of Flow Fire Hydrant F: Hydrant 27, SE corner of Park Shops
- f. Static Pressure at Residual Fire Hydrant R: 72 psi
- g. Measured Flow at Flow Fire Hydrant F: 1353 gpm
- h. Residual Pressure at Residual Fire Hydrant R: 62 psi

- C. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at each hose-connection outlet is as follows:
 - a. NPS 2-1/2 (DN 65) Hose Connections: 100 psig (690 kPa).
2. Maximum residual pressure at each hose-connection outlet is as follows:
 - a. NPS 2-1/2 (DN 65) Hose Connections: 125 psig (690 kPa).

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2.3 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials and for joining methods for specific services, service locations, and pipe sizes.

2.4 BLACK STEEL PIPE AND ASSOCIATED FITTINGS

- A. Schedule 40: ASTM A135/A135M, Grade A; with factory- or field-formed ends to accommodate joining method.
- B. Grooved-Joint, Steel-Pipe Appurtenances:
 - 1. Pressure Rating: 250 psig (1725 kPa).
 - 2. Uncoated, Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting; with dimensions matching steel pipe.
 - 3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.5 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free.
 - 1. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.6 SPECIALTY VALVES

- A. General Requirements:
 - 1. Standard: UL's "Fire Protection Equipment Directory" listing or FM Global's "Approval Guide."
 - 2. Pressure Rating:
 - a. High-Pressure Piping Specialty Valves: 250 psig (1725 kPa) minimum.
 - 3. Body Material: Cast or ductile iron.
 - 4. Size: Same as connected piping.
 - 5. End Connections: Flanged or grooved.
- B. Alarm Valves:
 - 1. Standard: UL 193.
 - 2. Design: For vertical installation.
 - 3. Include trim sets for electrical sprinkler alarm.

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C. Pressure-Reducing Valves:

1. UL 668 hose valve, with integral UL 1468 reducing device.
2. Pressure Rating: 300 psig (2070 kPa) minimum.
3. Material: Brass or bronze.
4. Inlet: Female pipe threads.
5. Outlet: Threaded with or without adapter having male hose threads.
6. Pattern: Angle or gate.
7. Finish: Polished chrome-plated.

D. Automatic (Ball Drip) Drain Valves:

1. Standard: UL 1726.
2. Pressure Rating: 175 psig (1200 kPa) minimum.
3. Type: Automatic draining, ball check.
4. Size: NPS 3/4 (DN 20).
5. End Connections: Threaded.

2.7 HOSE CONNECTIONS

A. Adjustable-Valve Hose Connections:

1. Standard: UL 668 hose valve, with integral UL 1468 reducing or restricting pressure-control device, for connecting fire hose.
2. Pressure Rating: 300 psig (2070 kPa) minimum.
3. Material: Brass or bronze.
4. Size: NPS 2-1/2 (DN 65), as indicated.
5. Inlet: Female pipe threads.
6. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
7. Pattern: Angle or gate.
8. Pressure-Control Device Type: Pressure reducing.
9. Design Outlet Pressure Setting: 100 psig.
10. Finish: Polished chrome-plated.

2.8 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:

1. Standard: UL 464.
2. Type: Vibrating, metal alarm bell.
3. Size: 10-inch (250-mm) diameter.
4. Finish: Red-enamel factory finish, suitable for outdoor use.

C. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.

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3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig (1725 kPa).
6. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.

E. Indicator-Post Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.9 PRESSURE GAGES

- A. Standard: UL 393.
- B. Dial Size: 3-1/2- to 4-1/2-inch (90- to 115-mm) diameter.
- C. Pressure Gage Range: Zero to 250 psig (Zero to 1725 kPa) minimum.
- D. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Perform fire-hydrant flow test according to NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
- B. Report test results promptly and in writing.

3.2 EXAMINATION

- A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

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- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 SERVICE-ENTRANCE PIPING

- A. Connect fire-suppression standpipe piping to water-service piping at service entrance into building.
- B. Install shutoff valve, pressure gage, drain, and other accessories at connection to fire-suppression water-service piping.
- C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.4 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.
 - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
- B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.
- C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.
- D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- E. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.
- F. Install alarm devices in piping systems.
- G. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.
- H. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- I. Fill wet-type standpipe system piping with water.
- J. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."
- K. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 210517 "Sleeves and Sleeve Seals for Fire-Suppression Piping."

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- L. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 210518 "Escutcheons for Fire-Suppression Piping."

3.5 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- C. Ream ends of pipes and tubes, and remove burrs. Bevel plain ends of steel pipe.
- D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- E. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. 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.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- G. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- H. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

3.6 VALVE AND SPECIALTIES INSTALLATION

- A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.
- B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:

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1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Install bypass check valve and retarding chamber drain-line connection.

3.7 HOSE-CONNECTION INSTALLATION

- A. Install hose connections adjacent to standpipes.
- B. Install freestanding hose connections for access and minimum passage restriction.

3.8 FIRE-DEPARTMENT CONNECTION INSTALLATION

- A. Install wall-type fire-department connections.
- B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.9 IDENTIFICATION

- A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.
- B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
 4. Energize circuits to electrical equipment and devices.
 5. Coordinate with fire-alarm tests. Operate as required.
 6. Coordinate with fire-pump tests. Operate as required.
 7. Verify that equipment hose threads are same as local fire-department equipment.
- C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

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3.11 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

3.12 PIPING SCHEDULE

- A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.
- B. High-pressure, wet-type fire-suppression standpipe piping, NPS 5 (DN 125) and larger, shall be] the following:
 - 1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
 - 2. Schedule 40, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 211200

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SECTION 213000 – MOTOR DRIVEN FIRE PUMP SYSTEMS

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. This Section includes electric-drive, split-case centrifugal fire pumps and the following:
 - 1. Full-service fire-pump.
 - 2. Fire-pump accessories and specialties.
 - 3. Pressure-maintenance pumps, controllers, accessories, and specialties.
 - 4. Alarm panels.
 - 5. Flowmeter systems.

1.3 PERFORMANCE REQUIREMENTS

- A. Pump, Equipment, Accessory, Specialty, and Piping Pressure Rating: 175-psig minimum working-pressure rating, unless otherwise indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, certified pump performance curves with each selection point indicated, operating characteristics, and furnished accessories and specialties for each fire pump and pressure-maintenance pump.
- B. Shop Drawings: For fire pumps and drivers, fire-pump controllers, fire-pump accessories and specialties, pressure-maintenance pumps, pressure-maintenance-pump controllers, and pressure-maintenance-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. Wiring Diagrams: Power, signal, and control wiring.
- C. Product Certificates: For each type of fire pump, signed by product manufacturer.
- D. Source quality-control test reports.
- E. Field quality-control test reports.
- F. Operation and Maintenance Data: For fire pumps and drivers, pressure-maintenance pumps, controllers, accessories and specialties and alarm panels to include in emergency, operation, and maintenance manuals.

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G. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 21 Section "Wet-Pipe Standpipes"
2. Division 28 Section "Fire Alarm Systems" for alarm devices not specified in this section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire pumps, pressure-maintenance pumps, and controllers through one source from a single manufacturer for each type of equipment.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of fire pumps, pressure-maintenance pumps, and controllers and are based on specific systems indicated. Refer to Division 1 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with standards of authorities having jurisdiction pertaining to materials, hose threads, and installation. Test header shall be Raleigh or National hose thread type.
- E. Comply with NFPA 20, "Stationary Pumps for Fire Protection," for fire pumps, drivers, controllers, accessories, and their installation.

1.6 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CENTRIFUGAL FIRE PUMPS

- A. Description, General: UL 448, factory-assembled and -tested, electric-drive, In-line fire pumps capable of furnishing not less than 150 percent of rated capacity at not less than 65 percent of total rated head and with shutoff head limited to 140 percent of total rated head.
 1. Finish: Manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 2. Nameplate: Complete with capacities, characteristics, and other pertinent data.
- B. Fabricate base and attachment to fire pumps, pressure-maintenance pumps, and controllers with reinforcement to resist movement of pumps and controllers during a seismic event when their bases are anchored to building structure.

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2.3 SPLIT CASE FIRE PUMPS:

- A. Horizontally mounted type with electric-motor driver coupled to pump casing.
- B. Fire-Pump Plan No.: FP-1
 - 1. Rated Capacity: 750 gpm @ 115 psi
 - 2. Inlet Size: 6"
 - 3. Outlet Size: 6"
 - 4. Outlet Flange Class: 250.
 - 5. Speed: Same as driver.
 - 6. Electric-Motor Driver: 75 hp, 3500 rpm, 480V, 3 phase, 60 Hz.
 - 7. Test Header Size: 6"
 - a. Hose Valves Required: Three.
 - b. Hose Valve Size: NPS 2-1/2.
- C. Manufacturers:
 - 1. A-C Pump; ITT Industries.
 - 2. Armstrong Darling, Inc.
 - 3. Aurora Pump; Pentair Pump Group.
 - 4. Fairbanks Morse; Pentair Pump Group.
 - 5. Patterson Pump Company.
 - 6. Reddy-Buffaloes Pump Co.
 - 7. Sterling Peerless Pump; Sterling Fluid Systems Group.
- D. Pump: Radially split cast-iron casing with suction and discharge flanges machined to ASME B16.1, Class 250 dimensions, unless otherwise indicated.
 - 1. Impeller: Cast bronze of construction to match fire pump, statically and dynamically balanced, and keyed to shaft.
 - 2. Wear Rings: Replaceable, bronze.
 - 3. Shaft and Sleeve: Steel shaft with bronze sleeve.
 - a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
 - b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.
- E. Driver: UL-listed, NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with existing controller (Verify in Field).
 - 1. Manufacturers:
 - a. Emerson; U.S. Electrical Motors.
 - b. Lincoln Electric Company (The).
 - c. Marathon Electric, Inc.
 - d. WEG

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2.4 FIRE-PUMP CONTROLLERS

- A. Fire-Pump Controllers, General: UL 218 and NFPA 20; listed for electric-drive, fire-pump service and service entrance; combined automatic and manual operation; factory assembled and wired; and factory tested for capacities and electrical characteristics.
1. Manufacturers:
 - a. Cutler-Hammer.
 - b. Firetrol, Inc.
 - c. Hubbell Industrial Controls, Inc.
 - d. Joslyn Clark.
 - e. Master Control Systems, Inc.
 - f. Metron, Inc.
 2. Rate controllers for scheduled fire-pump horsepower and short-circuit withstand rating at least equal to short-circuit current available at controller location. Take into account cable size and distance from substation or supply transformers.
 3. Enclosure: UL 50, Type 2, dripproof, indoor, unless special-purpose enclosure is indicated. Include manufacturer's standard red paint applied to factory-assembled and -tested unit before shipping.
 4. Controls, devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used, and specific items listed.
 - a. Isolating means and circuit breaker.
 - b. "Power on" pilot lamp.
 - c. Fire-alarm system connections for indicating motor running condition, loss-of-line power, and line-power phase reversal.
 - d. Automatic and manual operation and minimum run-time relay to prevent short cycling.
 - e. Water-pressure-actuated switch with independent high and low calibrated adjustments responsive to water pressure in fire-suppression piping.
 - f. Automatic and manual shutdown.
 - g. System pressure recorder, electric ac driven with spring backup.
 5. Nameplate: Complete with capacity, characteristics, approvals and listings, and other pertinent data.
 6. Controller Sensing Pipes: Fabricate pipe and fittings according to NFPA 20 with nonferrous-metal sensing piping, NPS 1/2, with globe valves for testing controller mechanism from system to pump controller as indicated. Include bronze check valve with 3/32-inch orifice in clapper or ground-face union with non-corrosive diaphragm having 3/32-inch orifice.
- B. Full-Service Fire-Pump Controllers:
1. Type Starting: Solid state, closed transition (soft start).
 2. Mounting: Floor type for field electrical connections.

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3. Automatic Transfer Switches: UL 218 and UL 1008 and requirements for and attached to fire-pump controllers. Include enclosure complying with UL 50, Type 2, with automatic transfer switch with rating at least equal to fire-pump driver-motor horsepower. Include ampere rating not less than 115 percent of motor full-load current and suitable for switching motor-locked rotor current. Service Entrance-Rated.

2.5 FIRE-PUMP ACCESSORIES AND SPECIALTIES

- A. Match fire-pump suction and discharge ratings as required for fire-pump capacity rating. Include the following:
 1. Automatic air-release valve.
 2. Circulation relief valve.
 3. Suction and discharge pressure gages.
 4. Eccentric-tapered reducer at suction inlet.
 5. Concentric-tapered reducer at discharge outlet.
 6. Finish: Manufacturer's standard factory-applied red paint unless brass or other finish is specified.

2.6 PRESSURE-MAINTENANCE PUMPS

- A. Pressure-Maintenance Pumps, General: Factory-assembled and -tested pumps with electric-motor driver, controller, and accessories and specialties. Include cast-iron or stainless-steel casing and bronze or stainless-steel impellers, mechanical seals, and suction and discharge flanges machined to ASME B16.1, Class 250 flanges are indicated and except that connections may be threaded in sizes where flanges are not available.
 1. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
 2. Nameplate: Complete with capacity, characteristics, and other pertinent data.
- B. Multistage, Pressure-Maintenance Pumps: Multiple-impeller type complying with HI 1.1-1.2 and HI 1.3 requirements for multistage centrifugal pumps. Include base.
 1. Manufacturers:
 - a. A-C Pump; ITT Industries.
 - b. Grundfos Pumps Corp.
 - c. Paco Pumps, Inc.
 - d. Sterling Peerless Pump; Sterling Fluid Systems Group.
 2. Driver: NEMA MG 1, open-dripproof, squirrel-cage, induction motor complying with NFPA 20 and NFPA 70. Include wiring compatible with controller used.
- C. Controllers: UL 508; factory-assembled, -wired, and -tested, soft start type for combined automatic and manual operation.
 1. Manufacturers:
 - a. Cutler-Hammer.

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- b. Firetrol, Inc.
 - c. Hubbell Industrial Controls, Inc.
 - d. Joslyn Clark.
 - e. Master Control Systems, Inc.
 - f. Metron, Inc.
 2. Enclosure: UL 508 and NEMA 250, Type 2, wall-mounting type for field electrical wiring.
 - a. Finish: Manufacturer's standard color paint applied to factory-assembled and -tested unit before shipping.
 3. Rate controller for scheduled horsepower and include the following:
 - a. Fusible disconnect switch.
 - b. Pressure switch.
 - c. Hand-off-auto selector switch.
 - d. Pilot light.
 - e. Running period timer.
- D. Accessories and Specialties: Match pressure-maintenance-pump suction and discharge ratings as required for pump capacity rating. Include the following:
1. Circulation relief valve.
 2. Suction and discharge pressure gages.
- E. Pressure-Maintenance-Pump Characteristics and Specialty Data:
1. Plan No.: F2
 2. Rated Capacity: 7.5 gpm
 3. Total Rated Head (PSI): 130 psi
 4. Pump Speed: 3500 rpm.
 5. Electric-Motor Driver Size: 1.5 hp, 3500 rpm, 480 volt, 3 phase, 60 Hz.

2.7 FLOWMETER SYSTEMS

- A. Description: Fire-pump flowmeter system that indicates flow to not less than 175 percent of fire-pump rated capacity. Include sensor of size to match pipe, tubing, flowmeter, and fittings.
1. FMG-Approved Manufacturers:
 - a. Dieterich Standard Inc.
 - b. Gerand Engineering Co.
 - c. Hyspan Precision Products, Inc.
 - d. Meriam Instruments Div.; Scott Fetzer Co.
 - e. Preso Meters Corporation.
 - f. Reddy-Buffaloes Pump Co.
 2. UL-Listed Manufacturers:
 - a. Fire Research Corp.
 - b. Reddy-Buffaloes Pump Co.

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3. Pressure Rating: 175-psig (1200-kPa) minimum.
4. Sensor: Venturi, annubar probe, or orifice plate, unless otherwise indicated.
5. Flowmeter: Compatible with flow sensor with dial not less than 4-1/2 inches (115 mm) in diameter or manufacturer's equivalent size.
6. Permanently Mounted Flowmeter: Suitable for wall mounting with copper tubing to connect to flow sensor.

2.8 PRESSURE GAGES

- A. Description: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter dials with range of 0- to 250-psig (0- to 1725-kPa) minimum. Include caption "WATER" on dial face.
 1. Manufacturers:
 - a. AGF Manufacturing Co.
 - b. AMETEK, Inc.; U.S. Gauge.
 - c. Brecco Corporation.
 - d. Dresser Equipment Group; Instruments Div.
 - e. Marsh Bellofram.
 - f. WIKA Instrument Corporation.

2.9 GROUT

- A. Description: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 1. Properties: Non-staining, non-corrosive, and non-gaseous.
 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

2.10 SOURCE QUALITY CONTROL

- A. Test and inspect fire pumps with their controllers according to NFPA 20 for certified shop tests.
- B. Verification of Performance: Rate fire pumps according to requirements indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, concrete bases, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of fire pumps.
- B. Examine roughing-in for fire-suppression piping to verify actual locations of piping connections before fire-pump installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 CONCRETE BASES

- A. Install concrete bases of dimensions indicated for fire pumps, pressure-maintenance pumps, and controllers. Refer to Division 23 Section "Basic Mechanical Materials and Methods."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of 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.
- B. Cast-in-place concrete materials and placement requirements are specified in Division 3.

3.3 INSTALLATION

- A. Install and align fire pump, pressure-maintenance pump, and controller according to NFPA 20.
- B. Install pumps and controllers to provide access for periodic maintenance including removal of motors, impellers, couplings, and accessories.
- C. Set base-mounting-type pumps on concrete bases. Disconnect coupling halves before setting. Do not reconnect couplings until alignment operations have been completed.
 - 1. Support pump base plate on rectangular metal blocks and shims or on metal wedges having small taper, at points near anchor bolts, to provide 3/4- to 1-1/2-inch gap between pump base and concrete base for grouting.
 - 2. Adjust metal supports or wedges until pump and driver shafts are level. Verify that coupling faces and pump suction and discharge flanges are level and plumb.
- D. Install suction and discharge piping equal to or greater than diameter of fire-pump nozzles.
- E. Install valves that are same size as piping connecting fire pumps, bypasses, test headers, and other piping systems.
- F. Install pressure gages on fire-pump suction and discharge at pressure-gage tapings.
- G. Support pumps and piping separately so weight of piping does not rest on pumps.
- H. Install piping accessories, hangers and supports, anchors, valves, meters and gages, and equipment supports.
- I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

3.4 ALIGNMENT

- A. Align split case fire-pump and driver shafts after complete unit has been leveled on concrete base, grout has set, and anchor bolts have been tightened.

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- B. After alignment is correct, tighten anchor bolts evenly. Fill base plate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.
- C. Align piping connections.
- D. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.
- E. Align vertically mounted, split-case pump and driver shafts after complete unit has been made plumb on concrete base, grout has set, and anchor bolts have been tightened.

3.5 CONNECTIONS

- A. Piping installation requirements are specified in Division 21 Section "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to pumps and equipment to allow service and maintenance.
- C. Connect water supply and discharge piping to fire pumps. Connect water supply and discharge piping to pressure-maintenance pumps.
- D. Connect controllers to pumps.
- E. Connect fire-pump controllers to building fire-alarm system. Refer to Division 28 Section "Fire Alarm."
- F. Ground equipment according to Division 26 Section "Grounding and Bonding."
- G. Connect wiring according to Division 26 Section "Conductors and Cables."

3.6 FIELD QUALITY CONTROL

- A. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect, test and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform field tests for each fire pump when installation is complete. Comply with operating instructions and procedures in NFPA 20 to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or that does not perform as indicated, then retest to demonstrate compliance. Verify that each fire pump performs as indicated.
- C. Perform the following field tests and inspections and prepare test reports:
 - 1. **Leak Test:** After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. **Final Checks before Startup:** Perform the following preventive-maintenance operations and checks:

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- a. Lubricate oil-lubrication-type bearings.
 - b. Remove grease-lubrication-type bearing covers, flush bearings with kerosene, and clean thoroughly. Fill with new lubricant according to manufacturer's written instructions.
 - c. Disconnect coupling and check electric motor for proper rotation. Rotation shall match direction of rotation marked on pump casing.
 - d. Verify that pump is free to rotate by hand. If pump is bound or if it drags even slightly, do not operate until cause of trouble is determined and corrected.
3. Starting procedure for pumps is as follows:
- a. Prime pump by opening suction valve and closing drains and prepare pump for operation.
 - b. Open sealing-liquid supply valves if pump is so fitted.
 - c. Start motor.
 - d. Open discharge valve slowly.
 - e. Observe leakage from stuffing boxes and adjust sealing-liquid valve for proper flow to ensure lubrication of packing. Do not tighten gland immediately but let packing run in before reducing leakage through stuffing boxes.
 - f. Check general mechanical operation of pump and motor.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Fire hoses are for field-acceptance tests only and are not property of Owner.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire pumps, drivers, controllers, and pressure-maintenance pumps. Refer to Division 1 Section "Closeout Procedures, Demonstration and Training."

END OF SECTION 213000

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SECTION 230500 - COMMON WORK RESULTS 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. This Section includes the following:
 - 1. Sleeves.
 - 2. Escutcheons.
 - 3. Equipment installation requirements common to equipment sections.
 - 4. Concrete bases.
 - 5. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Use type L copper piping for all condensate drain piping

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2.2 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

2.3 SLEEVES

- A. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.4 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated

2.5 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

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3.2 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

3.4 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 230500

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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. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Fastener systems.
 - 5. Equipment supports.
- B. See Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
- C. See Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-protection piping.
- D. See Section "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Retain a registered engineer to design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 SUBMITTALS

- A. Product Data: For the following:

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1. Steel pipe hangers and supports.
2. Powder-actuated fastener systems.

PART 2 - PRODUCTS

2.1 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.2 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, 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 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

3.2 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 smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Field Welding: Comply with AWS D1.1 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 contours of welded surfaces match adjacent contours.

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3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.5 PAINTING

- A. Touch Up: 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 (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

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SECTION 211513 - GENERAL-SERVICE COMPRESSED-AIR 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. This Section includes piping and related specialties for general-service compressed-air systems:
 - 1. Pipes, tubes, and fittings.
 - 2. Joining materials.
 - 3. Valves.
 - 4. Dielectric fittings.
 - 5. Flexible pipe connectors.
 - 6. Specialties.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. CR: Chlorosulfonated polyethylene synthetic rubber.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. HDPE: High-density polyethylene plastic.
- E. NBR: Acrylonitrile-butadiene rubber.
- F. PE: Polyethylene plastic.
- G. PVC: Polyvinyl chloride plastic.
- H. Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 200 psig or less.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Dielectric fittings.
 - 2. Flexible pipe connectors.
 - 3. Safety valves.
 - 4. Pressure regulators. Include rated capacities and operating characteristics.
 - 5. Automatic drain valves.
 - 6. Filters. Include rated capacities and operating characteristics.
 - 7. Lubricators. Include rated capacities and operating characteristics.
 - 8. Quick couplings.
 - 9. Hose assemblies.

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1.5 INFORMATIONAL SUBMITTALS

- A. Brazing and welding certificates.
- B. Qualification Data: For installers.
- C. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For general-service compressed-air piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Brazing: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications," or to AWS B2.2, "Standard for Brazing Procedure and Performance Qualification."
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- C. ASME Compliance:
 - 1. Comply with ASME B31.1, "Power Piping," for high-pressure compressed-air piping.
 - 2. Comply with ASME B31.3, "Process Piping," for high- and low-pressure compressed-air piping.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Copper Tube: ASTM B88, Type K or L drawn-temper tube.
 - 1. Wrought-Copper Fittings: ASME B16.22, solder-joint pressure type or MSS SP-73, wrought copper with dimensions for brazed joints.
 - 2. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300.
 - 3. Copper Unions: ASME B16.22 or MSS SP-123.
- B. Transition Couplings for Metal Piping: Metal coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.2 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.

2.3 VALVES

- A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

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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. DynaQuip Controls.
 - d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
 - e. Hammond Valve.
 - f. Jamesbury; a subsidiary of Metso Automation.
 - g. Jomar International, LTD.
 - h. Kitz Corporation.
 - i. Legend Valve.
 - j. Marwin Valve; a division of Richards Industries.
 - k. Milwaukee Valve Company.
 - l. NIBCO INC.
 - m. Red-White Valve Corporation.
 - n. RuB Inc.

2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig (1035 kPa).
 - c. CWP Rating: 600 psig (4140 kPa).
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

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 Unions:
 1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 250 psig.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.5 FLEXIBLE PIPE CONNECTORS

- A. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 1. Working-Pressure Rating: 250 psig minimum.
 2. End Connections, NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.

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2.6 SPECIALTIES

- A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.
 - 1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.
- B. Air-Main Pressure Regulators: Bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 250-psig inlet pressure, unless otherwise indicated.
 - 1. Type: Pilot operated.
- C. Air-Line Pressure Regulators: Diaphragm operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure, unless otherwise indicated.
- D. Automatic Drain Valves: Stainless-steel body and internal parts, rated for 250-psig minimum working pressure, capable of automatic discharge of collected condensate. Include mounting bracket if wall mounting is indicated.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Compressed-Air Distribution Piping: Use the following piping materials for each size range:
 - 1. NPS 2 and Smaller: Type K or L (Type A or B), copper tube; wrought-copper fittings; and brazed joints.
- B. Drain Piping: Use the following piping materials:
 - 1. NPS 2 and Smaller: Type M (Type C) copper tube; wrought-copper fittings; and brazed or soldered joints.

3.2 VALVE APPLICATIONS

- 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. Compressed Air: Valve types specified for high-pressure compressed air.
- F. Equipment Isolation NPS 2 and Smaller: Safety-exhaust, copper-alloy ball valve with exhaust vent and pressure rating at least as great as piping system operating pressure.

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3.3 PIPING INSTALLATION, GENERAL

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping concealed from view and protected from physical contact by building occupants, 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 and to coordinate with other services occupying that space.
- E. Install piping adjacent to equipment and machines to allow service and maintenance.
- F. Install air and drain piping with 1 percent slope downward in direction of flow.
- G. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.
- H. Equipment and Specialty Flanged Connections:
 - 1. Use cast-copper-alloy companion flange with gasket and brazed joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.
- I. Install eccentric reducers where compressed-air piping is reduced in direction of flow, with bottoms of both pipes and reducer fitting flush.
- J. Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- K. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."
- L. Install piping to permit valve servicing.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

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3.4 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. Brazed Joints for Copper Tubing: Join according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.
- D. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Join according to ASTM B828 or CDA's "Copper Tube Handbook."
- E. Dissimilar Metal Piping Material Joints: Use dielectric fittings.

3.5 VALVE INSTALLATION

- A. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.
- B. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.
- C. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.6 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. NPS 2 and Smaller: Use dielectric unions.

3.7 FLEXIBLE PIPE CONNECTOR INSTALLATION

- A. Install flexible pipe connectors in discharge piping of each air compressor.
- B. Install bronze-hose flexible pipe connectors in copper compressed-air tubing.

3.8 SPECIALTY INSTALLATION

- A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.
- B. Install air-main pressure regulators in compressed-air piping at or near air compressors.
- C. Install air-line pressure regulators in branch piping to equipment and tools.
- D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate onto nearest floor drain.
- E. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters.

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- F. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters.
- G. Install air-line lubricators in branch piping to machine tools. Mount on wall at locations indicated.
- H. Install quick couplings at piping terminals for hose connections.
- I. Install hose assemblies at hose connections.

3.9 CONNECTIONS

- A. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment and machine.

3.10 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.
- B. Vertical Piping: MSS Type 8 or 42, clamps.
- C. Individual, Straight, Horizontal Piping Runs:
 - 1. 100 Feet or Less: MSS Type 1, adjustable, steel clevis hangers.
 - 2. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
- D. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- E. Base of Vertical Piping: MSS Type 52, spring hangers.
- F. Support horizontal piping within 12 inches of each fitting and coupling.
- G. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1/4 (DN 8): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 - 2. NPS 3/8 and NPS 1/2 (DN 10 and DN 15): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
 - 3. NPS 3/4 (DN 20): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.
- I. Install supports for vertical copper tubing every 10 feet (3 m).

3.11 LABELING AND IDENTIFICATION

- A. Install identifying labels and devices for general-service compressed-air piping, valves, and specialties.

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3.12 FIELD QUALITY CONTROL

- A. Perform field tests and inspections.
- B. Tests and Inspections:
 - 1. Piping Leak Tests for Metal Compressed-Air Piping: Test new and modified parts of existing piping. Cap and fill general-service compressed-air piping with oil-free dry air or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for four hours to equalize temperature. Refill system, if required, to test pressure; hold for two hours with no drop in pressure.
 - 2. Repair leaks and retest until no leaks exist.
 - 3. Inspect filters lubricators and pressure regulators for proper operation.
- C. Prepare test reports.

END OF SECTION 211513

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

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 the work of this section.

1.2 DESCRIPTION

- A. The work of this section includes the furnishing and installation of all electrical equipment, materials and devices as shown on the electrical drawings and/or as specified herein, including but not limited to:

1. Conduit and Wire
2. Safety Switches and Fuses
3. Lighting
4. Fire Alarm Systems

- B. The term "provide" shall mean furnish and install.

- C. Applicable Publications:

1. Where publications are listed in each Section, they form a part of that Section to the extent referenced.
2. When a standard is specified by reference, comply with the requirements and recommendations stated in that standard, except when its requirements are modified by the Contract Documents or applicable codes establish stricter standards.
3. When a code is not specified by reference in a Section, the work of that Section shall comply with applicable codes listed in the General Conditions.
4. The publication date is the publication in effect as of the bid date, except when a specific publication date is specified.
5. Obtain copies of referenced standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.

1.3 QUALITY ASSURANCE

- A. Codes and Standards:

1. The installation of all work under this section shall comply with all applicable codes, laws, standards and regulations. Nothing in the specifications shall be construed to permit deviation from these governing items.
2. Electrical material and equipment shall be listed and labeled as required by the North Carolina Department of Insurance. Refer to list of approved third-party listing agencies at the end of this section. Materials, equipment and installation shall also meet requirements of applicable codes and standards listed below:

National Electric Code	NEC
National Electrical Safety Code	NESC
National Electrical Manufacturers Association	NEMA
Illuminating Engineering Society	IES
Institute of Electrical and Electronic Engineers	IEEE
American National Standards Institute	ANSI

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B. Qualifications of Workmen:

1. Provide sufficient qualified journeyman electricians who are thoroughly experienced with the materials and methods specified and familiar with the design requirement.
2. At least one qualified journeyman shall be present at all times during the execution of the work.
3. In acceptance or rejection in any portion of the electrical work, no allowance will be made for lack of skill on the part of the workmen.

1.4 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. The implied and stated intent of the drawings and specifications is to establish minimum acceptable quality standards for materials, equipment, and workmanship, and to provide operable electrical and mechanical systems in every respect.
- B. The drawings are diagrammatic only, intending to show general arrangement and location of system components. Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets and fittings may not be shown, but shall be provided at no change in contract price.
- C. All work shall be accurately laid out and coordinated with other trades to avoid conflicts and to provide maximum accessibility for operation and maintenance.

1.5 SUBMITTALS

- A. Submit shop drawings of the electrical materials to the Designer for review in accordance with the provisions of Division 01 of these specifications.
- B. The following is a list of those items required to be submitted:
 1. Wire, Conduit, Boxes.
 2. Lighting
 3. Fire Alarm Systems
- C. Contractor shall not begin fabrication or work which requires submittals until return of submittals.

1.6 SUBSTITUTIONS

- A. Refer to the appropriate Division 01 Specification for requirements on Substitutions.

1.7 VISIT TO THE SITE

- A. All persons proposing to submit quotations for work in accordance with these plans and specifications are expected to visit the site of the work covered by the plans and specifications and are to familiarize themselves with existing conditions as they affect the work of this section of the specifications. Claims resulting from a failure to visit the site or inspect the existing conditions will not be considered.

1.8 OPERATING AND MAINTENANCE DATA

- A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.

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1. Prepare operating and maintenance data as specified in this section and as referenced in the General Conditions and applicable Section of Division 01 General Requirements.
- B. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.
- C. Preparation of data shall be done by personnel:
 1. Trained and experienced in maintenance and operation of desired products.
 2. Familiar with requirements of this Section.
 3. Skilled as technical writer to the extent required to communicate essential data.
 4. Skilled as draftsman competent to prepare required drawings.
- D. Prepare data in form of an instructional manual for use by Owner's personnel.

1.9 PAINTING

- A. Suitable finish coatings shall be provided under this section of the Specifications on all items of electrical equipment and wiring which are exposed. This shall consist of either an approved factory applied finish or an acceptable finish applied during or after installation. Equipment which is furnished in finishes such as stainless steel or satin aluminum is not to be painted. Exposed equipment and/or wiring in finished areas such as panel covers or surface raceway shall be supplied with factory applied prime coat and shall be professionally painted or enameled as directed to result in a completely coated and attractively finished manner. All such finishing shall be as directed and shall be satisfactory to the Architect/Engineer.
- B. All factory finished steel surfaces; boxes, enclosures, etc., shall be cleaned and retouched or repainted as necessary to provide a rust resistant coating. Where painting or galvanizing is not specifically specified, ferrous devices, bolts, nuts, inserts, etc., shall be galvanized.
- C. All nameplates shall be left unpainted and in a clean condition.

1.10 WIRING AND ELEMENTARY DIAGRAMS

- A. Wiring and elementary diagrams for equipment as shown on the drawings are based on the product of the specified equipment manufacturer and are shown for convenience to aid in estimating the extent of the work involved. The equipment actually installed shall be wired and connected in accordance with the equipment manufacturer's recommendations and shall conform to details in approved wiring diagrams to be furnished by the equipment manufacturer. All equipment so connected shall be made to operate in a safe, proper and efficient manner. Note that control circuitry is not necessarily shown on the drawings but shall be installed in conduit between the points and devices indicated on the diagrams.

1.11 EQUIPMENT TESTS

- A. An operating test of the complete electrical system shall be made. System shall test free from grounds, shorts and other faults. Connections shall be for positive mechanical and electrical connection and continuity. Equipment shall be demonstrated to operate in accordance with the requirements of the plans and specifications. Contractor shall furnish all personnel and test instruments required. Performance of tests shall be made in the presence of the Owner's representative, where requested.
- B. The following tests shall be performed as a minimum:
 1. Control and Distribution Equipment:

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- a. Check the wire terminals, clean connections.
 - b. Check all control switches, alarm devices, indicating instruments for proper operation under normal and simulated abnormal conditions.
 2. Phase rotation: The connections of all equipment shall be checked for correct phase rotation.
 3. Circuit Breakers: The following tests shall be performed:
 - a. Inspect each circuit breaker.
 - b. Check for loose connections.
 - c. Operate each circuit breaker manually.
 - d. Set the adjustable trips to the values specified.
- C. Spot-checks and/or back-checks to verify the testing accuracy shall be made for the Engineer or his agent during job-site visits.
- D. Validity of the ground path shall be assured by constant and careful attention to the thorough tightening of all couplings, connectors, locknuts, screws, bolts, etc. and by frequent checking of the path resistance with a quality low-range ohmmeter. Resistance of the path should not exceed one ohm between any two points. If a reading in excess of this is observed, it shall be discussed with the Engineer for an appraisal of the condition.
- E. After all fixtures, devices and equipment are installed and all connections completed to each panel – disconnect neutral feeder conductor from neutral bar and take a megger reading between neutral bar and grounded can. If this reading is less than 250,000 ohms, disconnect branch circuit (or sub-feeder) neutral wires from this neutral bar. Test each one separately to the panel can until low reading ones are found. Correct troubles reconnect and retest until at least 250,000 ohms from neutral bar to grounded panel can is achieved with only neutral feeder disconnected. In addition all wiring shall be tested. All phase and neutral conductors shall be tested with a 500 volt megger. Minimum acceptable readings shall be 1,000,000 ohms for conductors #6 awg and smaller; 250,000 ohms for conductors #4 awg and larger. All measurements shall be between the conductor and the grounding conductor.
- F. Upon completion of work, but before final inspection, the Contractor shall send a letter to the engineer and the Owner certifying that these tests have been accomplished and tabulating the megger readings for each panel. During field visits, contractor shall demonstrate installation and make such tests as may be required to satisfy the Designer and Owner that work is installed in accordance with drawings, specifications and instructions.

1.12 WARRANTIES

- A. All equipment installed under this Division of the work shall be warranted for a minimum of one year after project acceptance.
- B. During this warranty period, replace any and all defective equipment and parts at no cost to the Owner.

1.13 BRANCH CIRCUITS

- A. The number of conductors in each run of conduit is indicated on the drawings and where there is a conflict between the number of wires indicated and the actual number required as determined by the functional design requirements, the number of wires determined by the functional design requirements shall govern.
- B. In general, there is a number associated with each branch circuit outlet which identifies the particular branch circuit to which the device served by the outlet is to be connected. The circuit

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number indicated has been assigned only for reference and guidance, and is not intended to limit panelboard circuitry. All branch circuits shall be connected to breakers in accordance with circuit requirements and good industry practice. The balancing of all loads shall be included in the work of this DIVISION.

- C. Home runs shall not be combined where such would require derating of conductor ampacity. Separate neutrals shall be provided for all branch circuits.

1.14 MOTOR, APPLIANCE AND EQUIPMENT CONNECTIONS

- A. Unless otherwise shown on the drawings or specified herein, it is the intent of this DIVISION to provide all electrical equipment and connections required to protect, properly operate, and control all motors, appliances, electrical devices, and equipment furnished and installed under this and other DIVISIONS of the specifications or shown on the drawings.

1.15 SETTING OF EQUIPMENT

- A. The setting of equipment shall be carefully coordinated with the work and requirements of the other trades involved to ensure compatibility and to avoid conflicts.
- B. Equipment, base mounted on concrete or masonry slabs, pads and piers, or mounted on stands, gratings, platforms, or other, shall not be set in any manner, except on the finished and permanent support.
- C. Support of equipment on studs or by other means, and the placing or building of the supporting slab, pad, pier, stand, grading, or other, "to the equipment", is prohibited.

1.16 RECORD DRAWINGS/MANUALS

- A. Upon completion of the installation, Contractor shall submit to the Designer marked prints of drawings showing any changes made in circuits, location of equipment, panelboards or any other revision in the Contract Drawings, for the Owner's use in maintenance work and for future additions and expansions. Marked changes shall also include changes due to change orders unless already recorded by revised drawing or bulletin drawing.
- B. These records shall be submitted in one of two formats: either a clean, legible, marked set of prints with all markings in distinguishable colored pencil such as red; or a set of reverse-run reproducible sepia prints marked in soft pencil so that blue-line prints can be reproduced as required. The format to be used shall be as defined in the General Requirements section of the contract documents. If no format is defined, the marked blue-line prints shall be submitted.
- C. Operation and Maintenance manuals shall be submitted to the Designer at 80% completion. Information included shall be a copy of all submittal data, shop drawings and necessary operating and maintenance instructions and wiring diagrams on all major items of equipment and all special systems (fire alarm, intercom, etc.). Submit these manuals in the quantities and format described in the General Requirements section.

- 1.18 It shall be the sole responsibility of the Division 26 contractor to notify the Office of the State Electrical Inspector, State Construction Office of any necessary inspections and to schedule said inspections. Inspections shall take place during normal working hours Monday-Friday unless special approval for off-hours inspections are approved by NC SCO.

END OF SECTION 260500

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SECTION 260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 - GENERAL

- 1.1 Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to the work of this section.
- 1.2 All conductors shall be copper of the number and AWG sizes shown on the drawings and sized to equal or exceed the requirements of the NEC. Insulation shall be rated for 600 volts. Where not shown otherwise, wiring shall be not less than No. 12 AWG
- 1.3 All conductors shall be in conformance with NEMA WC-3 (rubber-insulated wire and cable), WC-5 (thermoplastic-insulated wire and cable), and WC-7 (cross-linked-thermosetting-polyethylene-insulated wire and cable) for the transmission and distribution of electrical energy.
- 1.4 All conductors shall be copper, Type THHN/THWN insulation stranded except conductors, #10 AWG or smaller, shall be solid.
- 1.6 Conductors No. 6 and smaller shall be identified by a continuous insulation color. Conductors larger than No. 6 shall be identified by three laps of colored tape equal to Scotch #35 at each point of access to the conductors. Color coding shall be as follows:

	208 Volt	480 Volt
Phase A Conductor	Black	Brown
Phase B Conductor	Red	Orange
Phase C Conductor	Blue	Yellow
Grounded (Neutral) Conductor	White	Gray
Grounding Conductor	Green	Green

- 1.7 Number code all control instrument wiring at all points of access, including junction boxes.
- 1.8 All wire sizes shown on the drawings are based upon the use of copper conductors with 75 degrees C rated insulation. Where appliance or equipment terminals are rated for 60 degrees C connections, conductor sizes and ampacities shall be based on 60 degrees C insulation. Where appliance or equipment terminals are rated for 60/75 degrees C connections, conductor sizes and ampacities shall be based on 60 or 75 degrees C insulation. Where appliance or equipment terminals are rated for 75 degrees C connections, conductor sizes and ampacities shall be based on 75 degrees C insulation.

PART 2 - PRODUCTS

- 2.1 Conductors shall be manufactured by American, Rome, Triangle, Southwire, Okonite or approved equal.
- 2.2 Conductors inside buildings shall have moisture and heat resistant thermoplastic insulation, type "THHN/THWN", or "XHHW", rated for 600 volts unless other types are required by the Code.

Type "THHN" shall not be used in wet or damp locations and, where used, shall have an ampacity rating based on the temperature rating of the termination lugs, equipment, devices, etc.

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- 2.3 Unless otherwise indicated, conduit sizes shown on the drawings are based upon the use of type THWN insulated conductors. Conduit sizes shall be increased where required by the NEC for the type insulation used.
- 2.4 Control wiring may be No. 14 AWG except where length of runs would not permit proper operation of the controls or where larger sizes are required by code.
- A. Class 1 remote control and signal circuit conductors shall not be smaller than No. 14 AWG.
 - B. Class 2 low energy remote control and signal circuit conductors shall not be smaller than No. 16 AWG, unless noted otherwise on the drawings or recommended by the equipment manufacturer incorporating such wiring.
 - C. Conductor insulations shall be as specified herein before except that No. 16 AWG conductors for remote control or signal circuits may be commercial grade fixture wire, Type RF-2, TF or other types recognized by the NEC as applicable for the purpose.
- 2.5 The use of type NM, NMC and MC cable is prohibited.
- 2.6 Instrumentation cables shall be low signal level type, 16 AWG, stranded copper with insulation of chemically cross-linked polyethylene or flame retardant ethylene propylene, 90 degrees C, 600 volts. Conductors shall be arranged as twisted pair, 1-1/2 inch minimum lay. Shielding shall be 100 percent coverage aluminum polyester tape with 18 gage bare, tinned, copper drain wire in continuous contact with tape. Jacket shall be polyvinyl chloride or chlorinated polyethylene, suitable for installation in cable tray.
- 2.7 Connections to motor “pig-tails” shall be by copper split-bolt type connectors “wrapped” with one layer of varnish tape, then one layer of rubber tape then one layer of electrical tape.
- 2.8 Terminal strips shall be Barrier type, rated 600 volts.

PART 3 - EXECUTION

- 3.1 Provide all wire and cable of AWG sizes indicated on the drawings and as specified or required to provide a complete installation.
- 3.2 Unless otherwise noted, splices in No. 8 and smaller conductors shall be made with screw type connectors listed by UL as 600 volt pressure cable connectors for branch circuit and fixture splicing applications and shall be equal to IDEAL "WING NUTS", SCOTCHLOK Spring Connectors, 3M wire nuts or approved equal connectors. Splices in copper conductors larger than No. 8 shall be made with Thomas and Betts, 3M, Burndy, or approved equal solderless connectors with molded composition covers.
- 3.3 Wiring must be installed in conduit and the minimum size conduit is 3/4". Install splice-free conductors within ducts, conduits or earth.
- 3.4 Conductors shall be continuous from outlet to outlet with splices made only in outlet or junction boxes.
- 3.5 Insulate splicing connectors to at least 200 percent of insulation. Use pre-stretched tubing connector insulators, 3/M PST, for No. 2 and larger conductors. Pull conductors using recognized methods and

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equipment leaving eight inches (minimum) of wire at junctions for connections.

- 3.6 Form and tie all wiring in panelboards utilizing Velcro style wire ties that will allow ease of access to conductors by the Owner's maintenance staff.
- 3.8 Wiring in hot locations and for recessed fixtures shall have heat-resistant insulations applicable for the purpose.
- 3.9 Where the conductor length from the panel to the first outlet on a 277 volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Where the conductor length from the panel to the first outlet on a 120 volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEM

PART 1 - GENERAL

- 1.1 Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to the work of this section.
- 1.2 Grounding shall be installed in accordance with the National Electrical Code and shall include ground and equipment grounds for all electrically operated equipment.
- 1.3 Grounding conductors shall be run with all lighting and power circuits 120V and above, and be bonded to all equipment or devices. Grounding conductors shall be run in all flexible metal conduits, including liquidtight conduit. Grounding conductors shall be installed elsewhere as shown.
- 1.4 The grounding system shall be bonded together and effectively ground all exposed, non-energized metal surfaces containing energized parts, devices or conductors, all metallic electrical raceways and the neutrals and cases of all transformers.
- 1.5 Resistance from the main ground electrode to ground shall not exceed 25 ohms. When measured values exceed this amount, install a sufficient number of grounding electrodes to lower the resistance to a value within the specified limit.

PART 2 - PRODUCTS

- 2.1 Service grounding conductor and building grounding conductors shall be bare stranded copper sized as shown on the Drawings.
- 2.2 Equipment grounding conductors in raceways shall be insulated copper sized as shown on the Drawings.
- 2.3 Direct buried ground connections shall be exothermic type Cadweld or Thermoweld.

PART 3 - EXECUTION

3.1 BUILDING SYSTEMS GROUNDING

- A. The main service ground clamp shall be attached to the cold water main at an accessible point and before its size is reduced immediately after it enters the building. Clamp shall be accessible after construction is complete. Grounding conductor shall be without splice into the service enclosure where it shall be connected to main service neutral. Grounding type insulated bonding bushings and jumpers shall be provided where conduits terminate in service entrance equipment, transformers, and where concentric, eccentric or over-sized knockouts are encountered. The jumpers shall be sized per NEC Table 250-66 for services, and transformers, and per Table 250-122 for branch circuits.
- B. In addition to the clamp on the water main, a supplemental electrode shall be provided. This supplemental electrode shall consist of one of the following:
 1. Three 10 foot minimum copper clad ground rods, 3/4" in diameter, driven to a depth so top of rod is below finished grade. Grounding conductor shall be

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continuous and sized as shown on plans. The grounding conductor conduit shall be fastened to service enclosure with double locknuts and bonding bushing.

- C. In addition, the metal frame of the building shall be bonded to the grounding electrode system using a conductor sized the same as the main grounding conductor on the drawings.
- D. Bonding shall be done with approved insulated bonding bushings and compression type lugs.
- E. Grounding conductor shall be Type TW or THHN/THWN run in heavy wall conduit, and of size shown on drawings or required by NEC.
- F. A grounding conductor shall be installed and solidly connected to all electrical equipment such as dry type transformer neutrals, motor control center ground buses, housings, switchgear, panelboards, switchboard, wireways, motor frames, controllers, generators, transfer switches, conduits, etc., in accordance with code requirements and as shown on the drawings. Connections to the equipment may be bolted or screwed using corrosion resisting bolts, nuts and screws as required for a solid and permanent connection.
- G. Bonding jumpers shall be installed. Bare grounding conductors, where passing through steel sleeves, shall be bonded to the steel at entrance and exit.
- H. **Upon completion of installation of the grounding electrode and bonding system at the service entrance location, the ground resistance shall be tested per IEEE Fall-of Potential testing procedures. Resistance to ground shall be less than 25 ohms. Should the test show more than 25 ohms of resistance, the contractor shall provide additional ground rods as necessary and re-test the system. All systems tests shall be documented including any tests that fail. Test shall be performed prior to energization of the service.**

END OF SECTION 260526

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SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

- 1.1 Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to the work of this section.
- 1.2 All conduits shall be properly supported in accordance with these specifications and the latest NEC.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Single Runs: Galvanized conduit straps on ring bolt type hangers with specialty spring clips. Do not use plumbers perforated straps.
- B. Multiple Runs: Conduit racks with 25 percent spare capacity.
- C. Vertical Runs: Channel support with conduit fittings.

2.2 ANCHOR METHODS

- A. Hollow Masonry: Toggle bolts or spider type expansion anchors.
- B. Solid Masonry: Lead expansion anchors or preset inserts.
- C. Metal Surfaces: Machine screws, bolts, or welded studs.
- D. Concrete Surfaces: Self-drilling anchors

2.3 Indoors in Dry Areas: Materials shall be galvanized or cadmium plated steel.

2.4 Indoors in Wet, Damp or Corrosive Areas: Threaded materials shall be stainless steel. All other materials shall be aluminum and/or stainless steel.

2.5 Outdoors: Threaded materials shall be galvanized steel. All other materials shall be aluminum, stainless steel, or both.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.

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- B. Conduits installed on the interior of exterior building walls shall be spaced off the wall surface a minimum of 1/4 inch using "clamp-backs" or strut.

- C. Loading of Equipment Supports:
 - Spans up to 5 feet: Deflection shall not exceed 1/240 of span.
 - Spans 5 feet and greater: Deflection shall not exceed 1/360 of span.
 - Compressive loading shall not exceed 33 percent of manufacturer's published ratings.

END OF SECTION 260529

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

- 1.1 Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division - 1 Specification sections, apply to the work of this section.
- 1.2 Unless otherwise shown or specified, raceways shall be provided for all conductors, including but not limited to lighting, power, control, fire alarm, communications and telephone. All raceway shall be third party listed and labeled. Reference Section 260500 for acceptable third party listing agencies.
- 1.3 Raceways shall be installed as a complete system without wires and shall be continuous from outlet to outlet and from fitting to fitting. Raceways shall be mechanically and electrically connected to all boxes and fittings and shall be properly grounded.
- 1.4 The routing and location of all conduits and other raceways shall be coordinated with other trades and with the building construction to avoid conflicts.
- 1.5 Where conduit and other raceway sizes are not specifically shown on the plans, conduits shall be sized in accordance with the requirements of the NEC. No conduit shall be less than 3/4" above grade and 1 1/4 " below grade.

PART 2 - PRODUCTS

- 2.1 Rigid Metal Conduit (RGS) shall be manufactured by Allied, Triangle, Wheatland or approved equal, in accordance with UL 6 and ANSI C80.1. Conduit shall be low carbon, hot-dipped galvanized inside and out, with threaded ends, 3/4" inch minimum size. Fittings shall be cast iron or alloy steel, threaded and galvanized.
- 2.2 Electrical metallic tubing (EMT) shall be as manufactured by Allied, Triangle, Republic, or approved equal, in accordance with UL 797 and ANSI C80.3. EMT shall be high-strength, zinc-coated, 3/4 inch minimum size. EMT shall not be utilized for service entrance conductors. Fittings shall be of same finish and material as tubing. Fittings shall be steel, hexagonal compression type, with insulated throat. Pot-metal, set-screw or indented fittings shall not be utilized.
- 2.3 Flexible metal conduit shall be in accordance with UL 1 and ANSI C33.92. Conduit shall be galvanized. Flexible metal conduit shall be secured to boxes and enclosures with angle saddle type connector with bushings between the conductors and the conduit. Minimum size 3/4" except 1/2 " may be used for lighting whips in lengths less than 6'-0".
- 2.4 Rigid Non-Metallic conduit shall be NEMA TC-2, Type EPC-40-PVC with NEMA TC-3 fittings.
- 2.5 Liquidtight flexible metal conduit shall be provided in accordance with UL 360. Conduit shall have galvanized steel core and moisture and oil resistant thermoplastic cover. Minimum size 3/4".
- 2.6 Expansion Joint Fittings: Watertight, permitting two-way movement up to 4 inches, equipped with bonding jumpers around or through each fitting.
- 2.7 Sealing Material for Sealing Fittings: Chico X Fiberdam, and Chico A sealing compound, or Chico A-P interpak by Crouse-Hinds or Apelco sealing cement and fiber filler by Appleton or equal by 3M Corp.

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- 2.8 Insulated Bushings: Type B or SBT, as applicable, by O-Z Gedney or series B1900, series BU500 or series TC700, as applicable, by Steel City or equal by T&B.
- 2.9 Pulling in Wire: Provide a 100# nylon pull rope in each row of empty conduit.
- 2.10 Wireways and wiring troughs shall be code gauge galvanized steel, sized as shown, or as required by the NEC. Covers shall be screwed. Where indicated as raintight, wireways shall be galvanized and shall comply with the NEMA requirements.
- 2.11 **BOXES, ENCLOSURES, AND CABINETS**
- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- F. Cabinets:
1. NEMA 250, Type 1, 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 Rigid steel conduit shall be installed with threaded fittings and couplings. Where conduits terminate in a threadless opening, locknuts shall be provided both inside and outside of the box or enclosure and the conduit end shall be fitted with an insulating bushing. Where bonding is required, the end of the conduit shall be equipped with an insulated metallic grounding and bonding bushing.
- 3.2 Liquidtight flexible metal conduit shall be secured with approved liquidtight fittings with insulated throats.
- 3.3 All metallic couplings, connectors and fittings shall be malleable iron or steel and finished with zinc plating or by galvanizing.
- 3.4 All conduits shall be plugged after installation to prevent the entrance of construction dirt and debris. Conduits shall be clean before wires are pulled.

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- 3.5 In wet or damp locations, all fittings shall be installed with suitable watertight gaskets.
- 3.6 Where raceways pass through walls, partitions and floors, seal penetrations to provide a neat installation which will maintain the integrity of the waterproofing or fireproofing, as applicable, of the structure. Coordinate installation requirements with roofing installer where conduits pass through the roof.
- 3.7 Conduit provided outdoors above grade shall be rigid steel conduit.
- 3.8 Conduit run underground, **OUTSIDE THE BUILDING**, shall be rigid non-metallic conduit encased in concrete. "Turn-ups" from below to above grade shall be provided by installation of rigid metallic elbows and a transition to rigid steel conduit.
- 3.9 Conduit located indoors, not in mechanical, electrical or elevator machine rooms or **UNDERSLAB**, may be EMT. All other indoor conduits shall be rigid steel.
- 3.10 Flexible metal conduit may be used indoors for connections to lighting fixtures in accordance with the NEC. Liquidtight metal conduit of sufficient length to eliminate vibration shall be used for connections to motors, transformers, and other equipment requiring flexibility.
- 3.11 The use of flexible metal conduit shall be limited in application to the connection of lighting fixtures and miscellaneous equipment, and in lengths not to exceed six feet. Fittings shall be of a type approved for grounding purposes.
- 3.12 Expansion fittings shall be utilized in all cases where conduits pass through or across building expansion joints. Fittings shall be of an approved weatherproof telescopic type permitting a movement of up to four inches and shall be provided with approved bonding jumpers around or through the fitting. Contractor shall review the structural drawings for locations of expansion joints.
- 3.13 All conduits shall be properly supported using galvanized malleable iron conduit clamps for individual runs. Multiple runs shall be supported on channel adequately secured to walls or hung from structure above with conduits fastened to channel with clamps designed for the purpose.
- 3.14 Raceways shall be run at least 6" from hot flues, steam pipes, hot water pipes and other hot surfaces.
- 3.15 All raceways entering a building from underground shall be sealed to prevent water, moisture, gas, or any other foreign matter from entering the building. Conduits shall be sealed in accordance with NFPA 70 Sections 225.27 and 230.8.
- 3.16 No flexible conduits or Condulets shall be used for the telecommunications raceway system. In addition, there shall be no more than a total of 180 degrees of bends in any telecommunications raceway system without the installation of an accessible pullbox.
- 3.17 Connection of Conduit to Sheet Metal Boxes and Enclosures:
 - A. Connection to NEMA 1 type boxes and enclosures:
 1. Rigid Metal Conduit: Install insulated bushings and double locknuts.
 2. EMT: Install compression steel box connectors with insulated throats.
 - B. Connection to NEMA 3R, 4, 4X, and 12 type boxes: Install insulated bushings and sealing locknuts or hubs.

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- C. When conduits enter floor mounted enclosures from below and there is no sheet metal to which to attach; install grounding bushings on the conduit. Bond bushings to ground bus using a conductor the same size as required for an equipment grounding conductor sized for the given circuit.
- D. Install sealing bushing within all conduits which have entered a building from outside, whether from above or below grade.

3.18 BOX INSTALLATION

- A. Pull and junction boxes, where concealed in unplastered masonry, shall be square corner masonry type.
- B. Boxes for exposed work shall be FS or FD series "Condulets" of a type and size applicable for the intended use at the locations shown on the drawings. SE and SEH Series "Condulets" shall be used for ceiling boxes where round boxes are required. Steel boxes will not be permitted for this purpose. Covers for use with these boxes shall have cadmium plated finish and shall be of rounded-edge design with openings to suit devices. Where the general arrangement and number of conduits prohibit the use of a single box, additional boxes shall be used as junction boxes and they shall be of the same general design as the outlet boxes. Provide weatherproof covers in outdoor areas. Such boxes shall be Crouse-Hinds or equivalent Appleton or Pyle-National.
- C. Boxes installed in concrete construction shall be galvanized concrete type at all locations, except that cast iron boxes shall be installed for watertight fixtures or devices.
- D. Boxes installed in unplastered masonry shall have covers of sufficient depth to avoid undue cutting of the masonry units.
- E. Special care shall be exercised in the location of pull and junction boxes in order that access not be obstructed by piping or ductwork installed by other trades. To this end, the work shall be coordinated with representatives of the other trades. Boxes shall be independently and securely supported.
- F. Pull boxes shall be installed at all necessary points, whether indicated on the drawing or not, to prevent injury to the insulation or other damage that might result from pulling resistance or for other reasons necessary to proper installation.
- G. Where boxes are used in exposed conduit runs, plain covers shall be attached to the box with a suitable number of countersunk flathead machine screws or slotted truss head bolts. Flush covers of similar construction shall be used for flush mounted boxes.
- H. ALL Junction and pull boxes for branch circuits, fire alarm or communication systems shall be identified by spray painting the interior and exterior of the box and the cover. In addition, the box cover shall be labeled using a permanent, black marking pen to identify circuits or systems in box. Color code for spray painting of boxes shall be per Section 260553 of the Specifications.
- I. Clean boxes of all foreign matter prior to installation of wiring or devices.

END OF SECTION 260533

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

- 1.1 Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division – 1 Specification sections, apply to the work of this section.
- 1.2 Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification of equipment controlled or served, phase, voltage, etc.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Nameplate material colors shall be:
 - 1. Blue surface with white core for 120/208 volt equipment.
 - 2. Black surface with white core for 480Y/277 volt equipment.
 - 3. Bright red surface with white core for all equipment related to fire alarm systems.
- B. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by phenolic tags with wire attached to conduit or outlet.
- C. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match surface color scheme outlined above. This includes covers on boxes above all type ceilings.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).
- D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch (6.4-mm) grommets in corners for mounting. Nominal size, 10 by 14 inches (250 by 360 mm).
- E. Fasteners for Signs: Pop-rivets, self-tapping (if screw end is protected), stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.
- F. Warning label and sign shall include, but are not limited to, the following legends:

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1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

- G. The contractor shall install Arc-Flash warning labels that will be created by the Designer. The contractor shall provide proposed distances for feeders/circuits to the Designer for this analysis prior to beginning any conduit installation and after feeders are installed.**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Nameplates shall be securely attached to equipment with self-tapping stainless steel screws with screw end protected, and shall identify equipment controlled, attached, etc. Letters shall be 1/2 inch high minimum. Embossed, self-adhesive plastic tape is NOT acceptable for marking equipment.
- B. Refer to specific detail sheets in the Drawings for specific information required on all nameplates or other labeling.

END OF SECTION 260553

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SECTION 265100 – INTERIOR LIGHTING

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 the work of this section.
- B. 2018 North Carolina Energy Code.

1.2 SUMMARY

- A. This section includes the supply and installation of fixtures, supports, lamps, ballasts and accessories, and supply of plaster frames, trim rings and backboxes for plaster or drywall ceilings or concrete.

1.3 COORDINATION

- A. Confirm compatibility and interface of other material with luminaire and ceiling system. Report discrepancies to the Engineer, and defer ordering until clarified.
- B. Supply plaster frames, trim rings and backboxes to other trades.
- C. Coordinate with other Divisions to avoid conflicts between luminaires, supports, fittings, and mechanical equipment.

1.4 LUMINAIRE DESIGNATION

- A. Furnish, assemble, install and connect all lighting fixtures for outlets shown on the drawings. Fixtures shall be as indicated in the LIGHTING FIXTURE SCHEDULE as shown on the drawings.
- B. All fixtures shall be furnished complete with sockets, lamps, internal wiring, leads, trims, hangers, supports, frames, ballasts, etc., as applicable and required for a complete and workmanlike installation.

1.5 DEFINITIONS

- A. Emergency Lighting Unit: A fixture with integral emergency battery power supply and the means for controlling and charging the battery. They are also known as an emergency light set.
- B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the power supply. Internal battery powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units are available with and without integral lamp heads and lamps.

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- C. Luminaire: Fixture.
- D. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under normal conditions.

1.6 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:
 - 1. Outline drawings of fixtures indicating dimensions and principal features.
 - 2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.
 - 3. Data on batteries and chargers of emergency lighting units.
- C. Maintenance data for products for inclusion in Operating and Maintenance Manual specified in Division 1.
- D. Product certifications signed by manufacturers of lighting fixtures certifying that their fixtures comply with specified requirements.
- E. Shop drawings from manufactures detailing nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features, and accessories.
- F. Coordination drawings for fixtures mounted on, in, or above the ceiling indicating coordination with ceiling grids and other equipment installed in the same space.

1.7 QUALITY ASSURANCE

- A. Listing and Labeling: Provide fixtures, poles/standards and emergency lighting units that are listed and labeled for their indicated use on the Project.
 - 1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, underwater, and recessed in combustible construction specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.
 - 2. The terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 - 3. Listing and Labeling Agency Qualification: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Manufacturers Qualifications: Firms experienced in manufacturing fixtures that are similar to those indicated for this Project and that have a record of successful in-service performance.
- C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system.

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1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
1. Warranty Period for Luminaires: Five years from date of Final Acceptance.
 2. Warranty Period for Metal Corrosion: Five years from date of Final Acceptance.
 3. Warranty Period for Color Retention: Five years from date of Final Acceptance.
 4. LED Luminaire Warranty:
 - a. Provide a comprehensive written 5-year warranty for including luminaire finish, on-site replacement of material, and workmanship. On-site replacement includes transportation, removal, and installation of new products. Finish warranty shall include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking, or fading.
 - b. Provide a written 5-year replacement material warranty for defective or non-starting LED source assemblies.
 - c. Provide a written 5-year replacement material warranty on all PSUs.
 - d. Provide a written 5-year replacement warranty for non-maintained illuminance levels on all light sources (LED package, LED array, or LED module) including, but not limited to the LED die, encapsulate, and phosphor. If the expected useful life of the luminaire system as defined in this specification is not maintained, then the manufacturer shall replace the light source(s) or luminaire as needed.
 - e. Provide a written 5-year warranty that LED color shift from initial shall color be less than 0.007 on the CIE 1976 (u',v') diagram

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. LED Modules: 5 for every 100 of each type and rating installed. Furnish at least five (5) of each type.
 2. Drivers: 5 for every 100 of each type and rating installed. Furnish at least five (5) of each type.
 3. Fixture Types: one (1) of each type.

PART 2 - PRODUCTS

2.1 FIXTURES, GENERAL

- A. Comply with the requirements specified in the Articles below and the lighting fixture schedule on the drawings.

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2.2 FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs and sharp corners and edges.
- B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in the operating position.
- D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass except as indicated.
 - 1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.
 - 2. Lens Thickness: 0.125 inches, minimum.

2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

- A. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
- B. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16-inch diameter cadmium plated, threaded steel rod.
- D. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking- type plug.

2.4 LED LIGHTING

- A. General:
 - 1. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified.
 - 2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.
 - 3. LED drivers shall include the following features unless otherwise indicated:
 - a. Minimum efficiency: 85% at full load.

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- b. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
 - c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
 - d. Integral short circuit, open circuit, and overload protection.
 - e. Power Factor: ≥ 0.95.
 - f. Total Harmonic Distortion: ≤ 20%.
 - g. Comply with FCC 47 CFR Part 15.
4. LED modules shall include the following features unless otherwise indicated:
- a. Comply with IES LM-79 and LM-80 requirements.
 - b. Minimum CRI 80 and color temperature 3000° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
 - c. Minimum Rated Life: 50,000 hours per IES L70.
 - d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.
5. Provide 2.5kV surge suppression on all interior luminaires and 10 kV surge suppression on all exterior luminaires.
- B. LED Downlights:
- 1. Housing, LED driver, and LED module shall be products of the same manufacturer.

2.5 FINISH

- A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.
- B. Other Parts: Manufacturer's standard finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved shop drawings.
- B. Support For Recessed and Semirecessed Fixtures: **Reference Drawings for specific details.**
- C. Support for Suspended Fixtures: Brace pendants and rods that are 4-feet long or longer to limit swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- D. Lamping: Lamp units according to manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

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- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.3 ADJUSTING AND CLEANING

- A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.

3.4 Verify with the Contractor the type of ceilings which will be used in the various spaces before ordering fixtures, to ensure compatibility with the ceiling types to be actually installed, including trim and accessories.

3.5 Mounting heights of fixtures are, in most cases, indicated on the drawings or scheduled. Where job conditions require mounting heights different from those shown or specified to avoid equipment, structural features, etc., such changes in mounting height shall be as directed without additional cost to the Owner.

3.6 The work of this Section shall include the careful examination of the Architectural and Mechanical drawings as to become acquainted with the structural features of the building, and the location of pipe and ductwork which would alter the location and spacing of outlets for fixtures. Where conflicts develop, same shall be referred to the Engineer for a decision as to the proper location. The work of this Section shall also include responsibility for the proper reinforcement of any ductwork necessary to carry the added weight of lighting fixtures where same must be supported by such ductwork.

3.7 Attention is directed to the possible close fit requirements of some lighting fixtures within bar joist areas. All fixtures for these areas shall be closely coordinated with bar joist locations for proper fit and alignment.

END OF SECTION 265100

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SECTION 283111 - DIGITAL ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This Section includes fire alarm systems with manual stations, detectors, signal equipment, controls, and devices and contains all relevant criteria contained in the North Carolina State Construction Office document "Fire Detection and Alarm Systems" dated 2020.

1.2 SCOPE

- A. This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled, analog addressable intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the Drawings and specified herein.

1.3 QUALITY ASSURANCE

- A. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled. Products of firms that do not maintain factory authorized service organization and spare parts stock are not acceptable for use on this project.
- B. **Acceptable Manufacturers/Models:** The University maintains its fire alarm system and as such all systems shall be fully serviceable and programmable by the University. Acceptable manufacturers are limited as follows:
 - 1. Notifier Intelligent Fire Alarm Systems to be compatible with the existing system components.
- C. **Installer's Qualifications:** Company specializing in performing the work of this section and making the final terminations of this section. Minimum of 5 years documented experience installing fire detection and alarm systems similar in size and scope to this project. Qualifications of installer shall be provided with equipment submittal. Installer shall be certified by the manufacturer to install, program and service the system and shall directly supervise the final connections between the equipment and the wiring system.
- D. Only the Installer may make program changes and must be present for the 100% test, Engineer's inspection and Owner inspections. Training certification shall not be more than 2 years old and must be for the equipment model installed on the project.
- E. **Codes and Standards:**
 - 1. NFPA Compliance: Comply with current applicable requirements of NFPA-72, National Fire Alarm Code.

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2. NEC Compliance: Comply with current applicable requirements of NFPA-70, National Electrical Code (NEC) standards pertaining to fire alarm systems.
3. Testing Laboratory Compliance: Comply with provisions of UL safety standards pertaining to fire alarm systems. Provide products and components, which are Listed and Labeled.
4. FM Compliance: Provide fire alarm systems and accessories, which are FM approved.

1.4 SUBMITTALS

A. General: Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification. Where a submitted item does not comply fully with each and every requirement of the specifications, the submittal shall clearly indicate such deviations. Identification requirements for non-complying features of items are very specific.

1. Prior to accepting the fire alarm shop drawing package, the Designer shall conduct a mandatory "fire alarm review meeting" with the NCSU construction management team and the Contractor. The electrical contractor and fire alarm contractor shall review the fire alarm shop drawing package with NCSU. The purpose of this meeting is to insure contractor complies with NCSU's site specific fire alarm and detection installation requirements.
2. Product Data: Submit Manufacturer's technical product data, including specifications and installation instructions, for each type of fire alarm system equipment. Submit technical product data on the fire alarm service equipment. Submittals shall provide mA current draw data for each device submitted and UL Listed minimum voltage required to operate. Panel submittal shall list voltage drop allowed for panel and Notification Appliance Circuits (NAC).
Shop Drawings: Submit shop drawings showing equipment, device locations, and connecting wiring of entire fire alarm system. Include wiring and riser diagrams. Copies of Project Construction Documents or details therefore may not be a part of the shop drawing submittal. Provide distance and proposed route for each Notification Appliance Circuit (NAC). Drawings shall include design ambient sound level, audible alarm device sound power and alarm sound level for each space.
Installation Instructions: Submit Manufacturer's detailed installation instruction for all duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.
3. Battery Calculations: Systems are to be provided with a separate and independent source of secondary power. All shall have a minimum of 60 hours secondary power capacity, plus 15 minutes of full alarm load

Include a copy of system battery sizing calculations with the shop drawing submittal to the engineer. Use manufacturer's battery discharge curve to determine expected battery voltage after 60 hours of providing standby power. Then use calculated Notification Appliance Circuit current draw in the alarm mode to determine expected voltage drop at EOL, based on conductor resistance per manufacturer's data sheet or NEC 2014, Table 8; add any inherent voltage drop caused by the system's power supply.

The voltage drop at EOL must not exceed 14% of the expected battery voltage, after the required standby time plus alarm time. Determine "worst case" voltage at far end of each NAC, by subtracting its calculated V-drop from the expected battery voltage. The result must be no less than the minimum listed operating voltage for the alarm notification appliances used.

All of these calculations must be placed on a dedicated sheet of as-built drawings, for future reference by fire alarm service technicians. NAC voltage drop is to be verified during system tests.

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4. Maintenance Data: Submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual.
5. Certifications: Submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses, and telephone numbers in the certification.
6. Qualifications: Submit data to indicate compliance with Quality Assurance requirements for Manufacturer and Installer.

PART 2 - PRODUCTS

2.1 FIRE ALARM CONTROL PANEL (FACP)

- A. FACP - General: The FACP shall meet the following general requirements:
- B. Signal Line Circuits: Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Style 6 (Class A) Signaling Line Circuit (SLC).
- C. Notification Appliance Circuits: Alarm notification appliance (NAC) circuits shall be NFPA 72 Style Y (Class B). The load connected to each circuit must not exceed 80% of rated module output. The NAC voltage drop during alarm must not exceed 14% of the voltage measured across the batteries at that time. The contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly.
- D. Digitized electronic signals shall employ check digits or multiple polling. In general a single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
- E. Loss of Power: Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
- F. System Response to an Alarm Condition: When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 1. The system alarm LED shall flash.
 2. A local piezo-electric signal in the control panel shall sound.
 3. The 80-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 4. History storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
 5. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
 6. Activate all fire alarm Notification Appliances in the building, sounding and flashing in synchronization continuously until manually silenced, or until the initiating device and control unit have been reset to normal condition.
 7. Communicate to Owner's Main Network Panel and Communicator.
 8. Deactivate door hold control relay such that all smoke doors are allowed to close.
 9. Deactivate control relays allowing HVAC units to stop.

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- G. System Response to Trouble Conditions
1. System AC power trouble signal shall not be sent unless maintained for 6 hours or more. Provide a dual time delay relay with a minimum setting of sixty (60) seconds in the FACP for this purpose.
 2. Provide immediate transmission of all other supervisory signals.
 3. Provide adjustable delay for all other trouble signals prior to transmission.
- H. FACP - Minimum Requirements: The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system controlled devices. The main FACP shall perform the following functions:
1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
 2. Supervise all initiating, signaling, and notification circuits throughout the facility by way of connection to monitor and control modules.
 3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
 4. Visually and audibly annunciate any trouble, supervisory or alarm condition on operator's terminals, panel display, and annunciators.
- I. System Capacity and General Operation: The system shall have the following capacities and general operation modes:
1. The FACP shall provide, or be capable of expansion to 198 intelligent/addressable devices per SLC and 2048 annunciation points per system. The number of SLCs provided shall be as indicated on the Drawings.
 2. The FACP shall include a full featured operator interface control and annunciation panel that shall include a backlit, 80 character liquid crystal display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
 3. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel, and shall be password protected.
 4. The FACP shall be able to provide the following features:

- Upload/Download to PC Computer	- Charger Rate Control
- Alarm Verification with Tally	- Drift Compensation
- Automatic Day/Night Sensitivity Adjust	- Device Blink Control
- Pre-alarm Control Panel Indication	- Trouble Reminder
- NFPA 72 Smoke Detector Sensitivity Test	- Walk Test
- System Status Reports	- Periodic Detector Test
- Alarm Verification, by device, with tally	- Multiple Printer Interface
- Multiple CRT Display Interface	- Security Monitor Points
- Non-Alarm Module Reporting	- Block Acknowledge
- Smoke Detector Maintenance Alert	- Control-By-Time
 5. The system shall perform time based control functions including automatic changes of specified smoke detector sensitivity settings.

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- J. Central Processing Unit: The Central Processing Unit (CPU) shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the CPU.
 - 1. The CPU shall contain and execute all control-by-event (including ANDing, ORing, NOTing, CROSSZONEing) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure. The CPU shall also provide a real-time clock for time annotation of all system displays. The Time-of-Day and date shall not be lost if system primary and secondary power supplies fail.
 - 2. The CPU shall be capable of being programmed on site with the use of a laptop computer and without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable. The system shall download to a personal computer for program editing, storage and examination.
 - 3. The CPU and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.
- K. Display: The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
 - 1. The system display shall provide an 80-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide five Light-Emitting-Diodes (LEDs), which will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, DISPLAY TROUBLE, and SIGNAL SILENCE.
 - 2. The system display shall provide a 25-key touch keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be accessible through the display interface assembly to prevent unauthorized system control or programming.
 - 3. The system display shall include the following operator control switches: SIGNAL SILENCE, LAMP TEST, RESET, SYSTEM TEST, and ACKNOWLEDGE.
- L. Audio Amplifiers – Amplifiers shall be suitable for use with power limited wiring systems. All amplifiers shall be the same wattage and size.
- M. Signaling Line Circuit (SLC) Interface Board: The FACP shall contain SLC interface boards as required to communicate with the SLC loops as shown on the Drawings. Each SLC board shall monitor and control a minimum of 198 intelligent addressable devices. This includes 99 analog detectors (Ionization, Photoelectric, or Thermal) and 99 monitor or control modules.
 - 1. Each SLC interface board shall contain its own microprocessor, and shall be capable of operating in a local mode (any SLC input activates all or specific SLC outputs) in the event of a failure in the main CPU of the control panel. The SLC interface board shall not require any jumper cuts or address switch settings to initialize SLC Loop operations. SLC interface boards shall provide power and communicate with all intelligent addressable detectors and modules connected to its SLC Loop on a single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 4, Style 6, or Style 7.
 - 2. Each SLC interface board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular detector. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in

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each detector. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

- N. Serial Interface Board: The FACP shall contain a serial interface board to provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals. The serial interface board shall allow the use of multiple printers, CRT monitors, and other peripherals connected to the EIA-232 ports. In addition, the serial interface board shall provide one EIA-485 port for the serial connection to annunciation and control subsystem components; LEDs shall be provided to show operational status. All serial interface input/outputs shall be optically isolated to provide protection from surges and/or earth grounds.
- O. Operator's Terminal: Provide an operator's terminal, which allows the following minimum functions. In addition, the operator's terminal shall support any other functions required for system control and/or operation:
1. Acknowledge (ACK/STEP) Switch
 2. Signal Silence Switch
 3. System Reset Switch
 4. System Test Switch
 5. Lamp Test Switch
- P. Power Supply: The FACP power supply(ies) shall operate on 120 VAC, 60 Hz and shall have a continuous rating adequate to power all equipment and functions in full alarm continuously. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line-to-ground, without damage.
1. The power supply shall provide a battery charger for 60 hours of standby using dual-rate-charging techniques for fast battery recharge. Power supply shall be capable of a minimum of 60 hours of standby power with an additional 15 minutes for powering signal devices.
- Q. Batteries: Shall be completely maintenance free and shall not require liquids, fluid level checks, refilling, and shall not be capable of producing spills and/or leaks, sealed gel-cell type with expected life of 10 years Battery voltage shall be as required by the FACP and related equipment. Battery shall have sufficient capacity to power the fire alarm system for not less than sixty (60) hours plus 15 minutes of alarm upon a normal AC power failure. Battery cabinet shall be twice the size of the batteries it will contain.
- R. Enclosures: The FACP shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable). Where multiple enclosures are required in the same area the cabinets shall all be the same size and color. Cabinet doors must be electrically bonded to enclosure it serves.
- S. Provide framed operating instructions under glass at the FACP location.
- ### 2.2 ALARM APPLIANCES
- A. Programmable Electronic Sounders shall be located as shown on the Drawings; sounders located outdoors shall be listed for use in wet locations. Electric sounders shall have the following specifications:

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1. Voltage: Programmable electronic sounders shall operate on 24 VDC nominal.
 2. Programming: All signal appliances, shall be field selectable ANSI S3.41, three-pulse temporal pattern. Audible signal level shall be field adjustable, with 101 dbA high level and 96 dbA low level. Sound level based upon anechoic dBA at 10 feet.
 3. Mounting: Provide surface mounting devices suitable for mounting in a standard device box unless otherwise indicated on the Drawings.
- B. Strobe Lights shall be located as shown on the Drawings. Strobe lights indicated for use exterior to the building shall be mounted at the indicated elevation and listed for use in wet locations. Strobe lights flash in synchronization and shall have the following specifications:
1. Voltage: Strobe lights shall operate on 24 VDC nominal.
 2. Maximum pulse duration: 2/10ths of one second.
 3. Mounting: Provide surface mounting devices suitable for mounting in a standard single gang device box unless otherwise indicated on the Drawings. Unless otherwise indicated on the Drawings, strobe lights shall be mounted at 96" Above Finished Floor (AFF) to the top of the device.
 4. Strobe intensity and flash rate: Must meet minimum requirements of UL 1971. Provide synchronous strobe lights with specific intensity Candela (Cd) rating of 15/75 Cd in all locations unless indicated otherwise on the drawings.
- C. Audible/Visual Combination Devices shall be located as shown on the Drawings and shall comply with all applicable requirements for both Programmable Electronic Sounders and Strobe Lights. Unless otherwise indicated on the Drawings, combination A/V devices shall be mounted at shall be mounted at 96" Above Finished Floor (AFF) to the top of the device.

2.3 INITIATING DEVICES

- A. Addressable Devices - General: Unless otherwise indicated on the Drawings all initiating devices shall be individually addressable. All detectors shall be the plug in type with a separate base to facilitate testing and maintenance. Provide locking tabs for all models located within 12' of floor. All devices shall be provided with terminal strips for circuit connections, "Pigtails" are not acceptable. Provide skirts for bases to create a finished appearance.
1. Address Setting: Addressable devices shall provide an address setting means that use rotary decimal switches configured to provide decade (numbered 1 to 10) type addresses. Devices, which use a binary address setting method, such as a dipswitch, are not acceptable. Devices, which are addressed by the FACP, are acceptable.
 2. Connections: Addressable devices shall be connected to a Signaling Line Circuit (SLC). Signaling Line Circuits shall originate as indicated on the Riser Diagram shown in the Drawings.
 3. Intelligent Initiation Devices: All smoke detectors shall be the "intelligent" in that smoke detector sensitivity shall be set through the FACP and shall be adjustable in the field through the field programming of the system. Sensitivity shall be capable of being automatically adjusted by the FACP on a time-of-day basis. Using software in the FACP, detectors shall be capable of automatically compensating for dust accumulation and other slow environmental changes that may affect performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
 4. Devices shall be capable of reporting obscuration level to the panel for reporting purposes.

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5. Device Mounting Base: Unless otherwise specified all existing detectors are ceiling-mount and replacement shall be ceiling mounted and shall include a separate twist-lock base with tamper proof feature.
6. Test Means: The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel when in the "test" condition.
7. Device Identification: Detectors shall store an internal identifying type code that the control panel shall use to identify the type of device. Device identifications shall be either ION, PHOTO, or THERMAL.

B. Addressable Pull Stations - General: Addressable pull stations shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

1. All pull stations shall have a positive, visual indication of operation and utilize a key type reset. Allen key type locks are unacceptable. Two (2) keys for each pull station shall be supplied to NC State.
2. Construction: Pull stations shall be constructed of Lexan or other material suitable to the installation environment with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger. Stations shall be suitable for surface mounting or semi flush mounting as shown on the plans. Unless otherwise indicated on the Drawings pull stations shall be mounted at 48" Above Finished Floor.

C. Photoelectric Smoke Detectors: Photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. Unless otherwise indicated on the Drawings all smoke detectors shall be photoelectric type.

D. Thermal Detectors: Thermal Detectors shall be intelligent addressable devices rated at 135°F. (58° C.) and unless otherwise indicated on the Drawings shall have a rate-of-rise element rated at 15° F. (9.4° C.) per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Addressable thermal detectors must not be used in spaces in which the temperature rating of the electronics is exceeded. In such cases, use conventional thermal detectors with an addressable module. Mount module in nearest conditioned space and indicate its address on the outside of the enclosure by means of a label. Up to 99 intelligent heat detectors may connect to one SLC loop.

2.4 MISCELLANEOUS SYSTEM ITEMS

A. Addressable Dry Contact Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone (either Style D or Style B) of conventional Alarm Initiating Devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.

1. Indication of Operation: Unless otherwise indicated on the Drawings an LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
2. Mounting Requirements: Monitor Modules shall be mounted in a standard 4-inch square, 2-1/8" deep electrical box at the same height as Audio Visual devices in a clearly visible location.

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- B. Two Wire Detector Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone, either Class A or B (Style D or Style B operation) of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.
1. Indication of Operation: Unless otherwise indicated on the Drawings an LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
 2. Mounting Requirements: Monitor Modules shall mount in a standard 4-inch square, 2-1/8" deep electrical box, and shall only be installed in conditioned spaces.
- C. Addressable Control Module: Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual (A/V) Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. The control module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel. Control modules shall be rated for the load they control. (Inductive Loads require inductive rated modules.)
1. Mounting Requirements: Control Modules shall mount in a standard 4-inch square, 2-1/8" deep electrical box, and shall only be installed in conditioned spaces.
 2. Configuration: The control module NAC circuit may be wired for Style Y Class B with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
 3. Power Source: Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply. A/V power sources and connections are not shown on the Drawings
 4. Test Switch: A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.
- D. Isolator Module: Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop.
1. Operation: Isolator Modules shall operate such that if a wire-to-wire short occurs, the Isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section. The Isolator Module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
 2. Mounting: The Isolator Module shall mount in standard 4-inch square, 2-1/8" deep electrical boxes at the same height as A/V devices in a clearly viewable area in corridors. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

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3. Locations: Provide isolator modules at FACP for both ends of each SLC loop. Provide a minimum of one (1) module in the field at the mid-point of the device loop. Provide additional modules necessary to limit the number of devices between isolators to 20.
- E. Annunciators: The Fire Alarm Panel should be placed as shown on the Documents.
- F. Serially Connected LED Annunciator: Annunciator shall communicate with the fire alarm control panel *via* an EIA-485 communications loop (four-wire) and shall individually annunciate all zones in the system. System zones shall be as indicated on the Drawings. Up to 10 annunciators may be connected to the EIA-485 communications loop.
1. Annunciator Indicators: The annunciator shall provide a red Alarm LED per zone, yellow Trouble LED, and Supervisory Trouble LED per zone. The annunciator shall also have an "ON-LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels. Annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset. All annunciator switches and indicators shall be software programmable.
- G. Remote Annunciator Indicator Lights (RAIL): Remote annunciator indicator lights shall be provided in locations where indicated on the Drawings. RAILs shall be provided with a key type switch for testing of the annunciated device. In addition, RAILs shall have the following features:
1. Voltage: RAILs shall operate on 24 VDC nominal.
 2. Mounting: Provide flush mounting devices suitable for mounting in a standard single gang device box unless otherwise indicated on the Drawings. They shall be mounted in the wall at the same height as A/V devices, in a public space or corridor and identified with an engraved label.
- H. Remote Power Supplies: Where remote power supplies are required, they shall meet the same requirements as those for the main fire alarm control panel, including the requirements for batteries.
- I. Keys and Locks: All panels, terminal cabinets, and pull stations shall be keyed alike. Coordinate key/lock with the Owner's requirements.

2.5 SYSTEM REQUIREMENTS

- A. Fire and smoke detection and alarm systems shall comply with the following system requirements with regard to operation and installation.
1. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all specific system installation/termination/wiring data.
 2. All system components shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Adhesives are not permitted to mount fire alarm system components to building surfaces or structure.
- B. The system shall be new and furnished with a warranty (parts & labor) of a minimum of one year from the date of final acceptance by the Owner. Should the manufacturer provide a

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standard warranty of greater than one (1) year, that time period shall be the minimum warranty period. Equipment, initiating devices, and alarm appliances shall be arranged as described in the Drawings; annunciator zones shall be configured as described in the Drawings.

- C. The system shall be equipped with the following protective devices to prevent damage or nuisance alarms by nearby lightning strikes, stray currents, or voltage transients. The devices are to be provided by the fire alarm equipment supplier:
1. On AC Input: A feed-through (not shunt-type) branch circuit transient suppressor such as Leviton 51020-WM-DN, or Di-Tech DTK-120S20A, or equivalent UL 1449 – 4th Edition Listed device. Install suppressor in a listed enclosure near the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil to be 5 to 10 turns, about 1" diameter, and securely tie-wrapped. This series impedance will improve the effectiveness of the suppressor in clipping fast rise time voltage transients.
 2. On DC Circuits Extending Outside Building: Adjacent to the FACP, and also near point of entry to outlying building, provide "pi"-type filter on each leg, consisting of a primary arrester, series impedance, and a fast acting secondary arrester that clamps at 30v-40v. Some acceptable models: Simplex 2081-9027, Simplex 2081-9028, Transtector TSP8601, Ditek DTK 2MHLP24B series, Citel America B280-24V, and Northern Technologies DLP-42. Submit data on others to the engineer for approval. UL 497B listing is normally a prerequisite for their consideration. Devices using only MOV active elements are not acceptable.
- D. Both audible and visible alarm signals shall be provided. Visible signals must be the strobe (flash discharge) type, with white or clear lens, and shall comply with current ADA requirements for intensity and placement.
- E. The FACP must have an Alarm Silence switch, and be equipped with the Subsequent Alarm (alarm resound) feature. Any remote annunciators or graphic displays located away from the alarm area must also include an audible signal with alarm resound feature and must be silence-able from the main panel.
- F. A supervised "AHU Shutdown Defeat" switch must be provided in the FACP. The switch must be labeled and its "Normal" position indicated.
- G. The coverage of each fire alarm zone as described in the Drawings shall be indicated on the FACP and any remote annunciator. This may be accomplished by engraved labels, framed directories, and/or graphic displays. Label tape or handwritten labels are not acceptable.
- H. Systems are to be provided with a separate and independent source of emergency power. Switching to emergency power during alarm shall not cause signal drop-out. Batteries must meet the appropriate NFPA capacity requirements, with a 25% safety factor.
- I. All wiring shall be color coded in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:

<u>Addressable Devices</u>	<u>Approved Manufacture Data Cable</u>
Initiating Circuits, General*	Red (+)/White (-)
Signal Line Circuit Cable	Red jacket with Red(+)/Black(-)
Alarm Indicating Appliance Circuits	Blue (+)/Black (-)

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AHU Shutdown Circuits	Yellow (+)/Brown (-)
Door Control Circuits	Orange

- J. There shall be NO splices in the system other than at terminal blocks. "Wire nuts," crimp splices, or insulation piercing type connectors are not acceptable. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
- K. Permanent wire markers shall be used to identify all splices and terminations for each circuit. For splices, use markers or other means to indicate which conductors leads to the FACP. All junction boxes and covers shall be painted red, unless in finished areas.
- L. Device Numbering: Device number shall correspond to the way cable is installed (sequentially).
- M. All wiring and cable must be in EMT, 3/4" minimum diameter, unless indicated otherwise on the Drawings or elsewhere in the Specifications.
1. The exterior of all junction boxes containing fire alarm conductors shall be painted red; box interiors shall not be painted. Box covers for junction boxes containing fire alarm conductors shall be painted red on both sides. All painting of junction boxes and junction box covers shall be accomplished prior to installation of the boxes to avoid possible problems with overspray.
 2. Box covers shall be labeled to indicate the circuit(s) or function of the conductors contained therein. Labels shall be neatly applied black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.
- N. Wire shall be new AWG #14 minimum stranded copper, type THHN/THWN for notification appliance circuits. Addressable loop (signaling line) circuits shall be wired with type FPL/FPLR/FPLP fire alarm cable, AWG 18 minimum, low capacitance, twisted shielded copper pair. Cable shield drain wires are to be connected at each device on the loop to maintain continuity, taped to insulate from ground, and terminated at the FACU. Acceptable cables include Atlas 228-18-1-1STP, BSCC S1802s19 (same as EEC 7806LC), West Penn D975, D991 (AWG 16), D995 (AWG 14), or equal wire having capacitance of 30pf/ft. maximum between conductors. Belden 5320FJ acceptable if only FPL rating needed. The cable jacket color shall be red, with red (+) and black (-) conductor insulation.
1. EXCEPTION #1: Unshielded cable, otherwise equal to the above, is permitted to be used where the manufacturer's installation instructions unequivocally require, or state a preference for, the use of unshielded cable of all systems, AWG #16 minimum.
 2. EXCEPTION #2: In underground conduit, use Type TC or PLTC cable (PE insulated) to avoid problems from moisture.
- O. Detection or alarm circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP, any 120 VAC control wiring or other circuits with an externally supplied AC/DC voltage above the nominal 24 VDC system power must be properly separated from other circuits and the enclosure must have an appropriate warning label to alert service personnel to the potential hazard.
- P. Provide an engraved label in FACP identifying its 120 VAC power source. This label shall include panel board location, identification, and circuit number. Any circuit breaker supplying 120v to any Fire Alarm equipment must have a locking tab installed at the breaker.

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- Q. All wiring shall be checked for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be ten megohms (10 MW), as verified with a megger. Provide advance notice to the A/E of these tests.
- R. All connections at the FACP must be made by the Manufacturer's authorized, factory trained representative (rather than by the electrical contractor).
- S. The system shall be electrically supervised for open or (+/-) ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug-in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.
- T. All addressable devices shall be installed in "conditioned" spaces.
- U. Spare Parts: Provide the following spare parts with the system, each individually packaged and labeled. For multi-building projects, calculate separately for each building:

Fuses- two (2) of each size used in the installed system..

MPS- w/ monitor modules – Minimum one (1) or 2% of total installation.

Audio-visual devices – Minimum one (1) or 4% of total installation.

Indoor strobe only devices – Minimum one (1) or 4 % of total installation.

Exterior indicating devices – Minimum one (1) or 2% of total installation.

Spot Smoke Detectors – Minimum one (1) or 6% of total installation.

Spot heat/thermal detectors – Minimum one (1) or 6% of total installation.

Spot detector bases – Minimum one (1) or 2% of total installation.

Spot detector sounder bases – Minimum one (1) or 6% of total installation.

Relay modules – Minimum one (1) or 4% of each total installation.

Monitor modules – Minimum one (1) or 4% of total installation.

Isolation modules – Minimum one (1) or 4% of total installation.

- 1. Increase decimal quantities of spare parts to the next higher whole number. For example if a system has 20 spot-type smoke detectors provide 2 spare detectors with bases.

2.6 ALARM VERIFICATION FOR SMOKE DETECTORS

- A. The fire alarm system shall be equipped with logic method of verifying the presence of smoke.
 - 1. Alarms from other than spot type smoke detectors must not be delayed by Alarm Verification. Alarm Verification is NOT to be applied to linear beam or duct smoke detectors, nor to any software configured "cross-zoned" detection devices. When programming the system, activate the automatic drift compensation feature for all spot-type smoke detectors. Whether or not to activate the alarm verification feature for such detectors is to be determined by the design engineer/ owner's representative.
- B. Systems with Alarm Verification must be permanently labeled to indicate that fact.

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- C. While a verification cycle is in progress, an alarm, which occurs on another zone, must not cause the verification cycle under way to be restarted or extended. It may have the same effect on the system as a verified alarm.
- D. The equipment must be Listed for Alarm Verification purposes. It must either be installed at the factory, or field wired and tested by the Manufacturer's authorized representative.

2.7 REMOTE ALARM TRANSMISSION REQUIREMENTS

- A. The fire alarm system (DACT) shall communicate separate signals for Fire Alarm (zone 3), Fire Alarm Trouble (zone 4), Sprinkler Alarm and Sprinkler water flow alarm (zone 5), and Sprinkler Supervisory Trouble (zone 6). All other zones/signals required for specific installations shall be coordinated and approved by the NCSU before installation and programming.
- B. Digital communications shall be via 10 channel dialer complete with battery back-up. Approved dialer is a Fire-Lite MS-10UD.
- C. The DACT shall be mounted in an adjacent or nearest mechanical or electrical room to the FACP unless approved by the owner for installation adjacent to the FACP. Installation in a telecommunications equipment room is prohibited.
- D. The Contractor shall install conduit from a location next to the DACT for connection of the dialer to the main telecommunications room. A minimum 4x4x2.5 inch deep hinged enclosure shall be installed within one (1) foot of the DACT and connected by a one (1) inch conduit. Cable termination will be performed by NC State.
- E. The precedence of alarm system transmission shall be as follows:
 - 1. Fire
 - 2. Alarm
 - 3. Supervisory
 - 4. Trouble
 - a. The "trouble" signal for AC power loss must not be sent unless maintained for 6 hours or more to avoid nuisance transmissions due to momentary 120 VAC power outages or alarm verification cycles.

2.8 SMOKE DETECTORS

- A. Detectors: Must be the plug-in type, each having a separate base, to facilitate replacement and maintenance. When installed in a room, detectors shall be oriented so their alarm light is visible from the nearest door to the corridor, unless Remote Alarm Indicator Light (RAIL) equipped.
- B. Spot type smoke detectors mounted within 12 feet of a walking surface shall have their built-in locking device activated.
- C. Unless suitably protected against dust, paint, etc., detectors shall not be installed until the final construction clean-up has been completed. Contaminated detectors must be REPLACED by the Contractor at no additional cost to the Owner.

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- D. Identification of individual detectors is required. These device numbers, which must also be shown on the shop drawings, shall be permanently affixed to the detector base. Device labels may not be affixed to the device. Identification labels must be printed labels with black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Designer shall conduct a mandatory “pre-construction meeting” with the electrical contractor, the fire alarm contractor and the NCSU construction management team . The purpose of this meeting is to insure NCSU understands the contractor’s installation plan and the contractor understands NCSU’s site specific requirements. No work may begin until this meeting occurs.
- B. In addition to other requirements of these Specifications the fire alarm system must comply with the following:
 1. The addressable fire alarm system shall be connected, programmed, and tested only by the Manufacturer or by an authorized distributor who stocks a full compliment of spare parts for the system. Technicians performing this service shall be trained and individually certified by the Manufacturer for the model of system being installed. Copies of installer certification must be included with the Contractor's submittal.
 2. The complete configuration data (site-specific programming) for the system must be permanently stored on a computer disk or diskette and archived by the manufacturer or authorized distributor. A diskette copy of this data must be submitted to the A/E for transmission to the Owner when the system is commissioned.
 3. The Manufacturer or authorized distributor must maintain software version (VER) records on the system installed. The system software shall be upgraded free of charge if a new VER is released for any reason during the warranty period. For any new VER to correct problems, free upgrade shall apply during the entire life of the system.
 4. All addressable loop controller circuits must be "Class A", with no “T” taps and shall have a minimum of 20% spare addresses for future use **UNLESS OTHERWISE NOTED ON THE DRAWINGS**. To minimize the impact of a wiring fault on the system, isolation modules must be provided as follows:
 - a. After each 20 devices/control points on any addressable circuit.
 - b. For each circuit extending outside the building.
 - c. In the FACP, at each end of the loop.
 - d. On loops containing less than the 20 devices place an isolator at each end of the loop and one in the electrical center of the loop.
 5. Supervision required: The connection between individual addressable modules and their contact type initiating device(s) must be supervised.
 6. The Fire Alarm System shall have multiple access levels, which permit the Owner's authorized personnel to make temporary changes in the system alarm response matrix without actually changing the system programming. This must include the ability to override selected alarm inputs or system responses to alarms without affecting the remaining portions of the system.

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- C. Floor Plans with Device Numbers: A copy of the floor plans shall be provided in the control panel. A separate sheet shall be provided for each floor. All device addresses shall be clearly labeled on plans. Indicate locations of all cabinets, modules and end of line resistors. Plans shall be bound and installed in a “tube” adjacent to the FACP. Provide legend for symbols.

3.2 SYSTEM TESTING & CERTIFICATION

- A. All connections to the FACP and the system's programming shall be done only by the manufacturer, or by an authorized distributor that stocks a full compliment of spare parts for the system. The technicians who do this are required to be trained and individually certified by the manufacturer, for the FACP model/series being installed. This training and certification must have occurred within the most recent 24 months, except that a NICET Level III certification will extend this to 36 months. Copies of the certifications must be part of the Shop Drawing submittal to the engineer, prior to installation. The submittal cannot be approved without this info.

The technician who makes final connections and programs the FACP is legally the "installer" even though most field connections to system devices and appliances are normally made by electrical contractor personnel. The responsibility for assuring a proper installation overall rests with this individual. In addition to doing the final hookups and activating the system, this individual is expected to check enough field connections to assure a proper job was done there. The absence of system "trouble" signals is not a sufficient measure of the field wiring, which could have "T" taps, the wrong type of wire, improper terminations, ground (drain wire) issues, etc.

- B. When programming the system, activate the automatic drift compensation feature for all spot-type smoke detectors. Systems with alarm verification are not to have this feature activated without written direction from the owner's representative or the AHJ. Alarm verification must not be used with multi-sensor/multi-criteria detectors under any circumstances, as inadequate system response may result.
- C. Set spot-type smoke detector sensitivities to normal/medium, unless directed otherwise by the design engineer/owner's rep.
- D. Print a complete System Status and Programming Report, after the above steps have been done. This must include the program settings for each alarm initiating device and the current sensitivity of each analog addressable smoke detector.
- E. The manufacturer or authorized distributor (by definition, "installer") must 100% test all site-specific software functions for the system and then provide a detailed report or check list showing the system's operational matrix. This documentation must be part of the "System Status and Programming Report".
- F. Upon completion of the installation and its programming, the installer's technician shall test every alarm initiating device for proper response and indication, and all alarm notification appliances for effectiveness. Also, in coordination with the other building system contractors, all other system functions shall be verified, including (where applicable) elevator capture and the control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, etc.
- G. The installer must fill out and submit the following documentation to the owner, through the engineer, prior to the system acceptance inspection:

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1. The NFPA 72-2013, Figure 1-6.2.1, "Record of Completion" Form. Use this form (no substitutes) to detail the system installation and also to certify that: (a.) It was done per Code, and (b.) The Code-required 100% test was performed. The fire alarm installer (manufacturer or authorized distributor's technician) must sign this form.
2. The System Status and Programming Report. This must be generated on the day of the system acceptance inspection.

- H. After completion of the 100% system test and submission of documentation, the installer is to request the engineer to set up an inspection. The system must operate for at least two days prior to this inspection. This will normally include the use of appropriate means to simulate smoke for testing detectors, as well as functionally testing the system interface with building controls, fire extinguishing systems and any off-premises supervising station. This inspection is intended to assure that the contractor has properly installed the system and performed the 100% operational test as required by NFPA 72. This will be a 100% test. The electrical contractor shall provide two-way radios, ladders, and any other materials needed for testing the system, including a suitable smoke source. The engineer must witness a "clean" 100% test before the system is accepted.
- I. A full copy of all final shop drawings, battery calculations, etc. shall be provided at the FINAL inspection for review by Designer, Owner and NCSCO.

3.3 LABELLING

- A. When field addressable modules are located in junction boxes, the junction box covers must be labeled as to their contents (e.g. 3-24 Sprinkler Monitor).
- B. Contractor shall label all wires terminating in junction boxes and riser boxes. These labels shall be self-sticking wire numbers or similar type. Write-on labels are prohibited. Contractor shall provide a typed legend for all junction boxes and riser boxes corresponding to these labels. Legend shall be mounted in riser boxes (if applicable). If system does not have riser boxes, contractor shall provide legend to NCSU Electronic Systems at time of University acceptance of system installation.
- C. All initiating devices and modules shall be labeled with their respective addresses; including loop and point number.
- D. All device labels shall be made using an electronic labeling system with black letters on white background. Write-on labels are prohibited.

3.4 SYSTEM DOCUMENTATION, TRAINING, AND MAINTENANCE

- A. In addition to the Shop Drawing submittal, the fire alarm system contractor shall provide the engineer copies of the following technical information, for transmittal to the owner
1. Three (3) copies of maintenance, repair manuals and two (2) copies of software manuals required in operation, maintenance, repair, and modification (for system additions or deletions) of fire alarm system.
 2. Documentation provided shall be complete and include all necessary information to support the above stated functions. Manuals shall be bound, and published, consisting of the following:
 - a. Installation Manual
 - b. Operator/Users Manual

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- c. Technical Manual
 - d. Programming Manual
3. Documentation must be provided to the University at the time of acceptance.

B. Warranty and Preventive Maintenance Requirements

1. System shall have a 12 month warranty period for all installed or delivered hardware and software. During the 12 month warranty period, one annual preventive maintenance (PM) inspection/test shall be performed on the entire fire alarm system by the contractor. This PM is to be performed 6 months or more after University acceptance of system. The system acceptance test, punch list items, and other acceptance issues do not meet the PM inspection/test requirement. All system deficiencies found shall be documented and corrected during this PM. All parts and repairs shall be covered under the system warranty. This PM shall include all items to be annually tested as defined by tables 7-2.2 and 7-3.2 in NFPA 72, latest edition, in addition to the following:
 - a. Complete software backup (where applicable).
 - b. Performance test of battery backup.
2. All tests shall be scheduled by the Contractor through Facilities Operations Electronic Systems and will required fifteen (15) days notice. The test shall be witnessed by a representative designated by NCSU Facilities Operations Electronic Systems.
3. A report consisting of the NFPA Inspection and Testing Form shall be furnished by the contractor, to the Engineer of Record and NCSU Construction Management within 2 days after completion of this test. The NFPA Inspection and Testing Form can be found on page 72-111, of NFPA 72, latest edition.

C. Training Requirements

1. The Contractor shall provide to the University sixteen (16) hours of on site owners training. Training to include hardware repair and maintenance by University personnel of all building panels, devices, including but not limited to diagnostic procedures, system expansion and maintenance techniques.

Contractor shall also provide to the University factory sponsored certified technical training for system installed. This training shall certify two (2) technicians to maintain, service, and program installed system and receive direct manufacturer's technical support for these systems, to include software updates if applicable. All expenses, to include tuition, transportation by University approved vendor and lodging for this training, shall be the responsibility of the contractor.

D. Programming and Software Requirements

1. Contractor shall also include all software, hardware, interfaces, adapters, and cables, etc. required for all programming, and maintenance functions.
2. If the contractor would normally use a laptop to program the system, a similar computer shall be supplied even if programming from the FACP keypad is available.
3. Contractor shall provide to the University, all software required for full system maintenance and upgrades to fire alarm system including any device changes, additions, or deletions.
4. Contractor shall provide to the University, without cost, all software updates during the warranty period and free upgrades to software following the warranty period that address system operating failures or known defects during the life of the system.

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5. Contractor shall provide to the University all levels of password access, and documentation to support the use of the above mentioned.
 - E. Basic operating instructions shall be framed and permanently mounted at the FACP. (If the owner concurs, they may instead be affixed to the inside of the FACP's door.) In addition, the NFPA 72 "Record of Completion" (see 7.7) must either be kept at/in the FACP, or its location shall be permanently indicated there by engraved label.
 - F. Provide an engraved label inside the FACP and any NAC panels identifying its 120vac power source, as follows: Panelboard location, panelboard identification, and branch circuit number.

END OF SECTION 283111

7. Confirm the system batteries are date labeled.
8. Confirm operational instructions are framed and mounted at the FACP and the annunciator panel.
9. Confirm zone map is legible, framed, and mounted at the FACP and the annunciator panel. Minimum font size of 6 point in bold.
10. Verify smoke detector and SNAC panel are located within 15' of the FACP and in the same room.
11. Building with 100 or more addressable devices or more than 3 or more occupies floors shall have a printer installed in an approved location and on an approved shelf or table. The printer must also be served by an electrical circuit.
12. Confirm location of LED annunciator as acceptable.
13. On new and existing projects: AHU confirm defeat switch must be installed at the FACP. An abnormal position of the switch must cause a trouble in the FACP.

Fire Alarm testing and operation:

1. The fire alarm panel must be clear of troubles and in a 'green' condition before beginning testing.
2. Perform an LED lamp test of the panel. Do all the lights work?
3. Disconnect each phone line 1 at a time to verify line failure is transmitted to the monitoring station within a 1 minute time period. Reconnect each line to verify the trouble clears.
4. Have contractor unscrew each end of line device from the wall and in each NAC circuit for verifying battery voltage during testing, per procedures listed below.
5. Disconnect the batteries to the FACP, verify a trouble is indicated in the panel within 1 minute. Reconnect the batteries to verify the trouble clears.
6. Perform a battery/current test. This requires 2 digital meters to test current and voltage.
7. All troubles should activate the DAC within 1 minute.

NAC test procedure for A/V devices:

Turn off A/C power & while on battery power initiate an alarm condition, test battery voltages at FACP to confirm there is @ 13 volts with no more than a 0.4 volt difference between batteries.
Install 1 digital meter to read inline current and 1 digital meter to read voltage.

Starting Voltage and Current Test:

FACP

Battery 1 ___ VDC
 Battery 2 ___ VDC
 Batteries 1&2 Series ___ VDC
 Card output NAC 1 ___ VDC ___ Amps
 Card output NAC 2 ___ VDC ___ Amps
 Card output NAC 3 ___ VDC ___ Amps

End of Line Device

___ VDC
 ___ VDC
 ___ VDC

SNAC# _____

Battery 1	_____	VDC		
Battery 2	_____	VDC		
Batteries 1&2 Series	_____	VDC		
Card output NAC 1	_____	VDC	_____	Amps
Card output NAC 2	_____	VDC	_____	Amps
Card output NAC 3	_____	VDC	_____	Amps
Card output NAC 4	_____	VDC	_____	Amps

SNAC# _____

Battery 1	_____	VDC		
Battery 2	_____	VDC		
Batteries 1&2 Series	_____	VDC		
Card output NAC 1	_____	VDC	_____	Amps
Card output NAC 2	_____	VDC	_____	Amps
Card output NAC 3	_____	VDC	_____	Amps
Card output NAC 4	_____	VDC	_____	Amps

SNAC# _____

Battery 1	_____	VDC		
Battery 2	_____	VDC		
Batteries 1&2 Series	_____	VDC		
Card output NAC 1	_____	VDC	_____	Amps
Card output NAC 2	_____	VDC	_____	Amps
Card output NAC 3	_____	VDC	_____	Amps
Card output NAC 4	_____	VDC	_____	Amps

SNAC# _____

Battery 1	_____	VDC		
Battery 2	_____	VDC		
Batteries 1&2 Series	_____	VDC		
Card output NAC 1	_____	VDC	_____	Amps
Card output NAC 2	_____	VDC	_____	Amps
Card output NAC 3	_____	VDC	_____	Amps
Card output NAC 4	_____	VDC	_____	Amps

Batteries shall not exceed a voltage drop of three (3) volts from the NAC card output terminal to the End of Line device for each loop. If the voltage drop is more than 3 volts the test must stop and the system fails inspection until the error can be corrected.

Post Voltage Test Continuation

1. Request a mapping chart layout to test isolation modules. Modules shall be installed after a max. of 25 devices in each addressable loop.
2. Confirm addressable loop controller circuits are Class 'A' with the contractor.
3. Confirm isolation modules are installed at the FACP on both the outgoing and returning conductors for each loop (minimum of 3 per loop).
4. Confirm each ISO module is labeled as 'Isolation Module' with the Loop #.
5. If speakers are installed, all must be shielded and tested free of grounds with

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SECTION 31 10 00 - SITE CLEARING

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. Standards set forth by the North Carolina Department of Environmental Quality (NCDEQ) Division of Energy, Mineral and Land Resources.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Removal of trees and other vegetation.
 - 2. Clearing and grubbing.
 - 3. Removing above-grade improvements.
 - 4. Removing below-grade improvements.
- B. Related Sections:
 - 1. Division 31 Section "Earth Moving".
 - 2. Division 31 Section "Erosion Controls".

1.3 PROJECT CONDITIONS

- A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
 - 3. All erosion control measures shall be in place prior to commencement of clearing operations.
- C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation indicated to remain in place against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
 - 1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
 - 2. Provide protection for roots over 1-1/2 inch (38 mm) in diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt or other acceptable coating formulated to

use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

3. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations in a manner acceptable to Engineer. Employ a licensed arborist to repair damage to trees and shrubs.
4. Replace trees that cannot be repaired and restored to full-growth status, as determined by arborist.

- D. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.

1.4 EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.
- C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

1.5 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 2 – PRODUCTS

None Used.

PART 3 – EXECUTION

3.1 SITE CLEARING

- A. General: Remove trees, shrubs, grass, and other vegetation, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site removal of stumps and roots.
 1. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 2. Existing trees within clearing limits may be chipped and stockpiled on-site but shall NOT be used as landscaping mulch or fill.
- B. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
 1. Completely remove stumps, roots, and other debris protruding through ground surface.
 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.

3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 6 inches (150 mm) loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.
- C. Topsoil Stripping: Strip and stockpile existing topsoil within construction limits for re-spreading. Should the Contractor elect to remove topsoil from the site, suitable topsoil from off-site sources shall be provided for re-spreading at no cost to the Owner.
 1. Remove sod and grass before stripping topsoil.
 2. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. All surface topsoil, regardless of thickness encountered, shall not be considered Unsuitable Soil.
 3. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.
 4. Stockpile topsoil materials within construction limits and away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 5. Do not stockpile topsoil within tree protection zones.
 6. Dispose of excess topsoil off-site.
- D. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
 1. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings and is included under work of related Division 22 Sections. Removing abandoned underground piping or conduits interfering with construction is included under this section.

3.2 DEMOLITION PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations or as shown on the drawings.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective site demolition area.
 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction or as shown on the plans.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

- C. Provide and maintain exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.
- D. Protect trees, fences, poles, mailboxes, and all other property unless their removal is authorized. Any property damaged, that is not authorized for removal, shall be restored or replaced to the Owner's satisfaction.

3.3 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective site demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the building before proceeding with selective demolition.
- C. Utility Requirements: Refer also to Division 15 and 16 Sections for additional requirements for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective site demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Utility Adjustments and Relocations: Adjust locations, elevations and routes of existing utility lines, poles, guys, vaults, handholes, boxes, and other related appurtenances as required to facilitate new construction. Coordinate adjustments and relocations with utility companies.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective site demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE SITE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the drawings. Use methods required to complete Work within limitations of governing regulations.
 - 1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 - 2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
 - 3. Comply with all applicable regulations during demolition, handling and disposal of all items indicated to be removed or necessary to be removed to allow construction of new work.
- B. Demolish asphalt, concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools.
- C. Remove sawcut concrete and asphalt, including aggregate base, to a depth of 12-inches below existing, adjacent grade, or as indicated. Provide neat sawcut at limits of pavement removal as indicated.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective site demolition operations.
- B. Where repairs to existing surfaces are required, match previous work as closely as possible.
 - 1. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.7 CLEANING

- A. Keep the site free from debris and hazards and inspect the site at the end of each day for trash. All adjacent roads and drives outside of the construction fencing shall remain in operation during construction and shall remain free of all construction materials and debris.

3.8 DISPOSAL OF WASTE MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning on Owner's Property: Burning is not permitted on Owner's property.
- C. Removal from Owner's Property: Remove waste materials and unsuitable or excess soils and mulch from Owner's property. Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 31 20 00 – EARTH MOVING

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. This Section includes the following:
 - 1. Preparing and grading subgrades for walks, lawn areas, and landscaping.
 - 2. Base course for walks and pavements.
 - 3. Subsurface drainage backfill for trenches.
 - 4. Excavating and backfilling trenches.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 01 Sections for allowances, definitions and procedures.
 - 2. Division 31 Section "Site Clearing" for site stripping, grubbing, topsoil removal, and tree protection.

1.3 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
 - 1. 24 inches outside of concrete forms other than at footings.
 - 2. 12 inches outside of concrete forms at footings.
 - 3. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - 4. 6 inches beneath bottom of concrete slabs on grade.
 - 5. 6 inches beneath invert elevation of pipe in trenches and 12 inches wider than pipe outside diameter.
 - 6. Additional rock removed beyond the limits outlined above to accommodate trench boxes, other removal methods, compaction equipment or other reasons shall not be included in the payment volume.
 - 7. Any materials paid by Unit Prices to replace excavated rock shall utilize these same measurement limits.
- B. Unsuitable Soil Measurement: Volume of soil actually removed, measured in original position, but not to exceed the limits directed by the Owner's Independent Testing Agency.
 - 1. Additional soil excavated beyond the limits directed by the Owner's Independent Testing Agency; including lay-back of excavation walls, excavation to accommodate trench boxes or other shoring, etc.; shall not be considered Unsuitable Soil.
- C. Replacement Material Measurement: Volume exactly equal to that of the unsuitable soil or rock that was removed, measured in original position.

- D. Unit prices for unsuitable soil and rock removal shall include all work and materials as defined in Division 01 sections.

1.4 DEFINITIONS

- A. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed. Refer to the following section for additional definitions of classified excavations.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base course, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Surface Course: The top layer of the pavement structure placed on base course or subgrade.
- E. Base Course: Layer placed between the subgrade elevation and asphalt paving courses.
- F. Bedding Course: Layer placed over excavated subgrade in a trench before laying pipe.
- G. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.5 EXCAVATION CLASSIFICATIONS

- A. Excavation Classifications: All excavation is classified as General Excavation except for Mass Rock, Trench Rock and Unsuitable Soil Materials as defined in this section.
 - 1. General Excavation: Excavation, removal and/or disposal of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and/or removed; together with soil, boulders, and other materials encountered that are not classified as rock, unsuitable soil, or unauthorized excavation.
 - a. Intermittent drilling, blasting, or ripping to increase production and not necessary to permit excavation of material encountered will be considered general excavation.
 - b. Soil (regardless of nature) or other debris encountered above proposed subgrade elevations shall be considered general excavation unless determined by the Architect to meet the definition of rock.
 - 2. Unsuitable Soil Excavation: Removal and disposal of soil materials or other debris encountered below proposed subgrade elevations which is deemed unsuitable to remain in place by the Architect or Owner's Independent Testing Agency.

- a. Soil and/or other debris encountered above proposed subgrade elevations shall be considered general excavation.
 - b. Soil material which, in the opinion of the Architect or Owner's independent testing agency, can be repaired by scarifying, drying and recompacting or material which is made unsuitable by delay of work, lack of protection or other actions of the Contractor or his Sub-Contractors shall not be considered as unsuitable soil and shall be repaired or replaced by the Contractor at no additional cost to the Owner. Moisture content alone shall not be the determining factor as to the presence of unsuitable soil.
 - c. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Architect will be considered as general excavation.
 - d. Surface topsoil, regardless of thickness encountered, shall not be considered unsuitable soil.
 - e. Stones, rocks and boulders not meeting classifications of rock shall not be considered unsuitable soil. Stones, rocks and boulders shall be removed from soil as necessary if soil is to be used as fill or backfill. Removed stones, rocks and boulders shall be removed from the site.
 - f. The unsuitable soil allowances shall be for unsuitable soils only and not for repair of weather related deterioration of subgrade. These Allowances are not for required on-site cut and off-site fill necessary to bring subgrades and grades to elevations shown on drawings. Contractor shall be responsible for proper drying and dewatering procedures, as necessary, as part of his normal operations.
3. Rock Excavation: Removal of rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1.0-cu.yd. that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. In the event rock (as defined above) is encountered, the Contractor shall immediately notify the Architect.
- a. Rock excavation equipment: Late-model, track mounted CAT 330 or equivalent hydraulic excavator equipped with a narrow (36" max) bucket with new rock teeth and operating at the highest normal operating RPM. The Contractor shall provide equipment specification and test data verifying that the equipment to be used for demonstration purposes complies with the minimum requirements. The equipment shall be in good repair and in proper working condition. The Owner reserves the right to inspect and approve the equipment to be used for demonstration purposes. Trench rock is defined as material which, after 1 hour of continuous digging using the equipment described above, removes less than 10 cubic yards of material.
4. Classified excavation requirements:
- a. Contractor shall expose and clean the rock material for inspection and measurement by the Architect.
 - b. Do not excavate rock or unsuitable soil until it has been classified and cross-sectioned by the Owner's independent testing agency or Architect. Any material moved or removed without the measurement by the Owner's independent testing agency and approval by the Architect will be considered as General Excavation.
 - c. The Architect shall be the final judge on what is classified as unsuitable or rock excavation.

- d. The contractor may be required to provide equipment specification data verifying that the above minimum-rated equipment will be used for demonstration purposes. The equipment shall be in good repair and in proper working condition.
- e. Rippable rock, weathered rock or overburden which is not classified as rock according to the above definitions shall be considered General Excavation.

1.6 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Test Reports: In addition to test reports required under field quality control, submit the following:
 - 1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
 - 2. One optimum moisture-maximum density curve for each soil material.
 - 3. Reports of all laboratory and field tests including evaluations of subgrades and foundation bearing conditions.
 - 4. As-built survey of athletic fields, courts and tracks demonstrating compliance with specified tolerances.
- C. Blasting plan approved by authorities having jurisdiction if applicable due to on-site rock.
- D. Report of rock or unsuitable soil removal with quantities confirmed in writing by the Architect or Owner's independent testing agency.

1.7 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction. Any earthwork required for preparation of parking areas and drives shall comply with current NCDOT Standard Specifications as per the North Carolina Construction Manual.
- B. Comply with applicable requirements of NFPA 495--Explosive Materials Code.
- C. Testing and Inspection Service: Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1
 - 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.8 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.
 - 1. Provide a minimum 48-hours' notice to the Architect and receive written notice to proceed before interrupting any utility.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

1.9 PAYMENT

- A. General Excavation: All general excavation to the lines and grades indicated on the drawings including all necessary off-site disposal of excess materials and/or off-site borrow of fill materials shall be included in the base bid.
 - 1. No statement is made or implied that the on-site grading and earthwork indicated on the drawings is balanced.
- B. Unsuitable Soil Material Excavation: Unsuitable soil material excavation will be paid by unit prices included in the Contract Documents.
 - 1. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.
- C. Rock Excavation: Rock excavation will be paid by unit prices included in the Contract Documents.
 - 1. Unused amounts of monies included under allowances shall be credited to the Owner by deduct change order.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GC, GP, GM, ML, CL, SW, SP, SC, and SM; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups MH, CH, OL, OH, and PT. Soils having a Plasticity Index greater than 20 and a Liquid Limit greater than 50 are also unsatisfactory within structural (pavement and building) areas.
- D. Unsuitable Soil: Refer to paragraph 1.5 of this Section.
- F. Backfill and Fill Materials: Satisfactory soil materials.

2.2 PROCESSED AGGREGATE MATERIALS

- A. Base Course Material: Type A aggregate base course meeting the requirements of Section 520 of NCDOT “Standard Specifications for Roads and Structures.”
- B. Bedding Material: #57 washed stone.

2.3 ACCESSORIES

- A. Separation/Stabilization Fabric: Woven geotextile, specifically manufactured for use as a separation and or stabilization geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 200 lbf (890 N); ASTM D 4632.
 - 2. Tear Strength: 75 lbf (333 N); ASTM D 4533.
 - 3. Puncture Resistance: 90 lbf (400 N); ASTM D 4833.
 - 4. Water Flow Rate: 4 gpm per sq. ft. (2.7 L/s per sq. m); ASTM D 4491.
 - 5. Apparent Opening Size: No. 30 (0.6 mm); ASTM D 4751.
- B. Biaxial Geogrid: Integrally formed biaxial geogrid, specifically manufactured for use as a base reinforcement for subgrade improvement. Tensor BX1100, Mirafi BXG-110, or approved equal with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Aperture Dimensions: 1-in (25-mm) nominal.
 - 2. Minimum Rib Thickness: 0.03-in (0.76-mm) nominal.
 - 3. Tensile Strength @ 2% Strain: 280-lb/ft (4.1 kN/m); ASTM D-6637.
 - 4. Tensile Strength @ 5% Strain: 580-lb/ft (8.5 kN/m); ASTM D-6637.
 - 5. Ultimate Tensile Strength: 850-lb/ft (12.4 kN/m); ASTM D-6637.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Site Maintenance: The Contractor shall be responsible to take whatever measures are necessary to ensure reasonable accessibility to and on the construction site so that undue delays are avoided under normal weather conditions. These measures shall include, but not be limited to, the following:
 - 1. Maintaining the surface of the soils in a manner to promote drainage runoff and avoid ponding of water, especially prior to predicted rain events.
 - 2. Avoiding operation of temporary water sources or hoses in a manner which will cause unnecessary and repeated wetting of the site.

3. Fill in severely rutted areas which are ponding water during the construction activities or after rain events with drainage fill material to assist drying and allow construction activities to continue.
4. Provide drying of surface soils and soils intended for filling or backfilling as required to promote accelerated drying of those materials.
5. After successful drying efforts or prior to predicted rain events, grade the areas back to a smooth condition to promote drainage runoff.
6. Controlling vehicular traffic, both construction and personal on the site in a manner to prevent undue damage to soils whenever possible and practical.
7. Providing temporary staging areas of crushed stone or other materials around the construction site which will better withstand the weather and traffic and keep the site accessible immediately or shortly after rain events.
8. Provide de-watering equipment for any areas collecting water which may affect construction or soil densities under built areas.
9. Any claims for weather related delays considered shall be considered with particular attention paid to the Contractor's efforts in regard to the above requirements

3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 2. Install a dewatering system to keep subgrades dry and convey groundwater away from excavations. Maintain until dewatering is no longer required.
- C. Design, furnish, install, test, operate, monitor, and maintain temporary dewatering systems of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
 1. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls as needed.
 2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
 3. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
 4. Prevent surface water from entering excavations by grading, dikes, or other means.
 5. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
 6. Remove dewatering system when no longer required for construction.
- D. Soft wet soils, if present at the surface, shall be dried and compacted in place by the Contractor and be stable under proofrolling prior to placing fill. Drying shall be accomplished by discing, plowing or other means necessary and shall be included in the Contractor's bid. Site soils are typical of the area and susceptible to loss of strength if they become wet, resulting in softening and rutting during construction. Site soils are extremely moisture sensitive, therefore, the Contractor shall take active and aggressive steps to dry soil materials wet of optimum to maintain construction progress through the work and to

maintain access to and around the construction. The Contractor, at his option and cost may remove unstable, wet materials and replace with available fill materials in lieu of accomplishing soil drying procedures.

3.3 EXPLOSIVES

- A. Explosives: Explosives shall not be used.

3.4 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. Contractor is responsible for ensuring all excavation operations and other construction comply with applicable OSHA requirements. Contractor shall provide temporary shoring and bracing as needed to construct the proposed improvements and comply with the above requirements.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: As indicated
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
 - 1. For pipes or conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
 - 3. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches (150 mm) below invert elevation to receive bedding course.

3.7 APPROVAL OF SUBGRADE PRIOR TO PLACING FILL OR OTHER IMPROVEMENTS

- A. Notify Architect or Owner's independent testing agency when excavations have reached required subgrade.
- B. After stripping is complete the exposed subgrade shall be proofrolled with a fully loaded dual wheel tandem axle dump truck or similar construction equipment. Four passes shall be made in each orthogonal

direction. The proofrolling operation shall be observed by the Architect or Owner's independent testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompactd. Repeat proofrolling operations.

- C. When Architect or Owner's independent testing agency determines that unforeseen unsuitable soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. Unforeseen additional excavation and replacement with suitable material approved by the Architect will be considered unsuitable material and will be paid by unit prices included in the Contract Documents. Refer to Division 1 Sections.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect. Install french drains at design subgrade if directed by the Owner's independent testing agency and approved by the Architect.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect.
 - 1. Fill unauthorized excavations under other construction as directed by the Architect or the Owner's independent testing agency.
- B. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Architect.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Testing, inspecting, and approval of underground utilities.
 - 4. Concrete formwork removal.
 - 5. Removal of trash and debris from excavation.
 - 6. Removal of temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
 - 8. Removal of objectionable materials, including rocks larger than acceptable size, from backfill soils.

3.11 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Pipe sleeves and concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches (450 mm) of footings. Place concrete to level of bottom of footings. Contact the Architect or the Owner's independent testing agency to coordinate details, procedures and possible alternatives.
- C. Provide 4 inch (100 mm) thick concrete base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway base course.
- D. Place and compact initial backfill of satisfactory soil material or base course material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.
- G. Place and compact final backfill of satisfactory soil material to final subgrade.
- H. Install detectable warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.12 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
 - a. Stockpile or spread and dry removed wet satisfactory soil material.

3.13 COMPACTION

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure.

- C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D698 Standard Proctor:
 - 1. Under structures, steps, walks, and pavements:
 - a. Compact each layer of backfill or fill material at 95% of the standard Proctor Density (ASTM D-698).
 - b. Compact each layer of the final 12-in of backfill material in building and pavement areas at 98% of the standard Proctor Density (ASTM D-698).
 - c. Moisture content of the fill during placement shall be kept within +/-2% of optimum.
 - d. Under pavements within NCDOT rights-of-way or new pavement to be constructed to NCDOT standards compact the top 8 inches below pavement subgrade to at least 100% density in accordance with AASHTO T-99 as modified by NCDOT.
 - 2. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material at 90 percent maximum dry density.
 - 3. Compact each layer of aggregate base material under pavement to 100% density in accordance with AASHTO T-180 as modified by NCDOT or to at least 98% of the nuclear target density as specified in section 520 of the NCDOT Standard Specifications for Roads and Structures.

3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between existing adjacent grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Lawn Areas: Grade lawn area surfaces to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1/2 inch in any dimension, and other objects that may interfere with planting or maintenance operations. Remove all glass, wire or other objects of any size which may cause injury. Surfaces shall be top dressed following establishment of grass as necessary to obtain smooth, consistent surface.

3.15 BASE COURSES

- A. Under pavements, walks, courts and tracks, place base course material on prepared subgrades.
 - 1. Where indicated, place biaxial geogrid directly on prepared subgrade under all asphalt and concrete pavement without wrinkles or folds. Seams shall be overlapped a minimum of 12-in. Geogrid placement shall be observed by the Owner's Independent Testing Agency prior to covering. Place compacted base course over geogrid and control traffic and operation of equipment over geogrid and base course in accordance with manufacturer's instructions.
 - 2. Compact base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 100 percent density in accordance with AASHTO T-180 as modified by NCDOT or to at least 98% of the nuclear target density as specified in section 520 of the NCDOT Standard Specifications for Roads and Structures.
 - 3. Shape base course to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted base course is 6 inches or less, place materials in a single layer.
 - 5. When thickness of compacted base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

6. Following compaction testing and within 48 hours prior to the application of asphalt or concrete pavement, the aggregate base course shall be proofrolled with a fully loaded dual wheel tandem axle dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Architect or Owner's independent testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the base course shall be scarified and moistened or aerated and recompacted. Repeat proofroll testing.

- B. Pavement Shoulders: Place shoulders along edges of base course to prevent lateral movement. Construct shoulders at least 12 inches (300 mm) wide of acceptable soil materials and compact simultaneously with each base course layer.

3.16 FIELD QUALITY CONTROL

- A. Owner's Independent Testing Agency Services: Allow testing agency to evaluate and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Perform testing and evaluation of borrow or fill soils for compliance with material specifications of this Section.
2. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D6938 (nuclear gauge method) or equal as determined by the Owner's independent testing agency.
3. Paved Areas: At subgrade and at each compacted fill, backfill layer, and aggregate base course layer, perform at least one field in-place density test for every 10,000 sq. ft. or less of paved area, but in no case fewer than three tests. Observe proofrolling of finished subgrade and aggregate base course.
4. Trench Backfill: Perform at least one field in-place density test per 2 feet of backfill per 100 linear feet or less of trench outside of limits of buildings, but no fewer than two tests per trench per day.
5. Non-Structural Areas: Field density and moisture content tests shall be performed on the fill and backfill at a rate of at least one test per every 15,000 square feet of area being filled.
6. Observe proof-rolling as described herein.

- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained. Contractor shall be responsible for all costs associated with re-testing required due to failed compaction.

- C. Proofrolling: Subgrade to receive fill, finish subgrade of building or pavement areas, and aggregate base courses shall be proofrolled with a fully loaded dual wheel tandem axle dump truck or similar construction equipment. Four passes shall be made in each orthogonal direction. The proofrolling operation shall be observed by the Owner's testing agency. Should any area fail to tighten up after proofrolling and continue to rut and/or pump, the soil shall be scarified and moistened or aerated and recompacted. Repeat proofrolling operations.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

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Raleigh, North Carolina

CD Submittal

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- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace material to depth directed by the Architect or Owner's independent testing agency; reshape and recompact at optimum moisture content to the required density.
- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes provisions for hot-mixed asphalt paving over prepared subbase.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements of NCDOT "Standard Specifications for Roads and Structures".
- C. Job Mix Formula: Provide Geotechnical consultant with two copies of the proposed job mix formula at least ten days prior to beginning work. This formula shall be approved by NCDOT for the type of pavement specified.
- D. Recycled Content: 15% minimum, or as approved by NCDOT except as noted below.
 - 1. No Recycled Asphalt Pavement (RAP) shall be used in the asphalt pavement mix for exterior athletic surfacing.

1.4 SITE CONDITIONS

- A. Weather Limitations for Prime and Tack Coats: Apply prime and tack coats only when the surface to be treated is dry and when the atmospheric temperature measured at the location of paving operations away from artificial heat are in compliance with current NCDOT Standard Specifications for Roads and Structures. Do not apply tack coat when weather is foggy or rainy.
- B. Weather Limitations for Asphalt Courses: Apply hot-mixed asphalt surface, intermediate and base courses when surface and air temperatures are in compliance with current NCDOT Standard Specifications for Roads and Structures and when base is dry.
- C. Grade Control: Establish and maintain required lines and elevations.
- D. Traffic Control: Provide traffic control devices, lane closures, positive protection and/or any other warning or positive protection devices necessary for the safety of road users and pedestrians during construction.
 - 1. Traffic control shall be performed in conformance with the latest NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures and the Manual on Uniform Traffic Control Devices for Streets and Highways.

2. Sidewalk closures shall be installed as necessary. Pedestrian traffic shall be detoured around these closures and shall be signed appropriately and in accordance with ADA guidelines.
3. Two-way traffic shall be maintained at all times through use of flagmen when necessary.
4. Maintain access for fire-fighting equipment and access to fire hydrants.

1.5 QUALITY ASSURANCE

- A. All materials, construction methods and testing shall comply with the requirements of the latest editions of the North Carolina Department of Transportation (NCDOT) "Standard Specifications for Roads and Structures" and the Asphalt Handbook Manual Series No. 4 (MS-4).
- B. All work within any NCDOT right-of-way shall conform to the provisions and conditions of the NCDOT encroachment agreement(s) and driveway permit(s) and other applicable NCDOT standards and policies. The encroachment agreement(s) and driveway permit(s) are considered part of the project specifications by reference. Copies of the agreement(s) and permit(s) will be provided upon request from the Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Use locally available materials and gradations that comply with the requirements of the NCDOT "Standard Specifications for Roads and Structures" and exhibit a satisfactory record of previous installations.
- B. Aggregate Base Course (ABC): Type A aggregate base course meeting the requirements of the latest version of NCDOT "Standard Specifications for Roads and Structures."
- C. Superpave Asphalt Paving Mix: Superpave base, intermediate and surface asphalt paving mix meeting the requirements of the latest version of NCDOT "Standard Specifications for Roads and Structures." Types as indicated on the drawings.
- D. Tack Coat: Asphalt material meeting the requirement of the latest version of NCDOT "Standard Specifications for Roads and Structures."
- E. Parking Lot Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
 1. Color: White for parking and bus lot striping.
 2. Color: Yellow for fire lanes and service area striping.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. General: Remove loose material from compacted subbase surface immediately before applying base courses of asphalt.
- B. Proof-roll prepared subgrade surface as described in Section "Earth Moving" to check for unstable areas and areas requiring additional compaction.

- C. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- D. Cold mill surfaces of existing pavements in locations and to depths as indicated on the drawings and as follows.
 - 1. At butt joint of new asphalt to existing asphalt: Cold mill surfaces of existing pavements to a minimum depth of 1.5-inches for a minimum width of 12-inches along length of new joint to allow new asphalt surface to be keyed-in to the existing pavement. Thoroughly remove all loose material from milled surface before placing tack coat.
- E. Thoroughly remove all dust and loose material from surfaces of that which the tack coat is to be applied along with adjacent surfaces before placing tack coat.
- F. Apply tack coat to all contact surfaces of milled asphalt, existing asphalt to be overlaid, and surfaces abutting or projecting into hot-mixed asphalt pavement including the vertical face of adjacent concrete gutter. Distribute evenly and thoroughly at a rate of 0.04 to 0.08 gallons per sq. yd. of surface.
 - 1. Apply only as much tack coat as can be covered during the same day's operation.
 - 2. Take necessary precautions to limit the tracking and/or accumulation of tack coat material on either existing or newly constructed pavements. Excessive accumulation of tack may require corrective measures.
 - 3. Apply tack coat material with a distributor spray bar that can be adjusted to uniformly coat the entire surface at the directed rate. Use hand hose attachments only on irregular area and areas inaccessible to the spray bar. Cover these areas uniformly and completely.
 - 4. Apply tack coat to contact surfaces of gutters, concrete pavements, manholes, vertical faces of old pavements, and all exposed transverse and longitudinal edges of each course before mixture is placed adjacent to such surfaces.
 - 5. Cover curbs, adjacent concrete, and all other appurtenances to protect them from tracking or splattering tack coat material.
 - 6. Do not place any asphalt mixture until the tack coat has sufficiently cured.
- G. Allow to dry until at proper condition to receive paving.
- H. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.
- I. Place aggregate base courses as specified in Section "Earth Moving".

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

- C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 PLACING MIX

- A. Limitations: Do not produce or place asphalt mixtures during rainy weather, when the subgrade or base course is frozen, or when the moisture on the surface to be paved would prevent proper bond. Comply with all NCDOT weather and temperature limitations.
- B. General: Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 225 deg F. Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.
- C. Paver Placing: Place in strips not less than 10 feet wide, unless otherwise acceptable to Architect. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.
- D. Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.
- E. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

3.4 ROLLING

- A. General: Begin rolling when mixture will bear roller weight without excessive displacement.
- B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- C. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.
- D. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.
- E. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained required density. Compact the asphalt to at least the minimum percentage of the maximum specific gravity listed below unless otherwise allowed by NCDOT.
1. SF-9.5A: 90.0% of Maximum Specific Gravity
 2. S-9.5B/C, I-19.0B/C, B-25.0B/C: 92.0% of Maximum Specific Gravity.

- F. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 TRAFFIC MARKINGS

- A. Cleaning: Sweep and clean surface to eliminate loose material and dust.
- B. Materials: Use thermoplastic marking for permanent markings on public streets and stop bars and crosswalks on private drives and parking lots. Use marking paint for parking and fire lane striping and other markings on private drives and parking lots.
- C. Apply traffic paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.6 FIELD QUALITY CONTROL

- A. General: Testing of asphalt concrete mix and in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory in accordance with Division 1 Section "Quality Control." Repair or remove and replace unacceptable paving as directed by Architect.
 - 1. Owner's Independent Testing Agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from the specified requirements.
- B. Thickness: In-place compacted thickness of each layer of asphalt shall be tested in accordance with ASTM D 3549. Results shall be considered unacceptable if the compacted thickness of any one core sample is greater than 1/2-inch below the thickness specified on the drawings or if the average thickness of all core samples is less than the thickness specified on the drawings.
- C. Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10 feet straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:
 - 1. Base Course Surface: 1/4 inch.
 - 2. Wearing Course Surface: 3/16 inch.
 - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.
 - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.

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2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.
- F. Contractor shall repair all test core holes with full depth asphalt patch.
- G. Perform ponding water tests. Repair areas of pavement that pond water.
- H. Check surface areas at intervals as directed by Architect.

END OF SECTION

SECTION 32 13 13 - CONCRETE PAVING

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. This Section includes exterior portland cement concrete paving for the following:
 - 1. Curbs and gutters, pavement, walkways, service court, dumpster pads.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 31 Section "Earth Moving" for subgrade preparation, grading and subbase course.
 - 2. Division 03 Section "Cast-in-Place Concrete" for general building applications of concrete.
 - 3. Division 07 Section "Sealants and Caulking" for joint fillers and sealants within concrete paving and at joints with adjacent construction.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, joint systems, curing compounds, dry-shake finish materials, and others if requested by Architect.
- C. Design mixes for each class of concrete. Include percentage of recycled content (20% minimum). Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- D. Scaled plan of proposed construction, expansion and control joint locations in concrete pavement and concrete sidewalk. Submittal of plans for joints in curb and gutter or longitudinal sidewalk 6-feet or less in width is not required.

1.4 QUALITY ASSURANCE

- A. Concrete Standards: Comply with provisions of the following standards, except where more stringent requirements are indicated.
 - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
 - 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 - 3. ACI 330R, "Guide for the Design and Construction of Concrete Parking Lots."
 - 4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

- B. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- D. Plain Steel Wire: ASTM A 82, as drawn.
- E. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs. Electroplated zinc steel plates, ASTM A 108, ASTM B633 with corresponding pocket former.
- F. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to

CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, portland cement, Type I, II, or III.
 - a. Fly Ash: ASTM C 618, Class F. Up to 30% by weight of required cement content, with 1.0-lbs Fly Ash per 1-lb of cement replaced.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120 with 1-lb slag per 1-lb of cement replaced.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate, uniformly graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M, potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Wheel Stops: Precast, air-entrained concrete; 2500-psi minimum compressive strength; approximately 6 inches high, 9 inches wide, and 84 inches long. Provide chamfered corners and drainage slots on underside and provide holes for dowel-anchoring to substrate.
 - 1. Dowels: Galvanized steel, diameter of $\frac{3}{4}$ inch, minimum length 10 inches.
- C. Slip Resistive Aggregate Finish: Factory-graded, packaged, rustproof, non-glazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.
- D. Bonding Agent: ASTM C 1059, Acrylic or styrene butadiene.
- E. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi, 3500 psi, or 3000 psi as indicated on the drawings.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: As specified by NCDOT Standard Specifications for class of concrete indicated.
 - 3. Slump Limit: Maximum 3.5 inches for non-vibrated, maximum 4 inches for vibrated.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: 5-1/2 percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 - 2. Air Content: 6 percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 - 3. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use admixtures in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
 - 1. Fly Ash: 30 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 3. Combined Fly Ash, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash not exceeding 20 percent.
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

2.9 JOINT SEALANTS

- A. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
- B. Round Backer Rod for Cold-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and pavement bottom-side adhesion of sealant.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving. Ensure subgrade is graded for proper drainage. Repair as needed to avoid ponding on final pavement surfaces.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.
- C. Place aggregate base courses as specified in Division 31 Section "Earth Moving".

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations. Install forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement. Set forms to ensure positive drainage and compliance with ADA and Building Code requirements.
- B. Check completed formwork and screeds for grade and alignment to following tolerances:
 - 1. Top of Forms: Not more than 1/8 inch in 10 feet.
 - 2. Vertical Face on Longitudinal Axis: Not more than 1/4 inch in 10 feet.
- C. Clean forms after each use and coat with form release agent as required to ensure separation from concrete without damage.

3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable at mid depth of concrete. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct contraction, construction, and isolation joints true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to the centerline, unless indicated otherwise.
 - 1. When joining existing paving, place transverse joints to align with previously placed joints, unless indicated otherwise.
- B. Contraction (Control) Joints: Provide weakened-plane contraction joints, sectioning concrete into areas as indicated below unless shown otherwise on Drawings. Construct contraction joints for a depth equal to at least 1/3 of the concrete thickness, as follows:

1. **Tooled Joints:** Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a radiused jointer tool.
 2. **Sawed Joints:** Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into hardened concrete when cutting action will not tear, abrade, or otherwise damage surface and before development of random contraction cracks.
 3. **Inserts:** Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strips into fresh concrete until top surface of strip is flush with paving surface. Radius each joint edge with a jointer tool. Carefully remove strips or caps of two-piece assemblies after concrete has hardened. Clean groove of loose debris.
 4. **Spacing:**
 - a. **Pavement (greater than 4-in thick slabs):** Locate contraction joints at 10-ft max. intervals, each way in concrete pavement.
 - b. **Sidewalk & Patios (4-in thick slabs):** Locate contraction joints at 5-ft max. intervals, each way in concrete sidewalks/patios unless shown otherwise. Locate contraction joints in sidewalks less than 8-ft in width at 5-ft intervals across the walk. Locate contraction joints in sidewalks of 8-ft and greater width at 5-ft intervals across the walk and equally section the walk lengthwise with joints at 5-ft. max. intervals (example: an 8-ft wide walk shall have contraction joints at 5-ft. spacing across the walk and one joint dividing the walk lengthwise into two, equal 4-ft sections.)
 - c. **Curbs or Curb & Gutter:** Locate contraction joints at 10-ft max. intervals in concrete curbs or concrete curb and gutter.
- C. **Construction Joints:** Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than 1/2 hour, unless paving terminates at isolation joints.
1. Continue reinforcement across construction joints unless indicated otherwise. Do not continue reinforcement through sides of strip paving unless indicated.
 2. Provide tie bars at sides of paving strips where indicated.
 3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- D. **Isolation (expansion) Joints:** Form isolation joints of preformed joint filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. **General spacing:** Locate additional expansion joints at the following intervals unless indicated otherwise on the drawings.
 - a. **Pavement (greater than 4-in thick slabs):** None in addition to located specified above.
 - b. **Sidewalks (4-in thick slabs):** 30-ft each way.
 - c. **Curbs or Curb & Gutter:** 90-ft spacing.
 2. Extend joint fillers full width and depth of joint 1/2 inch below finished surface where joint sealant is indicated. Place top of joint filler flush with finished concrete surface when no joint sealant is required.
 3. Furnish joint fillers in one-piece lengths for full width being placed wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 4. Protect top edge of joint filler during concrete placement with a metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated
 - 1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
 - 2. Diamond Dowel System is acceptable in lieu of round dowels. Contractor to provide submittal information to Engineer for review/approval. Install per manufacturer recommendations.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Ensure forms are set to ensure water will not pond on final surface.
- B. Remove snow, ice, or frost from base surface and reinforcing before placing concrete. Do not place concrete on surfaces that are frozen.
- C. Moisten base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Form and pour concrete pavement with thickened edges along all edges that could be subject to vehicle wheel loads, do not abut a building or wall, or are not doweled to the adjacent pavement or structure.
- G. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- H. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.
- I. Screed paved surfaces with a straightedge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- J. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

- K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.
1. Spill Gutters: Form and install curb and gutter with gutter pans that spill at $\frac{1}{4}$ " per foot slope away from the curb in the following locations. Do not install curb and gutter that will pond water.
 - a. Outside of the Public Right of Way: Provide spill gutter where curb and gutter is located adjacent to pavement surfaces that slope away from curb.
 - b. Within the Public Right of Way: Slope gutter per NCDOT Standard Drawing 846.01.
- L. Cold-Weather Placement: Comply with provisions of ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- M. Hot-Weather Placement: Place concrete complying with ACI 305R and as specified when hot weather conditions exist.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
 3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots to ensure positive drainage and eliminate ponding. Refloat surface immediately to a uniform granular texture.
1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across all site concrete sidewalk and pavement surfaces perpendicular to line of traffic to provide a uniform fine line texture finish.

- B. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to a radius of ¼-inch unless indicated otherwise on the drawings. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 FIELD QUALITY CONTROL TESTING

- A. The Owner shall employ an independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement in accordance with Division 01 Section "Quality Control" and as follows:
 - 1. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 - 2. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within one week of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective, or does not meet the requirements of this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.

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- C. Protect concrete from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep concrete paving not more than 2 days prior to date scheduled for Substantial Completion inspections.
- E. Remove and replace concrete paving or curb and gutter that ponds water.

END OF SECTION

SECTION 321416 – BRICK UNIT PAVING

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. This Section includes the following:
 - 1. Brick pavers set in aggregate setting bed.
 - 2. Edge restraints for unit pavers.
- B. Related Sections include the following:
 - 1. Division 31 Section "Earth Moving" for compacted subgrade and subbase course, if any, under unit pavers.
 - 2. Division 32 Section "Concrete Paving" for cast-in-place concrete curbs and gutters serving as edge restraint for unit pavers.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Brick pavers.
 - 2. Setting materials.
 - 3. Edge restraints.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of unit paver indicated.
- C. Samples for Verification: Full-size units of each type of unit paver indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
 - 1. Include Samples of exposed edge restraints.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed unit paver installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- B. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect unit pavers and aggregate during storage and construction against soiling or contamination from earth and other materials.
 - 1. Cover pavers with plastic or use other packaging materials that will prevent rust marks from steel strapping.
- B. Store liquids in tightly closed containers protected from freezing.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Brick Pavers:
 - a. Pine Hall Brick.
 - b. Endicott Clay Products Co.
 - c. Glen-Gery Corporation.
 - d. Whitacre-Greer.

2.2 COLORS AND TEXTURES

- A. Colors and Textures: Match existing on-site.

2.3 UNIT PAVERS

- A. Brick Pavers: Light-traffic paving brick; ASTM C 902, Class SX, Type I, Application PX. Provide brick without frogs or cores in surfaces exposed to view in the completed work. Do not use pavers with chips, cracks, voids, discolorations, or other defects which might be visible in finished work.
 - 1. Existing brick pavers that are not chipped, broken, stained or otherwise damaged may be salvaged and re-used in the new work. Supplement with new brick pavers as needed to match existing. Any reused pavers shall be approved by the Owner prior to re-installation.

2.4 ACCESSORIES

- A. Job-Built Brick Edge Restraints: Construct edge restraints with brick-on-end sailor course set in a slush mortar bed.
 - 1. Set top of sailor course flush with the walk where walk abuts lawn.
 - 2. Set top of sailor course 2-in higher than the walk where walk abuts mulch.

2.5 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase: Aggregate base course material.
- B. Geotextile: Non-woven, min. 4-mil, geotextile. Propex 4546 by Ikex Company or approved equal.
- C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements of ASTM C 33 for fine aggregate.
- D. Sand for Joints: Fine, sharp, washed, natural white sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations. Examine areas where waterproofing system is turned up or flashed against vertical surfaces and horizontal waterproofing. Proceed with installation only after protection is in place.

3.2 PREPARATION

- A. Vacuum clean concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances, from concrete substrates, that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Proof-roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase for unit pavers.
- D. Prepared subgrade shall be approved by NC State prior to base course being installed.
- E. Where existing brick pavers are to be reused, bricks shall be carefully removed, stored on pallets, and reinstalled as needed. Bricks that are chipped, cracked, broken or otherwise marred shall not be reused and shall be disposed of off-site.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable. Do not use less than ½ brick in any pavement area.
- D. Joint Pattern: Running bond in direction of the walk or match existing unit paver joint pattern.
- E. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.
- F. Set brick pavers 1/8-in to ¼-in above finish grade.
- G. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Where pavers embedded in mortar are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in mortar and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of mortar below aggregate setting bed.

3.4 AGGREGATE SETTING-BED PAVER APPLICATIONS

- A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 1557 laboratory density.
- B. Place geotextile over prepared subgrade, overlapping ends and edges at least 12 inches (300 mm).
- C. Place aggregate base course to 8-in compacted thickness. Compact by tamping with plate vibrator and screed to depth required to allow setting of pavers. Compact base course uniformly to at least 98 percent of ASTM D 1557 laboratory density.
- D. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.
- E. Treat leveling base with soil sterilizer to inhibit growth of grass and weeds.
- F. Set pavers with a minimum joint width of 1/16 inch (1.6 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.
 - 1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.
- G. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:

1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
 2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover open layers with nonstaining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.
- H. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- I. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- J. Repeat joint-filling process 30 days later.

3.5 REPAIR, CLEANING, AND PROTECTION

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Sinks in brick areas holding more than 1-in of water for more than 3-hours, or those holding less than 1-in of water for more than 6-hours shall not be accepted.

END OF SECTION

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SECTION 331000 – SITE WATER SYSTEMS

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. This Section includes water systems piping for potable water service and fire protection service outside the building.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 21 Sections for fire protection systems inside building.
 - 2. Division 22 Sections for water distribution systems inside building.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure Ratings: Except where otherwise indicated, the following are minimum pressure requirements for water system piping.
 - 1. Underground Piping: 150 psig.
 - 2. Underground Piping, Downstream of Fire Department Connections: 200 psig.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data, including pressure rating, rated capacity, and settings of selected models for the following:
 - 1. Valves, indicator posts and valve boxes.
 - 2. Fire hydrants and fire department connections.
 - 3. Identification materials and devices.
 - 4. Pipe and Fittings.
 - 5. Tapping sleeves and saddles.
- C. As-Built survey of installed water system. Perform and submit as-built survey as soon as possible following installation of water main piping and appurtenances. Survey shall be submitted at least 60-days prior to needed use of water main.
- D. Record drawings at Project closeout of installed water system piping and products according to Division 1 Section "Closeout Procedures."
- E. Test reports specified in "Field Quality Control" Article in Part 3. Submit test reports at least 60-days prior to needed use of water main.

1.5 QUALITY ASSURANCE

- A. All materials, construction methods and testing shall comply with the requirements of the City of Raleigh Public Utilities Department.
- B. Provide listing/approval stamp, label, or other marking on equipment made to specified standards.
- C. Listing and Labeling: Provide equipment and accessories that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- D. Product Options: Water systems specialties and accessories are based on specific types, manufacturers, and models indicated. Components by other manufacturers but having equal performance characteristics may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by Architect. The burden of proof of equality of products is on Contractor. Refer to Division 1 Section "Substitution Procedures."
- E. All work within any NCDOT right-of-way shall conform to the requirements of the current version of the NCDOT's Policies and Procedures for Accommodating Utilities on Highway Rights of Way, the provisions and conditions of the encroachment agreement(s), and other applicable NCDOT standards and policies. The encroachment agreement(s) are considered part of the project specifications by reference. Copies of the agreement(s) will be provided upon request from the Architect.
- F. As-Built Survey: As-built survey shall be signed and seal by a NC Professional Land Surveyor and shall include the following:
 - 1. All fire hydrants and water valve sizes and locations with no less than two primary reference dimensions from permanent above grade features.
 - 2. Locations of bacteriological sampling points.
 - 3. Pipe materials and sizes.
 - 4. Other water system components such as meters, backflow preventers, etc.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, for shipping as follows:
 - 1. Ensure that valves are dry and internally protected against rust and corrosion.
 - 2. Protect valves against damage to threaded ends, flange faces, and weld ends.
 - 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. Storage: Use the following precautions for valves, including fire hydrants, during storage:
 - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
 - 2. Protect valves from weather. Store valves indoors and maintain temperature higher than ambient dew point temperature. Support valves off ground or pavement in watertight enclosures when outdoor storage is necessary.

- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and piping specialties from moisture and dirt.
- G. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water system piping may be installed in compliance with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during the design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate with pipe materials, sizes, entry locations, and pressure requirements of building fire protection and building water distribution systems piping.
- C. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Tapping Valves:
 - a. American Darling .
 - b. Clow Valve Co.
 - c. M&H Valve Co.
 - 2. Gate Valves:

- a. American Darling.
- b. AVK.
- c. Clow Valve Co.
- d. Kennedy Valve Div.
- e. M&H Valve Co.
- f. Mueller Co.
- g. Waterous Co.

3. Pipe:

- a. American Cast Iron Pipe Co.
- b. US Pipe and Foundry.
- c. Griffin Pipe Products Co.
- d. McWane Cast Iron Pipe Co.

2.2 PIPES AND TUBES

- A. Ductile-Iron Pipe: AWWA C150 and C151, Pressure Class 350. All ductile-iron pipe shall be listed by ANSI/NSF Standard 61 for potable water contact.

1. Lining: AWWA C104, cement mortar, seal coated.
2. Gaskets, Glands, and Bolts and Nuts: AWWA C111.
3. Push-On-Joint-Type Pipe: AWWA C111, rubber gaskets.
4. Mechanical-Joint-Type Pipe: AWWA C111, rubber gaskets, ductile- or cast-iron glands, and steel bolts and nuts.
5. Restrained-Joints: TR Flex or Lok Tyte as manufactured by US Pipe, Lok-Fast or Lok-Ring as manufactured by American Pipe, Super-Lock as manufactured by Clow, Bolt-Lok or Rigid-Lok as manufactured by Griffin.
6. Coating: AWWA C151, bituminous coating.

2.3 PIPE AND TUBE FITTINGS

- A. Ductile-Iron and Cast-Iron Pipe Fittings: AWWA C110, ductile-iron or cast-iron, 250-psig minimum pressure rating; or AWWA C153, ductile-iron compact fittings, 350-psig pressure rating. All ductile-iron fittings shall be listed by ANSI/NSF Standard 61 for potable water contact.

1. Lining: AWWA C104, cement mortar.
2. Gaskets: AWWA C111, rubber.
3. Joints: AWWA C111, mechanical joint, all bell.
4. Coating: AWWA C151, bituminous coating.

2.4 VALVES

- A. Valve Boxes: Cast-iron box having top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve. AASHTO H-20 load rating. Total valve box weight shall be a minimum of 85-lbs and shall have a minimum lid weight of 25-lbs.

1. Provide a steel tee-handle operating wrench with each valve box. Wrench shall have tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.
- B. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
 1. Tapping Sleeve: Mueller mechanical joint, Mueller Outlet Seal, American Uniseal or Kennedy Square Seal. One hundred percent stainless steel sleeves may also be used, as manufactured by Smith-Blair, Romac, Ford or JCM provided that all metallic parts of the sleeves are 100% stainless steel including bolts and nuts. Ductile iron flanges may be included on sleeves or saddles. All sleeves shall have a minimum of 150 psi working pressure. All taps shall be machine drilled, no burned taps will be allowed.

2.5 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- B. Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi.
 1. Cement: ASTM C 150, Type I.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.

2.6 IDENTIFICATION

- A. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 4 inches wide (min) by 4 mils thick, solid blue in color with continuously printed caption in black letters "CAUTION - WATER LINE BURIED BELOW."

PART 3 - EXECUTION

3.1 GENERAL

- A. All construction shall conform to the requirements of the Town of Garner, City of Raleigh Public Utilities Department and the NCDOT as applicable in addition to the requirements state herein.

3.2 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.3 SERVICE ENTRANCE PIPING

- A. Extend water system piping and connect to water supply source and building water distribution and fire protection systems in locations and pipe sizes indicated.
 - 1. Terminate domestic water system piping at 5-feet outside building wall until building water systems are installed. Terminate piping with caps, plugs, or other fittings as required for piping material. Make connections to building water system when those systems are installed.
 - 2. Terminate fire protection water system 12-in above finish floor elevation within building with caps, plugs, or flanges as required for piping material. Coordinate exact location with fire protection contractor. Install restrained joints for buried piping within 60 inches of building. Use restrained-joint pipe and fittings, thrust blocks, anchors, tie-rods and clamps, and other supports at vertical and horizontal offsets.

3.4 JOINT CONSTRUCTION

- A. Ductile-Iron Piping Gasketed Joints: Construct joints according to AWWA C600.
- B. Restrained-Joint Pipe and Fittings at vertical and horizontal bends.
- C. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads. Flanged joints shall be used in vaults or above grade installations only.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated except where deviations to layout are approved on coordination drawings.
- B. Install piping at indicated slope.
- C. Install components having pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Except as otherwise indicated, make piping connections as specified below within vaults or above-ground. Do not use flanges, unions or keyed couplings at underground installations.
 - 1. Above grade: Install unions, in piping 2 inches and smaller, adjacent to each valve and at final connection to each piece of equipment having 2-inch or smaller threaded pipe connection.
 - 2. Above grade: Install flanges, in piping 2-1/2 inches and larger, adjacent to flanged valves and at final connection to each piece of equipment having flanged pipe connection.
 - 3. Below grade: Join copper pipe with flared copper type brass fittings.
 - 4. Below grade: Join ductile iron pipe with push-on joints. Join fittings with mechanical joints.

3.6 PIPING INSTALLATION

- A. Water Main Connection: Tap water main with size and in location as indicated according to requirements of water utility.
 - 1. Install tapping sleeve and tapping valve according to manufacturer's installation instructions.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water service piping.
 - 5. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's installation instructions.
 - 6. Install service clamps on pipe to be tapped. Position outlet for corporation stop.
 - 7. Install corporation stops into service clamps. Install valve with stem pointing up and with cast-iron valve box.
 - 8. Install curb stop in service piping with head pointing up and with cast-iron service box.
 - 9. Install manifold for multiple taps in water main.
 - 10. Use drilling machine compatible with service clamp and corporate stop. Drill hole in main. Remove drilling machine and connect water service piping.
- B. Comply with requirements of NFPA 24 for materials and installation.
- C. Install ductile-iron pipe and ductile-iron and cast-iron fittings according to AWWA C600.
- D. Install piping with minimum cover over the top of pipe of 36 inches to finished grade.
- E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.
- F. Install and test fire protection piping and appurtenances in accordance with the specific requirements of the City of Raleigh and applicable NFPA requirements.

3.7 ANCHORAGE INSTALLATION

- A. Anchorages: Install anchorages or restrained joint pipe and fittings for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron Piping: According to AWWA C600.
 - 2. Fire Service Piping: According to NFPA 24.
- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.8 ALARM DEVICE INSTALLATION

- A. Comply with NFPA 24 for devices and methods of valve supervision.
- B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

- C. Connect alarm devices to building fire alarm system. Wiring and fire-alarm devices are specified in Division 22.

3.9 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water service piping. Locate 6 inches to 8 inches below finished grade, directly over piping.

3.10 FIELD QUALITY CONTROL

- A. Piping Tests: Water mains shall be tested in the following general sequence:

1. "Pigging" main (mains less than 16-in diameter);
2. Flush the main per AWWA C651 (ensure minimum velocity of 2.5-fps during flushing);
3. Perform hydrostatic tests;
4. Introduce the appropriate amount of chlorine by tapping the main;
5. Hold chlorine solution in main;
6. Flush the main per AWWA C651 (ensure minimum velocity of 2.5-fps during flushing);
7. Sample and perform bacteriological tests;
8. Backfill pipe.

- B. All tests shall be performed under the observation of a City of Raleigh Inspector.

- C. Only potable water shall be used.

- D. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.

1. All main installations shall be pressure tested between each main line valve in accordance with AWWA C600, Section 4. The test shall be performed using a suitable pump and an accurate pressure gauge. Immediately upon completion of a section of main, 150 psi (+/- 5 psi) of pressure shall be applied and held for 2 hours. The acceptable leakage rate shall not exceed 0.092 gallons per inch of pipe diameter per 1,000 feet of pipe per hour.
2. Failure of the water main to comply with the above acceptable leakage rate, shall require the contractor to replace any defective materials to insure a watertight installation. After any inadequacies have been corrected, the leakage rate shall again be tested. The test shall be repeated until that portion of the main is brought into compliance with the permissible leakage rate.

- E. Private Fire Service System Flushing & Testing: Perform flushing and all tests as required by NFPA 14 and NFPA 24. Contractor is responsible for performing and coordinating fire system installation and testing in accordance with the requirements of the City of Raleigh.

1. Complete and submit "Contractor's Material and Test Certificate for Underground Piping" (NFPA 14) upon satisfactory completion of system flushing and all tests.

- F. Chlorination

1. All additions or replacements to the water system, including fire lines and backflow prevention devices, shall be chlorinated prior to being placed into service. Such chlorination shall be performed under the observation of a City of Raleigh Inspector.
2. Pipe subjected to contaminating materials shall be treated as directed by the Engineer. Should such treatment fail to cleanse the pipe, replacement shall be required. The Owner and Engineer shall bear no portion of any cost sustained by the contractor in meeting this specification.
3. Chlorination of a completed line shall be carried out after completing the pressure test and in the following manner:
 - a. Tap will be made at the control valve at the upstream end of the line and at all extremities of the line including valves. These taps shall be located in such a manner as to allow HTH solution to be fed into all parts of the line.
 - b. A solution of water containing high test hypochlorite (70%) available chlorine or chlorine gas solution shall be introduced into the line by regulated pumping at the control valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of 50-ppm total chlorine immediately after chlorination. The chart below shows the required quantity of 70% HTH compound to be contained in the solution in each 1000-foot section of line to produce the desired concentration of 50-ppm.

Pipe Size (in)	Lbs. of HTH (70%) Per 1000-ft of Pipe
6	0.88
8	1.56
10	2.42
12	3.50
14	4.76
16	6.22
20	9.76

- c. The HTH solution shall be circulated in the main by opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution must be pumped in at a constant rate for each discharge rate in order that a uniform concentration will be produced in the mains.
- d. Service lines shall be sterilized by methods acceptable to the City of Raleigh Public Utilities Department or the Engineer, and the contractor shall have the same responsibility for the laterals as for mains in regard to bearing the full cost of any corrective measures needed to comply with bacteriological or other requirements.
- e. The HTH solution shall remain in lines for no less than 24-hours.
- f. Extreme care shall be exercised at all times to prevent the HTH solution from entering existing mains.

G. Bacteriological Sampling

1. Free residual chlorine after 24-hours shall be at least 10 ppm, or the lines shall be re-chlorinated.
2. Mains shall be flushed with a blow-off assembly of sufficient size to effectively clean the main. Flushing of lines may proceed after 24-hours of chlorination, provided free residual chlorine analysis is satisfactory. Flushing shall be continued until an orthotolidine check shows that the lines contain only the normal chlorine residual. During times of water shortages or distribution main problems, the flushing operation may be delayed by the Public Utilities Department. The

contractor shall advise the City Inspector prior to the chlorination and flushing so that the inspector can advise the Public Utilities Department of the construction location, size and length of mains. Flushing shall be for short durations. Sufficient precautions shall be taken to the satisfaction of the inspector to ensure that the impact of the water is absorbed and the water is conveyed without erosion or property damage.

3. Samples for bacteriological analysis shall be collected for each section of pipe between main line valves by the Public Utilities Department after flushing is completed. The contractor shall furnish such assistance as may be required to secure the samples.
 4. In the event that two successive bacteriologic tests fail, that section of the main shall be re-chlorinated by the contractor and new tests performed prior to moving to the next section of main.
- H. Contractor shall be responsible for ensuring all waterlines are fully flushed and free of all deleterious matter prior to connecting to the building plumbing system.

END OF SECTION

FORM OF PROPOSAL

Poe Hall – Fire Protection System Improvements Contract: _____
North Carolina State University Bidder: _____
SCO ID#: **22-24502-01** Date: _____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

The Bidder proposes and agrees if this proposal is accepted to contract with the
State of North Carolina through North Carolina State University
in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

Poe Hall – Fire Protection System Improvements
NC State University, SCO ID#: 22-24502-01

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the State of North Carolina, and the

North Carolina State University and Sigma Engineered Solutions, P.C.

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT:

Base Bid: _____ Dollars(\$)

General Subcontractor:
_____ Lic _____

Plumbing Subcontractor:
_____ Lic _____

Mechanical Subcontractor:
_____ Lic _____

Electrical Subcontractor:
_____ Lic _____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

ALTERNATES:

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be "added to" or "deducted from" the base bid. (Strike out "Add" or "Deduct" as appropriate.)

Alternate No. 1 Shall be a add Alternate to provide the fire pump, fire pump controller, jockey pump, jockey pump controller and all associated electrical and fire alarm.

(Add) _____ Dollars(\$)

Alternate No. 2 Preferred Brand Alternate: Mechanical Door Hardware shall be:
a. Mortise locks, key in levers, cylindrical deadbolts by: Best, Schlage US26D Finish.
b. Panic Hardware and Strikes by: Von Duprin.

(Add) _____ Dollars(\$)

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B**) to that effect in lieu of Affidavit (**A**) required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

* **OR** *

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

Proposal Signature Page

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

(Name of firm or corporation making bid)

WITNESS:

(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or type

Title _____
(Owner/Partner/Pres./V.Pres)

Address _____

ATTEST:

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

License No. _____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 7 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 8 _____

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State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of _____

I have made a good faith effort to comply under the following areas checked:

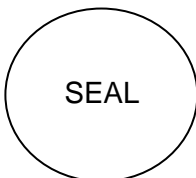
Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- 1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- 2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- 3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- 5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- 6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- 8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- 9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- 10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____
Signature: _____
Title: _____



State of _____, County of _____
Subscribed and sworn to before me this _____ day of _____ 20____
Notary Public _____
My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____

(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.

(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

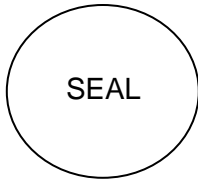
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
 This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
 (Name of Bidder)

_____ (Project Name)
 Project ID# _____ Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.
 Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (D)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

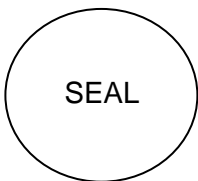
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the _____
(Name of Bidder)

Project ID# _____ (Project Name) Amount of Bid \$ _____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

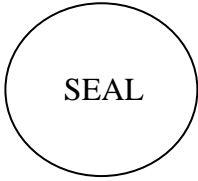
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____



State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public _____

My commission expires _____

FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS THAT _____ as principal, and _____, as surety, who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the State of North Carolina* through _____ as obligee, in the penal sum of _____ DOLLARS, lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this ____ day of ____ 20__

WHEREAS, the said principal is herewith submitting proposal for and the principal desires to file this bid bond in lieu of making the cash deposit as required by G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the principal shall be awarded the contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof within ten days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails to so execute such contract and give performance bond as required by G.S. 143-129, the surety shall, upon demand, forthwith pay to the obligee the amount set forth in the first paragraph hereof. Provided further, that the bid may be withdrawn as provided by G.S. 143-129.1

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

_____(SEAL)

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FORM OF CONSTRUCTION CONTRACT

(ALL PRIME CONTRACTS)

THIS AGREEMENT, made the _____ day of _____ in the year of 20__ by _____ and _____ between _____

hereinafter called the Party of the First Part and the State of North Carolina, through the _____

_____ hereinafter called the Party of the Second Part.

WITNESSETH:

That the Party of the First Part and the Party of the Second Part for the consideration herein named agree as follows:

1. Scope of Work: The Party of the First Part shall furnish and deliver all of the materials, and perform all of the work in the manner and form as provided by the following enumerated plans, specifications and documents, which are attached hereto and made a part thereof as if fully contained herein: advertisement; Instructions to Bidders; General Conditions; Supplementary General Conditions; specifications; accepted proposal; contract; performance bond; payment bond; power of attorney; workmen's compensation; public liability; property damage and builder's risk insurance certificates; approval of attorney general; certificate by the Office of State Budget and Management, and drawings, titled:

Consisting of the following sheets:

Dated: _____ and the following addenda:

Addendum No. _____ Dated: _____ Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____ Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____ Addendum No. _____ Dated: _____

Addendum No. _____ Dated: _____ Addendum No. _____ Dated: _____

2. That the Party of the First Part shall commence work to be performed under this agreement on a date to be specified in a written order of the Party of the Second Part and shall fully complete all work hereunder within _____ consecutive calendar days

from said date. For each day in excess thereof, liquidated damages shall be as stated in Supplementary General Conditions. The Party of the First Part, as one of the considerations for the awarding of this contract, shall furnish to the Party of the Second Part a construction schedule setting forth planned progress of the project broken down by the various divisions or part of the work and by calendar days as outlined in Article 14 of the General Conditions of the Contract.

3. The Party of the Second Part hereby agrees to pay to the Party of the First Part for the faithful performance of this agreement, subject to additions and deductions as provided in the specifications or proposal, in lawful money of the United States as follows:

(\$ _____).

Summary of Contract Award:

4. In accordance with Article 31 and Article 32 of the General Conditions of the Contract, the Party of the Second Part shall review, and if approved, process the Party of the First Party's pay request within 30 days upon receipt from the Designer. The Party of the Second Part, after reviewing and approving said pay request, shall make payments to the Party of the First Part on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the First Party, less five percent (5%) of the amount of such estimate which is to be retained by the Second Party until all work has been performed strictly in accordance with this agreement and until such work has been accepted by the Second Party. The Second Party may elect to waive retainage requirements after 50 percent of the work has been satisfactorily completed on schedule as referred to in Article 31 of the General Conditions.

5. Upon submission by the First Party of evidence satisfactory to the Second Party that all payrolls, material bills and other costs incurred by the First Party in connection with the construction of the work have been paid in full, final payment on account of this agreement shall be made within thirty (30) days after the completion by the First Party of all work covered by this agreement and the acceptance of such work by the Second Party.

6. It is further mutually agreed between the parties hereto that if at any time after the execution of this agreement and the surety bonds hereto attached for its faithful performance, the Second Party shall deem the surety or sureties upon such bonds to be unsatisfactory, or if, for any reason, such bonds cease to be adequate to cover the performance of the work, the First Party shall, at its expense, within five (5) days after the receipt of notice from the Second Party so to do, furnish an additional bond or bonds in such form and amount, and with such surety or sureties as shall be satisfactory to the Second Party. In such event no further payment to the First Party shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the Second Party.

7. The Party of the First Part attest that it and all of its subcontractors have fully complied with all requirements of NCGS 64 Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

IN WITNESS WHEREOF, the Parties hereto have executed this agreement on the day and date first above written in _____ counterparts, each of which shall without proof or accounting for other counterparts, be deemed an original contract.

Witness:

(Proprietorship or Partnership)

Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

The State of North Carolina through*

(CORPORATE SEAL)

(Agency, Department or Institution)

Witness:

By: _____

Title: _____

(This page intentionally left blank.)

FORM OF PERFORMANCE BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal
(Contractor) _____

Name of Surety: _____

Name of Contracting
Body: _____

Amount of Bond: _____

Project

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

(Proprietorship or Partnership)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

(Corporate Seal)

Contractor: (Trade or Corporate Name)

By: _____

Title: _____
(Owner, Partner, or Corp. Pres. or Vice Pres. only)

(Surety Company)

By: _____

Title: _____
(Attorney in Fact)

(Surety Corporate Seal)

Witness:

Countersigned:

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

FORM OF PAYMENT BOND

Date of Contract: _____

Date of Execution: _____

Name of Principal
(Contractor) _____

Name of Surety: _____

Name of Contracting
Body: _____

Amount of Bond: _____

Project _____

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in _____ counterparts.

Witness:

(Proprietorship or Partnership)

Attest: (Corporation)

By: _____

Title: _____
(Corp. Sec. or Asst. Sec.. only)

(Corporate Seal)

Witness:

Countersigned:

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address

Contractor: (Trade or Corporate Name)

By: _____

Title _____
(Owner, Partner, or Corp. Pres. or Vice
Pres. only)

(Surety Company)

By: _____

Title: _____
(Attorney in Fact)

(Surety Corporate Seal)

Sheet for Attaching Power of Attorney

Sheet for Attaching Insurance Certificates

APPROVAL OF THE ATTORNEY GENERAL

**CERTIFICATION BY THE OFFICE OF STATE
BUDGET AND MANAGEMENT**

Provision for the payment of money to fall due and payable by the

under this agreement has been provided for by allocation made and is available for the purpose of carrying out this agreement.

This _____ day of _____ 20____.

Signed _____
Budget Officer

ASBESTOS SURVEY REPORTS

**POE HALL BUILDING
FACILITY NO. 024**

PREPARED FOR:

**NORTH CAROLINA STATE
UNIVERSITY**

Prepared By:

**PROFESSIONAL SERVICE INDUSTRIES, INC.
5035-A WEST W.T. HARRIS BOULEVARD
CHARLOTTE, NORTH CAROLINA 28269**

PSI PROJECT No. 511-7A008

June 2, 1997



ASBESTOS SURVEY REPORTS



**POE HALL BUILDING
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June 2, 1997

Information To Build On

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APPENDICES

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- Appendix B. DEHNR Form 3535
- Appendix C. DEHNR Form 3540
- Appendix D. DEHNR Form 3542
- Appendix E. Analytical Reports
- Appendix F. Field Assessment Sheets

Professional Service Industries, Inc. (PSI) has conducted an Asbestos Survey and Assessment of Poe Hall at the North Carolina State University (NCSU) in Raleigh, North Carolina. The survey was conducted by PSI from March 10, 1997 through March 17, 1997.

The visual inspection and sampling survey was conducted in general accordance with EPA/AHERA guidelines to determine the presence of suspect asbestos-containing materials (ACM) which were accessible and/or exposed in the buildings. Sampling locations were chosen to be representative of the homogeneous sampling area. Bulk samples obtained from the facility were analyzed in the laboratory using Polarized Light Microscopy (PLM) with dispersion staining by a laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

A material is considered by the EPA and OSHA to be asbestos containing if at least one sample collected from the area has asbestos present in a quantity greater than one percent (1%).

The following lists the suspect materials observed and analyzed for asbestos content:

Suspect Material Description

- Wallboard and joint compound
- Plaster
- Floor tile and associated mastic
- Baseboard and associated mastic
- 2' x 2' lay-in Ceiling tile
- 2' x 4' lay-in Ceiling tile
- Duct mastic
- Pipe insulation
- Pipe fitting insulation
- Vibration damper
- Lab countertops
- Fume hood lining
- Duct insulation
- Tank insulation
- Welding blocks
- Furnace block lining
- Partition panels
- Foam panel adhesive
- 2' x 3' Acoustical panel
- Laboratory sink

1.0 EXECUTIVE SUMMARY

Asbestos-containing materials were identified throughout the building at a variety of locations. The following materials were identified as asbestos-containing (per EPA and OSHA definitions):

<u>Samples*</u>	<u>Homogeneous Material</u>	<u>Location</u>	<u>Condition</u>	<u>Quantity</u>
024-001 024-002 024-003	12" x 12" White with black streaks floor tile and associated mastic (both tile and mastic are asbestos-containing)	Rooms 108,504	Good	278 SF
024-019 024-020 024-021	Gasket type 1" rope	Rooms 116, and 212	Good	5 LF
024-022 024-023 024-024	Red duct mastic	Throughout the building on ductwork	Good	Unknown
024-028 024-029 024-030	Black duct mastic	Throughout the building on ductwork	Good	Unknown
024-031 024-032 024-033 024-034 024-035	9" x 9" White with black streaks floor tile and associated mastic (both tile and mastic are asbestos-containing)	Located in halls floors 2 through 7, and in a number of classrooms and offices	Good	59,533 SF
024-080 024-081 024-082	Lab countertop	Rooms 102D, 312, 317	Good	415 SF
024-083 024-084 024-085	Fume hood lining	Rooms 102D and 317	Good	64 SF
024-086 024-087 024-088	Pipe insulation (E-tar)	Room 102C	Good	12 LF
024-098 024-099 024-100	Tar coated pipe insulation	Throughout building in halls and classrooms above ceilings	Good	765 LF
024-113 024-114 024-115	Generator exhaust insulation	Room 130	Good	18 LF
024-116 024-117 024-118	Vibration joint cloth (vibration damper)	Room 130	Good	2 SF
024-122 024-123 024-124	Pipe insulation, tar paper Only sample 024-123 of the set tested positive for asbestos	Pipe chases, Rooms 212, 308, 312, 324, 509, 525, 500	Good	476 LF
024-140 024-141	12" x 12" Tan with brown streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-142 024-143	12" x 12" Brown with tan streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-144 024-145	12" x 12" Green floor tile and associated adhesive	Room 114	Good	5 SF
024-146 024-147	12" x 12" Gray floor tile and associated adhesive	Room 114	Good	5 SF

Refer to Appendix A for figures illustrating floor plans, asbestos bulk sample locations, and locations of the asbestos containing materials. Refer to Appendix C for further information on the homogeneous sampling areas.

* Sample numbers are assigned in the field during survey activities using the facility number as a prefix. These are the sample numbers reported. The laboratory assigned each sample a unique sample identification number using the sampled material homogeneous area as a prefix. Although the field identification number and the laboratory identification number have different prefixes, they both have the same root number and reference the same sample; e.g., field number 003 (building prefix)-014 (root number) references the same sample as the laboratory number 004 (homogeneous material number)-014 (root number).

1.1 Recommendations

1. PSI recommends that the asbestos-containing materials identified be placed under an operations and maintenance plan that conforms to the communication portion of OSHA CFR 1910.1001 (j) and 29 CFR 1926.1101 (k).). Removal of thermal system insulation is regulated by OSHA as a Class I removal operations (29 CFR 1926.1101). Removal of floor tile/mastic is regulated by OSHA as Class II removal operations (29 CFR 1926.1101

2. PSI recommends that when it becomes necessary to disturb the roofing materials that they be sampled to confirm the presence or absence of asbestos. If roofing materials are not sampled they should be assumed to be asbestos-containing and appropriate work practices followed.

This report presents the findings of the Asbestos Survey and Assessment conducted at the Poe Hall Building at the North Carolina State University campus located in Raleigh, North Carolina. The Poe Hall Building is constructed of masonry and steel and consists of 165,888 gross square feet. The building is used as laboratory, office, and classroom space.

2.1 Authorization

Authorization to perform this assessment was given by the client in the form of a North Carolina State University purchase order No. P0064610, dated February 6, 1997.

2.2 Purpose

The purpose of the asbestos survey was to identify those building materials which contain asbestos or which can be assumed to contain asbestos, to determine the condition and relative risk of potential disturbance.

2.3 Scope

The visual inspection and sampling survey was conducted in general accordance with EPA/AHERA guidelines and the provided Asbestos Bulk Survey Scope of Work to determine the presence of suspect asbestos containing materials (ACM) which were accessible and/or exposed within the building interior. A room by room inventory was conducted in which suspect materials were assessed, sampled, and quantified.

Bulk survey samples obtained from the facility were analyzed in the PSI Lawrence, Kansas, NVLAP accredited laboratory using Polarized Light Microscopy (PLM) with dispersion staining. A detailed listing of the analyses is included in Appendix E - Laboratory Analysis Data Sheets.

2.4 Limitations and Exclusions

Roofing materials were not within the scope of this survey and therefore, were not sampled. Roofing materials should be assumed to be asbestos-containing, unless sampling results indicate otherwise.

Destructive sampling was not performed, only accessible materials were included in this survey. Electrical wiring may be considered a suspect asbestos-containing material but was not assessed, sampled, or quantified by the inspection teams due to the risk of electrocution. NCSU should consider electrical wiring insulation to be a suspect asbestos-containing material and handle it with the appropriate protective measures.

In most cases material under carpeting was assessed, sampled, and quantified. Conditions may have existed, or do exist, that limit the inspectors ability to accurately identify and assess the underlying materials. Floor tile, floor tile mastic, and other suspect materials encountered underlying carpet should be assumed to be asbestos-containing material unless subsequent sampling indicates otherwise.

Quantities are estimates and should be confirmed by an engineering survey if renovation or demolition activities are contemplated.

This section includes the description of the methodologies used to perform the asbestos survey and assessment. These methodologies include document review, personnel interviews, visual inspection, quantification, sample collection, sample analysis, assessment, classification, and drawing development.

3.1 Document Review

a. Construction Documents

Construction documents provided by NCSU were used in part to determine quantities of materials, potential for hidden materials, and to develop material and sample location drawings.

b. Past Reports

Previous asbestos survey reports provided by NCSU were reviewed to provide additional background information about the building. The previous reports were not relied upon to develop a sampling strategy.

3.2 Personnel Interviews

When possible, interviews are conducted with personnel familiar with the building for their knowledge of the use of ACM in their buildings. Interviews are also conducted to determine the extent of renovation activities or past ACM removal activities.

3.3 Visual Inspection

The asbestos survey was performed by a North Carolina accredited inspector. An initial walk-through was conducted to determine the presence of suspect materials which were accessible and/or exposed in the facility. Suspect materials were also quantified during the walk-through.

Materials which were visually similar in color, texture, general appearance, and appear to have been installed at the same time were grouped into homogeneous sampling areas. A homogeneous sampling material is an area of surfacing, thermal system insulation, or miscellaneous material that is uniform in color and texture. Further definition includes material within a structure with the same installation date. When feasible, homogeneous sampling areas included multiple floors within a building.

Following the walk-through, the inspector collected samples of selected materials identified as suspect ACM. Sampling was limited to those materials which were accessible with minimum amount of damage to walls or ceilings, and did not involve destruction of physical barriers or the structural integrity of the item being tested.

The materials sampled are a good representation of the conditions in each building.

EPA guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous sampling area. While an effort was made to collect samples randomly, samples were taken preferentially from previously damaged areas or areas which were the least visible to minimize noticeable damage to the material. After each sample was extracted, a spray encapsulant or sealant was applied to the sampled area to prevent potential fiber release. Thermal system installation sample locations were labeled with tags and patched with non-asbestos heat resistant sealant. Repair of visible previously undamaged sample areas was performed after sample collection.

3.4 Sampling Materials

Sampling Procedure

Following the walk-through, the inspector collected selected samples of exposed and accessible materials identified as suspect ACM. Sampling was limited to those accessible materials not involving the destruction of walls, other building elements, physical barriers, or the structural integrity of the item being tested.

EPA guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous material.

Samples of surfacing material were collected in general accordance with the EPA random sampling protocol outlined in the EPA publication, "Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials" (EPA 560/5-85-030a, October, 1985). Samples of thermal system insulation (TSI) and miscellaneous materials were taken as randomly as possible while preferentially sampling previously damaged areas so as to minimize disturbance of the suspect materials.

Safety Precautions

Asbestos is a known carcinogen. Special care was taken when sampling. A properly selected and fit-tested respirator was worn during sampling activities. Samples were taken in such a manner as to minimize dust generation. Samples were collected following these general guidelines:

- (a) Do not create unnecessary dust (spray with amended water).
- (b) Collect only a small amount (size of a sugar cube).
- (c) Tightly close the sample container.
- (d) Repair the sample collection location.

Shipment

Samples are shipped by overnight express under chain-of-custody documentation to our PSI Lawrence, Kansas NVLAP accredited laboratory. Custody documentation procedures must be followed whenever samples are received, transferred, stored analyzed, or destroyed. Samples are held at the laboratory for 90 days.

3.5 Laboratory Analysis

Analysis was performed by using the bulk sample for visual observation and slide preparations for microscopic examination and identification. The samples were mounted on slides and analyzed for asbestos (chrysotile, amosite, crocidolite, anthophyllite, and actinolite/tremolite), fibrous non-asbestos constituents (mineral wool, paper, etc.) and non-fibrous constituents. Asbestos is identified by Polarized Light Microscopy. The same method is used to identify the non-asbestos constituents.

The microscopist visually estimated relative amounts of each constituent in proportion to the total volume of the sample, using a stereoscope. The Interim Method for the Determination of Asbestos in Bulk Insulation Samples, (40 CFR Ch 1 Pt. 763, App. A to Subpt. F. July 1, 1987) was used to analyze all bulk samples.

Laboratory Quality Control Program

PSI laboratories maintain an in-house quality control program. This program involves the re-analysis of a minimum of ten percent of all samples, precision and accuracy controls, use of standard bulk reference materials, maintenance of state and national accreditation, participation in external and internal proficiency testing programs, and confirmation of analyst experience and qualifications in compliance with specific internal training and competency requirements. Additionally, all quality assurance/quality control program and operational procedures are documented in manual form and retained on site as reference materials for all analytical staff.

3.6 Quantification of Materials

Quantities of accessible and exposed suspect building materials were estimated. The estimation was performed by taking approximate measurements in the field or estimating quantities based on the provided scale drawings. Materials such as pipe insulation and associated mudded joint packing (MJP) were categorized according to the outside diameter of the insulation, in 2 inch increments. Pipe lagging was quantified by linear footage while the actual number of accessible and exposed MJPs were counted. Insulation on mechanical equipment was

quantified by the square footage of the surface area of suspect insulation. Similarly, fireproofing, plasters, ceiling and floor tiles, and transite panels were measured in square feet of surface area.

3.7 Drawings

Scale drawings were provided by NCSU and modified for this report. ACM materials are identified by symbols for materials, utilizing a CAD menu provided by NCSU, such as floor tiles and ceiling tiles. Location of piping and other mechanical systems are designated by symbols. Symbols do not represent actual pipes but merely that piping is located in or runs through the area. The tag on the sample location drawing provides the sample number, homogeneous sample group code, bulk sample code, and whether the material is positive or negative for asbestos content.

3.8 Assessment of Materials

The condition of a suspect material is an indication of the likelihood that it may release asbestos fibers into the environment. The combination of its current condition coupled with the potential for damage coupled with the potential for future disturbance determines which EPA response priority is appropriate for that material.

The condition of each homogeneous suspect material within a room was assessed using the EPA decision tree approach. The friability of each material was determined and then its condition and potential for future damage were assessed using the following criteria:

- 1.) Source and type of damage
 - Physical contact
 - Water or air erosion
 - Deterioration or material delamination
 - Abrasions, punctures, tears, blistering, crumpling, etc.
- 2.) Extent of damage
 - Good; No damage or little damage
 - Damaged: less than 10% damage, evenly distributed OR less than 25% damage confined to a localized area
 - Significantly Damaged: 10% or more damage distributed OR 25% within a localized area
- 3.) Potential for future damage:
 - Frequency of access to material
 - Height of material
 - Location of material in plenum
 - Exposure of material
 - Accessibility
 - Presence in an area of air movement, vibrations, or loud noises

3.9 Report Format

This report has been organized in a manner that presents the data in several forms to best suit the needs of NCSU. The "Executive Summary" provides a description of the materials found to contain asbestos and the approximate quantity of each material. The "Findings" describe the materials found and provide recommendations for managing them. Appendix A contains Figures and illustrates asbestos-containing material and sample locations. Appendix B contains the Department of Environment, Health, and Natural Resources (DEHNR) form 3535, "Determination of Sampling Locations". The DEHNR form 3540 "Description of Sample Area" is presented in Appendix B. Appendix C contains DEHNR form 3542 "Assessment of Materials", which assesses the condition of asbestos-containing materials. Appendix E "Analytical Reports" contains the laboratory report of sample analysis and includes bulk sample collection field forms and an explanation of bulk sample codes. Appendix F contains the Field Assessment Sheet as it was completed in the field during the survey.

4.0 FINDINGS AND RECOMMENDATIONS

4.1 General Summary

Asbestos-containing materials were identified in the Poe Hall Building. The quantities and locations of these materials are presented below and in Appendix A.

Suspect materials found within the building were:

- Wallboard and joint compound
- Plaster
- Floor tile and associated mastic
- Baseboard and associated mastic
- 2' x 2' lay-in Ceiling tile
- 2' x 4' lay-in Ceiling tile
- Duct mastic
- Pipe insulation
- Pipe fitting insulation
- Vibration damper
- Lab countertops
- Fume hood lining
- Duct insulation
- Tank insulation
- Welding blocks
- Furnace block lining
- Partition panels
- Foam panel adhesive
- 2' x 3' Acoustical panel
- Laboratory sink

Asbestos-containing materials were identified throughout the building at a variety of locations. The following materials were identified as asbestos-containing (per EPA and OSHA definitions):

<u>Samples*</u>	<u>Homogeneous Material</u>	<u>Location</u>	<u>Condition</u>	<u>Quantity</u>
024-001 024-002 024-003	12" x 12" White with black streaks floor tile and associated mastic	Rooms 108,504	Good	278 SF
024-019 024-020 024-021	Gasket type 1" rope	Rooms 116, and 212	Good	5 LF
024-022 024-023 024-024	Red duct mastic	Throughout the building on ductwork	Good	Unknown

4.0 FINDINGS AND RECOMMENDATIONS

<u>Samples*</u>	<u>Homogeneous Material</u>	<u>Location</u>	<u>Condition</u>	<u>Quantity</u>
024-028 024-029 024-030	Black duct mastic	Throughout the building on ductwork	Good	Unknown
024-031 024-032 024-033 024-034 024-035	9" x 9" White with black streaks floor tile and associated mastic	Located in halls floors 2 through 7, and in a number of classrooms and offices	Good	59,533 SF
024-080 024-081 024-082	Lab countertop	Rooms 102D, 312, 317	Good	415 SF
024-083 024-084 024-085	Fume hood lining	Rooms 102D and 317	Good	64 SF
024-086 024-087 024-088	Pipe insulation (E-tar)	Room 102C	Good	12 LF
024-098 024-099 024-100	Tar coated pipe insulation	Throughout building in halls and classrooms	Good	765 LF
024-113 024-114 024-115	Generator exhaust insulation	Room 130	Good	18 LF
024-116 024-117 024-118	Vibration joint cloth (vibration damper)	Room 130	Good	2 SF
024-122 024-123 024-124	Pipe insulation, tar paper Only sample 024-123 of the set tested positive for asbestos	Pipe chases, Rooms 212, 308, 312, 324, 509, 525, 500	Good	476 LF
024-140 024-141	12" x 12" Tan with brown streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-142 024-143	12" x 12" Brown with tan streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-144 024-145	12" x 12" Green floor tile and associated adhesive	Room 114	Good	5 SF
024-146 024-147	12" x 12" Gray floor tile and associated adhesive	Room 114	Good	5 SF

Refer to Appendix A for figures illustrating asbestos bulk sample locations and locations of the asbestos containing materials. Refer to Appendix C for further information on the homogeneous sampling areas.

* Sample numbers are assigned in the field during survey activities using the facility number as a prefix. These are the sample numbers reported. The laboratory assigned each sample a unique sample identification number using the sampled material homogeneous area as a prefix. Although the field identification number and the laboratory identification number have different prefixes, they both have the same root number and reference the same sample; e.g., field number 003 (building prefix)-014 (root number) references the same sample as the laboratory number 004 (homogeneous material number)-014 (root number).

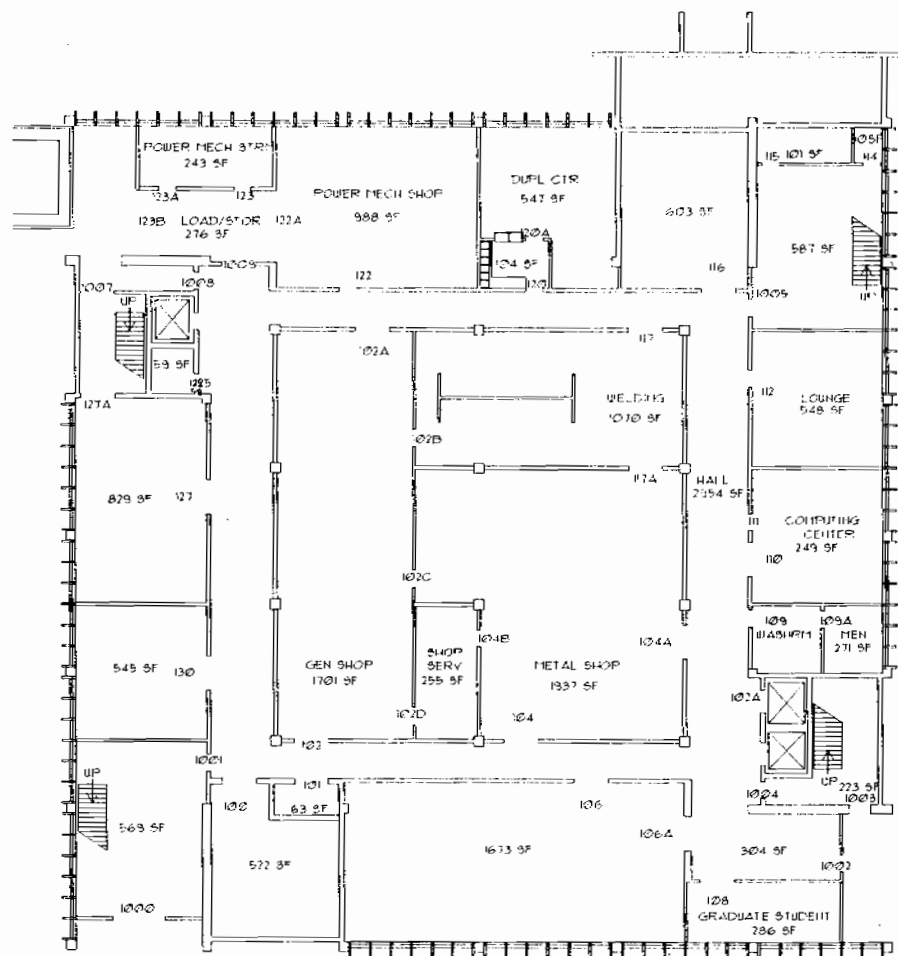
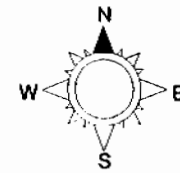
4.2 Recommendations

ACM identified in this survey was assessed as being in good condition. PSI recommends that the asbestos-containing materials identified be placed under an operations and maintenance plan that conforms to the communication portion of OSHA CFR 1910.1001 (j) and 29 CFR 1926.1101 (k).). If renovation or demolition of this facility results in the disturbance of asbestos-containing materials (ACM), Federal Regulations require specific control measures for the handling of ACM. Federal Regulations require that asbestos-containing materials, if impacted by renovation or demolition, be removed prior to disturbance by accredited personnel. Removal of thermal system insulation is regulated by OSHA as a Class I removal operations (29 CFR 1926.1101). Disturbance of asbestos-containing floor tile, floor tile mastic, and resilient floor coverings, until proven asbestos free, is regulated by OSHA regulation 29 CFR 1926.1101 as a Class II removal operation.

The field and laboratory results reported herein are considered sufficient in detail and scope to determine the presence of accessible and/or exposed suspect asbestos-containing building materials in the portion of the facility included in the project scope and which were made accessible to the PSI Survey Team. PSI warrants that the findings contained herein have been prepared in general accordance with accepted professional practices at the time of this preparation, as applied by similar professionals in the community.

No other warranties are implied or expressed.

APPENDIX A.



FIRST FLOOR

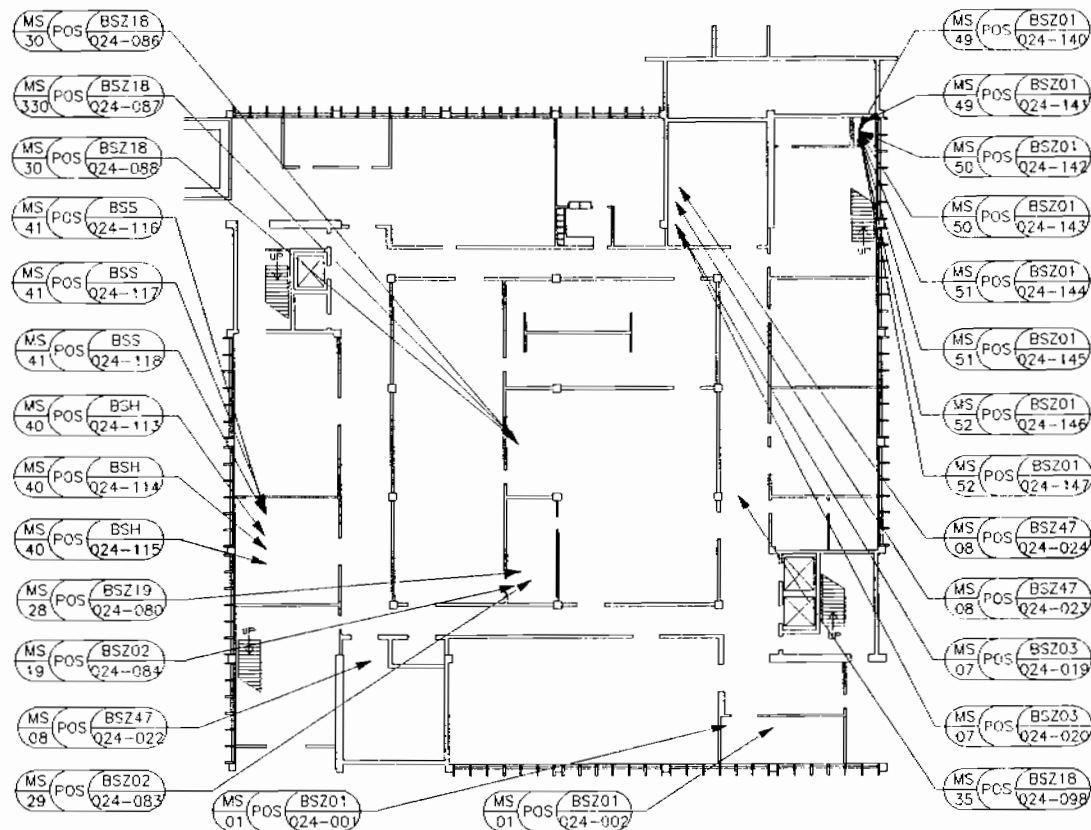
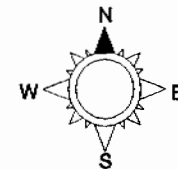
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Environmental Services
5035-A West W.T. Harris Blvd. Charlotte, NC 28269
Tel. (704) 598-2234
Fax. (704) 598-2236

PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

TITLE:
POE HALL

HAZMAT/DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 1
SCALE: NOT TO SCALE		PROJECT NUMBER: -7A008



BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z03	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIBLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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Fax. (704) 598-2236

PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

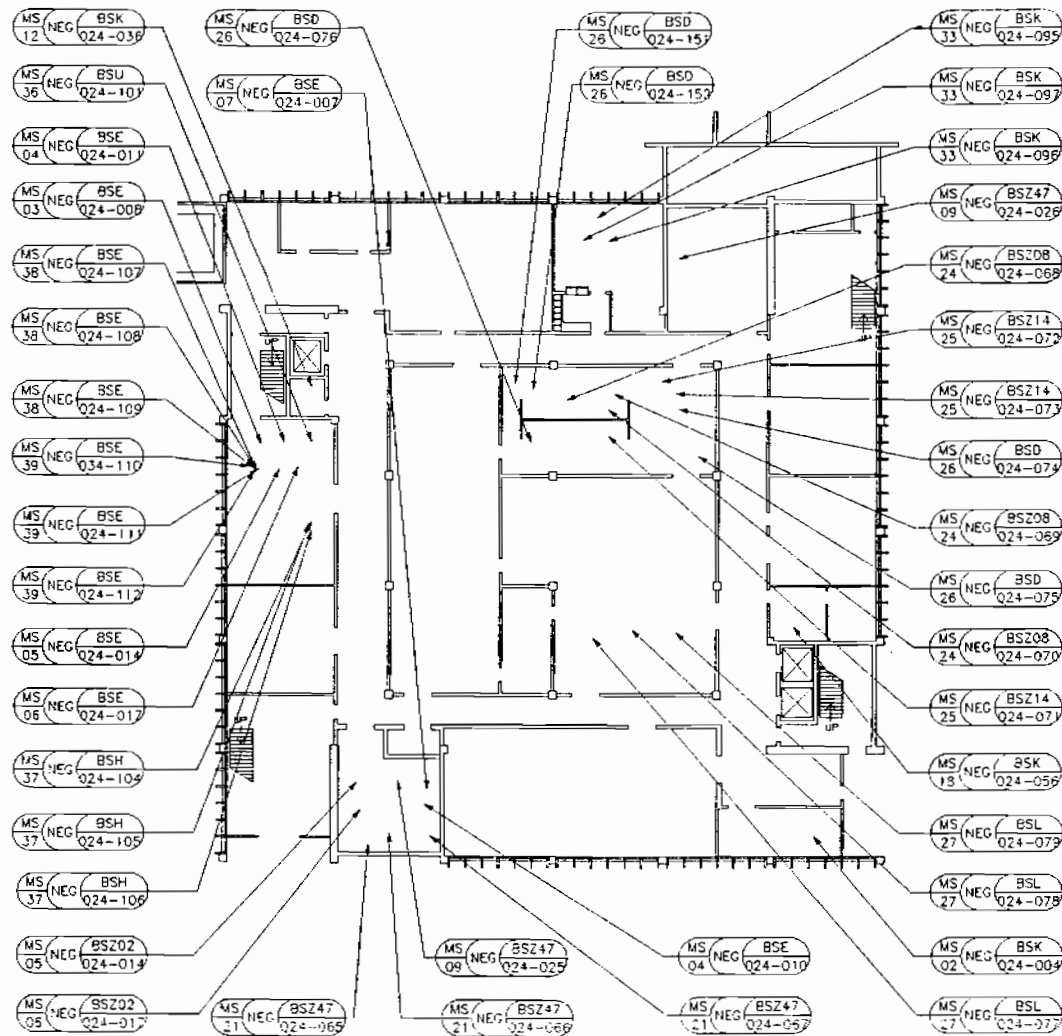
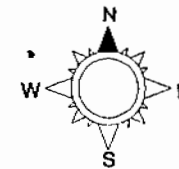
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TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS
POSITIVE RESULTS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z31	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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Tel. (704) 598-2234
Fax. (704) 598-2236

PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

HAZMAT/DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

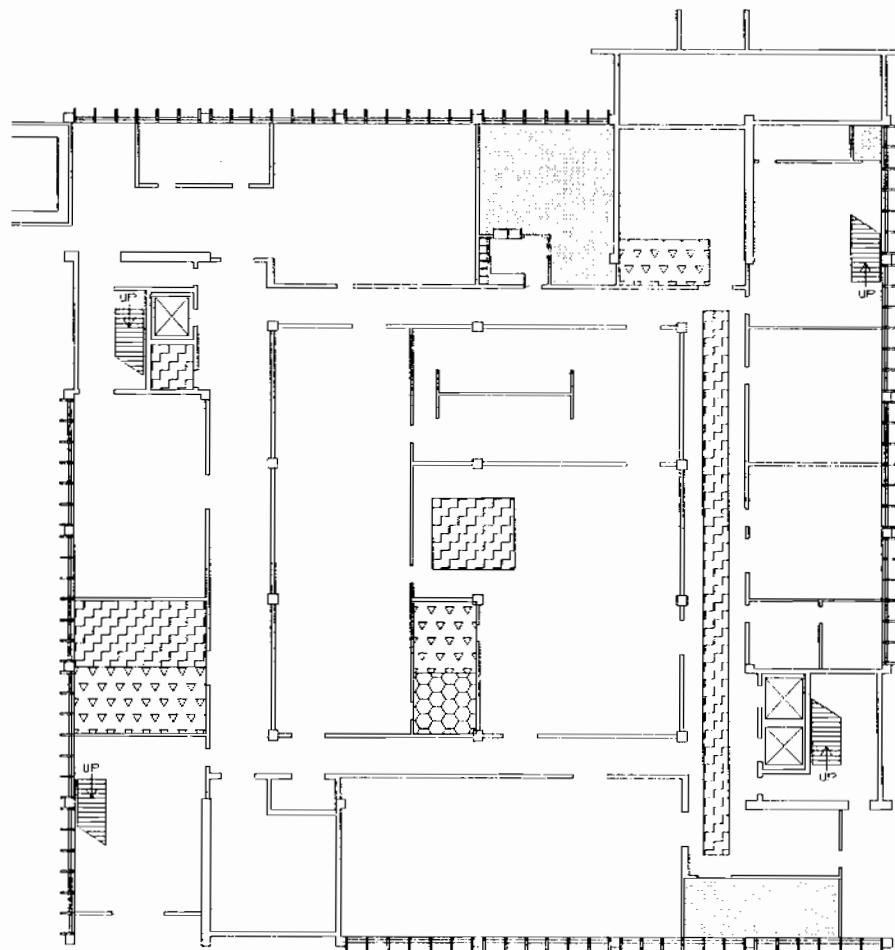
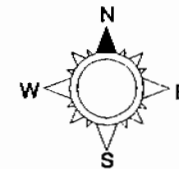
DRAWING NO.:
P 024 1

TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS
NEGATIVE RESULTS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z61	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	WSC, NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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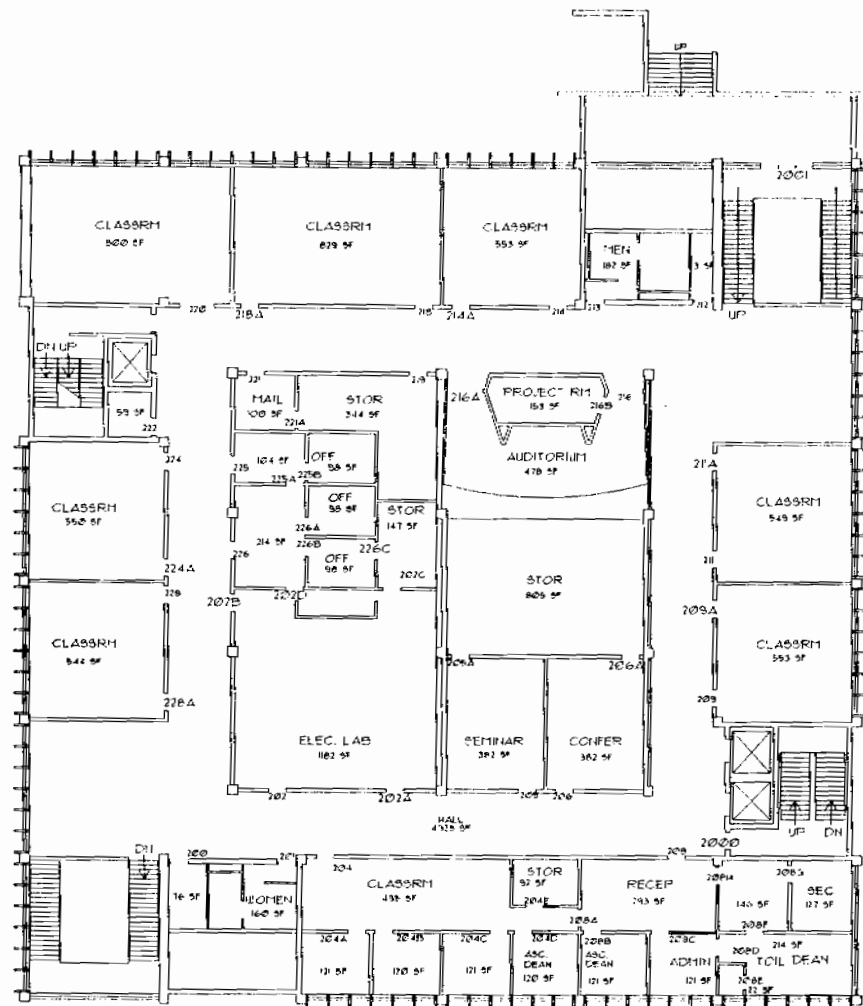
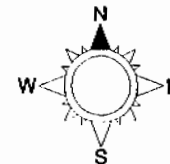
Environmental Services
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 Fax. (704) 598-2236

PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMATL DWN. BY: **A. ZDROBA**
 FLOORPLAN DWN. BY: **N.C.S.U.**
 SCALE: **NOT TO SCALE**

DATE: **MAY 1997**
 PROJECT NUMBER:

DRAWING NO.: **P 024 1**
7A008



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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

POE HALL

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

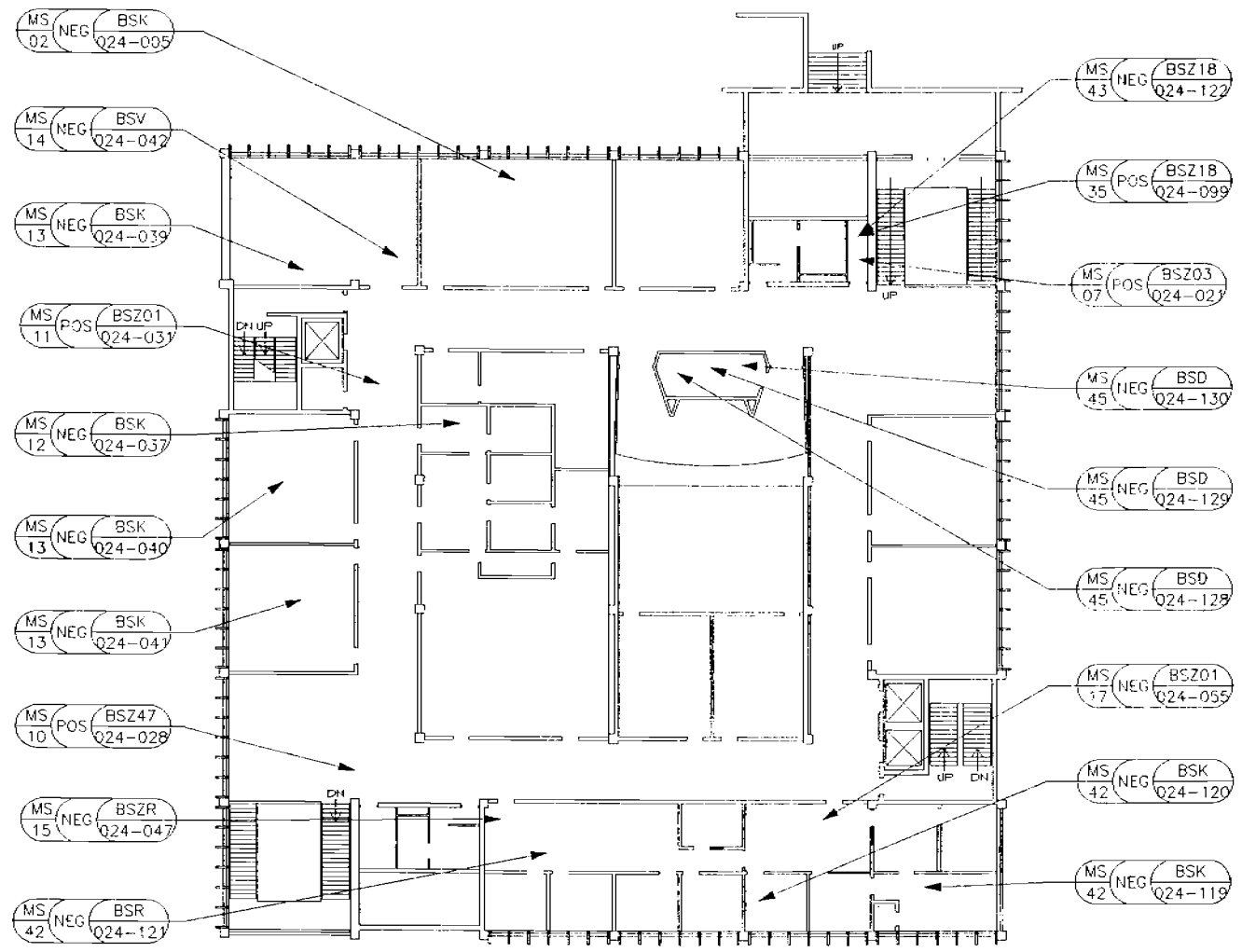
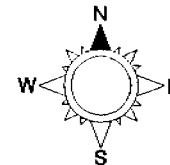
P 024 2

SCALE:

NOT TO SCALE

PROJECT NUMBER:

7A008



BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

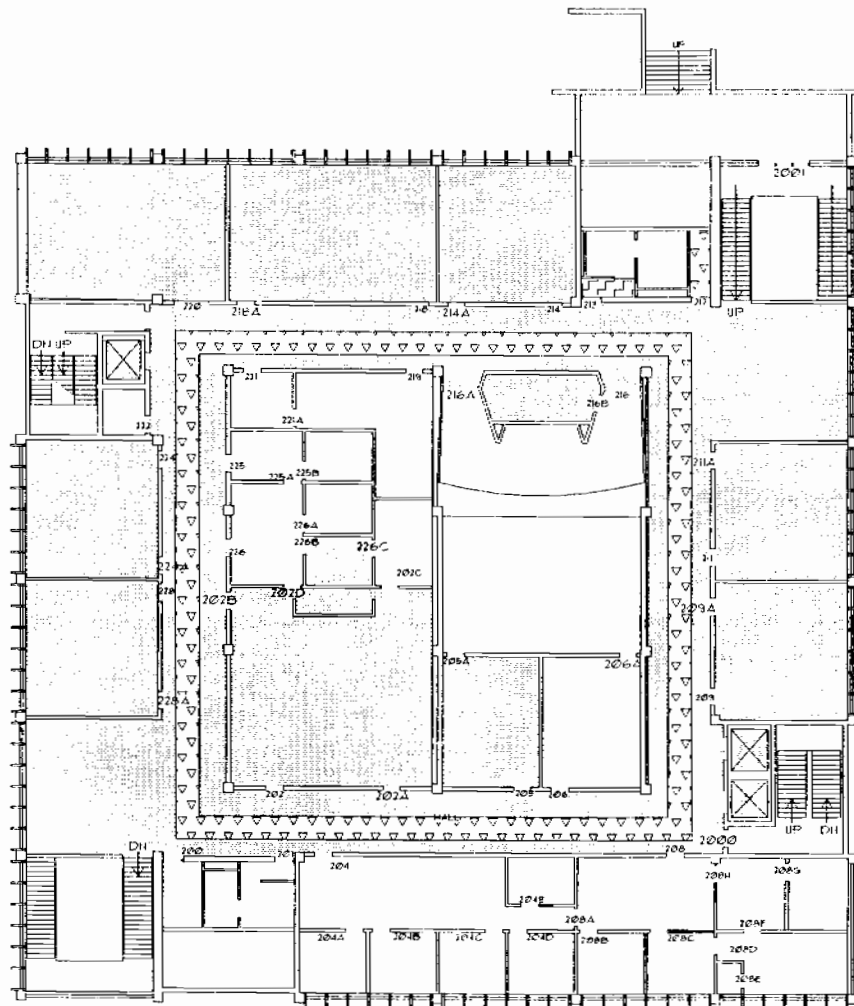
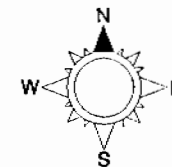
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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMATL DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 2
FLOORPLAN DWN. BY: N.C.S.U.	PROJECT NUMBER: 7A008	
SCALE: NOT TO SCALE		



BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMATL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

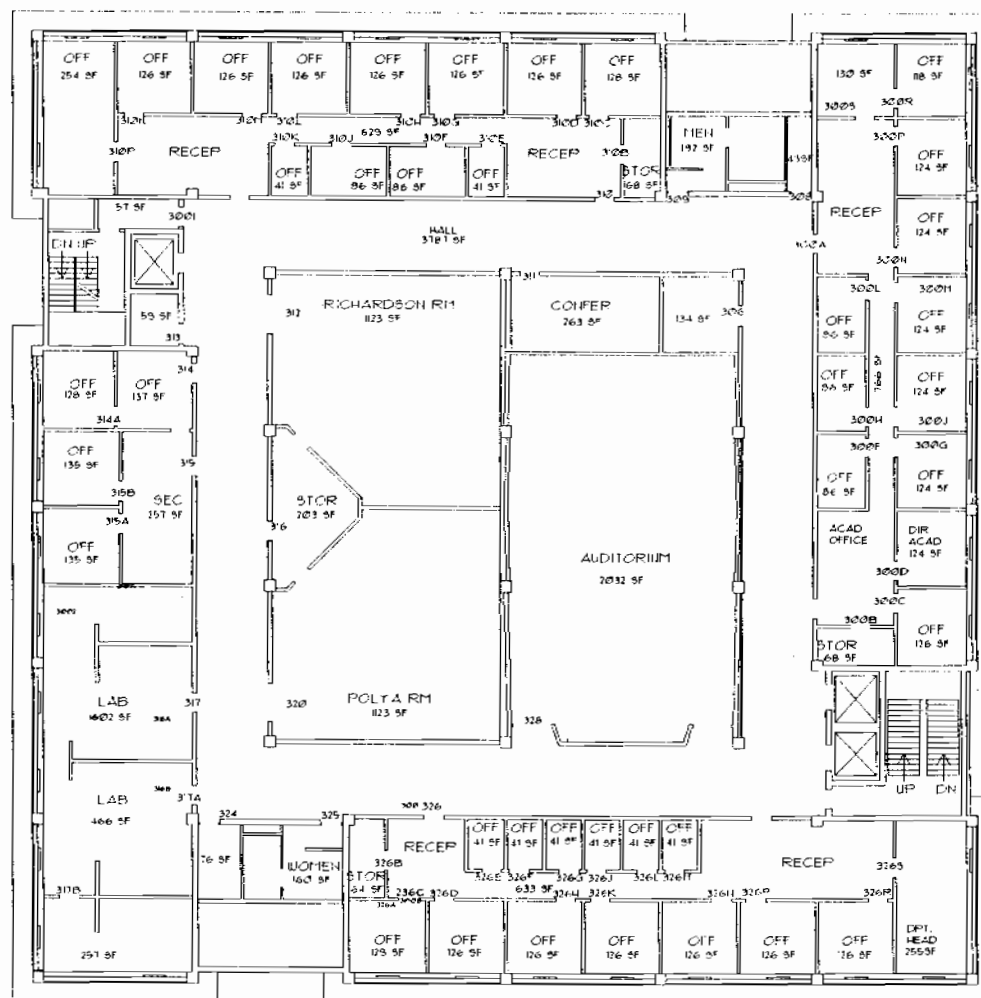
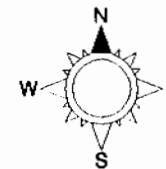
P 024 2

SCALE:

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PROJECT NUMBER:

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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

POE HALL

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

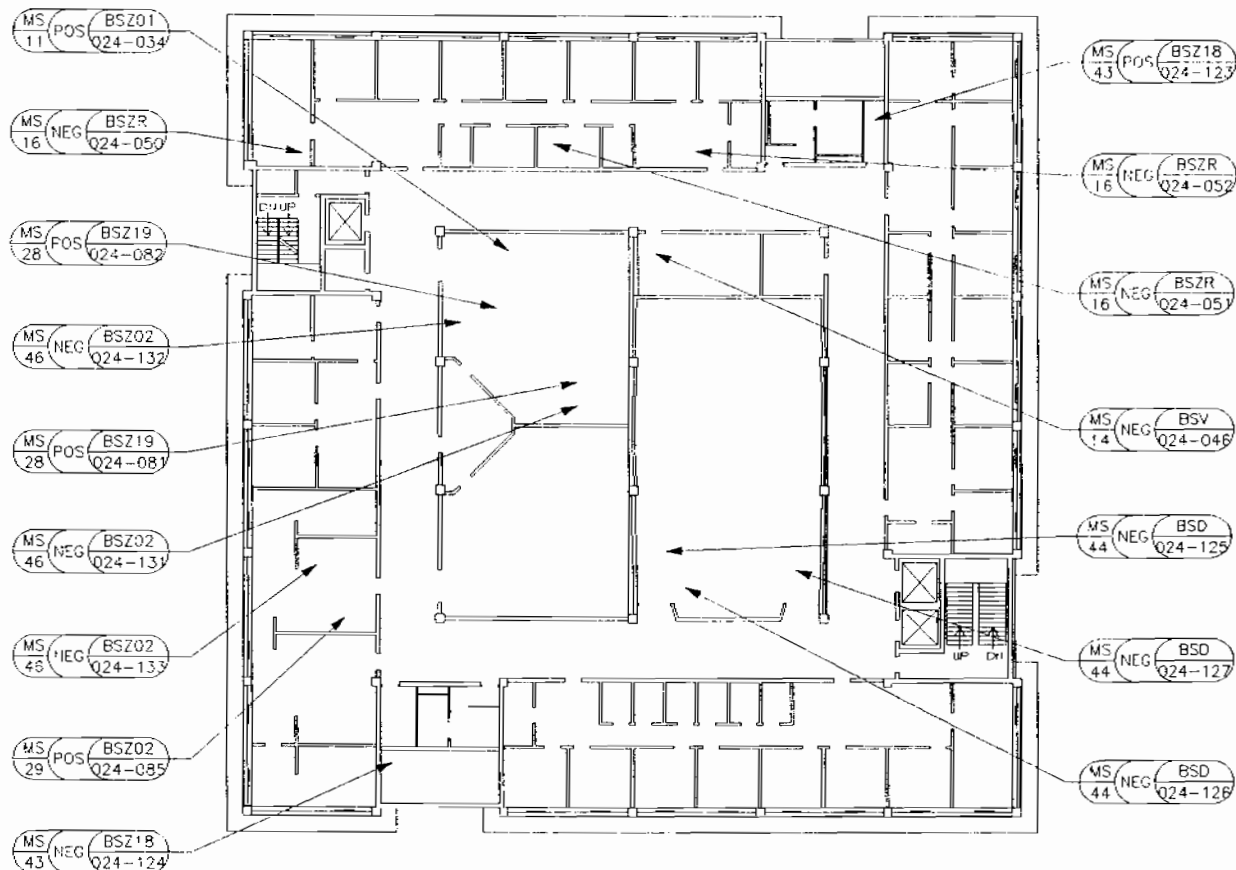
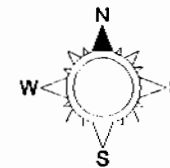
P 024 3

SCALE:

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PROJECT NUMBER:

7A008



BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	MF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMATL. DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

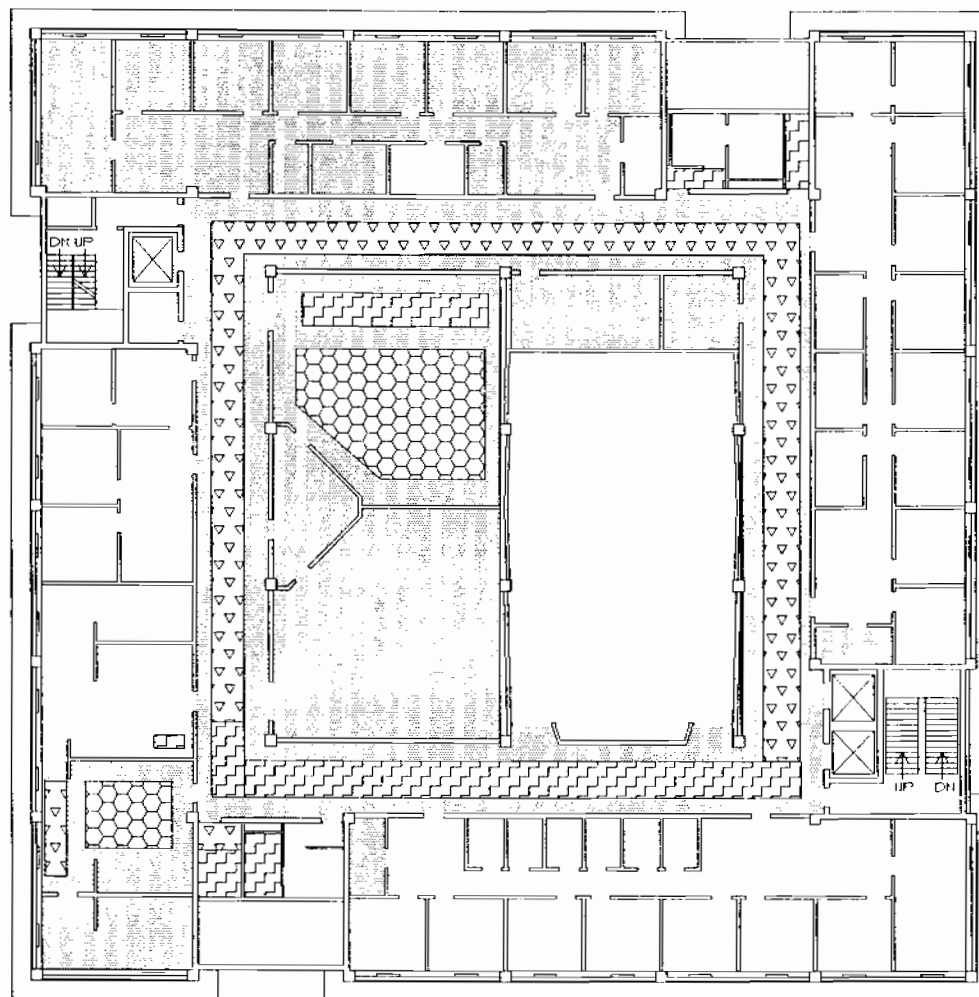
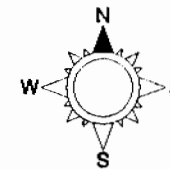
SCALE:
NOT TO SCALE

DATE:
MAY 1997

PROJECT NUMBER:

DRAWING NO.:
P 024 3

7A00B



THIRD FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

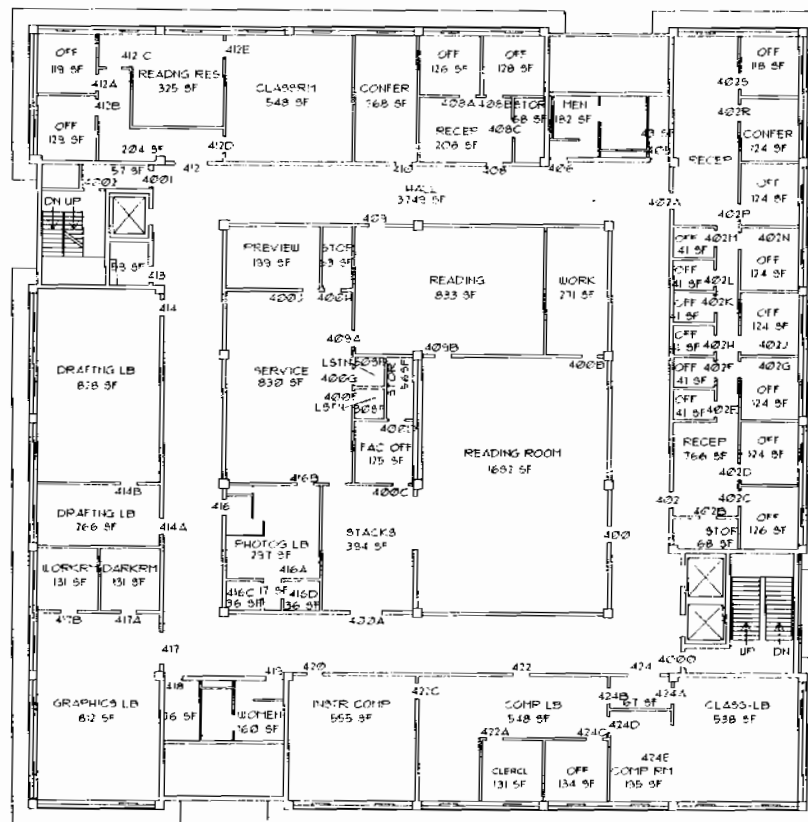
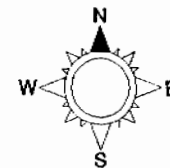
DRAWING NO.:
P 024 3

TITLE

**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

SCALE:
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PROJECT NUMBER:
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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

POE HALL

HAZMAT/DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

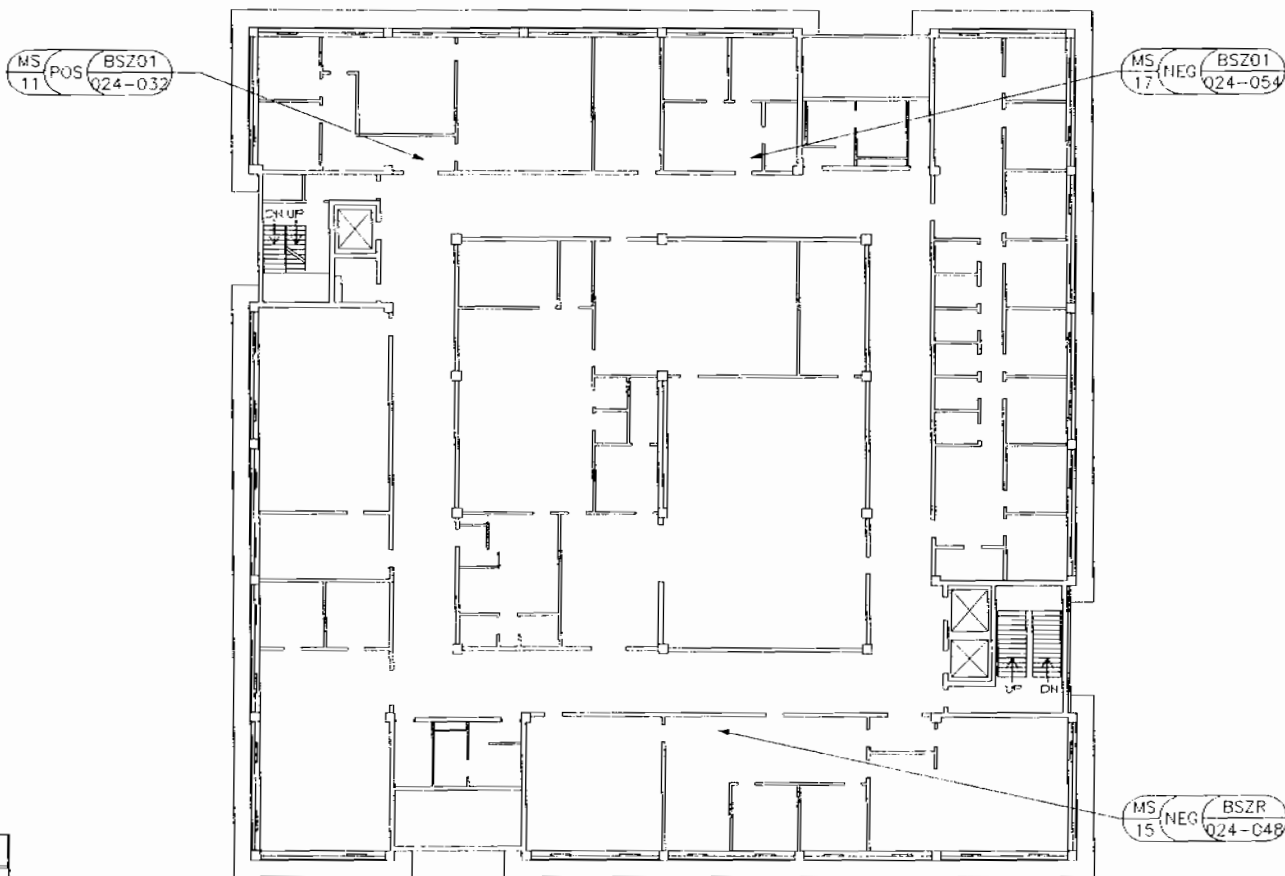
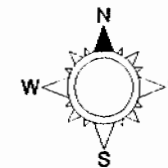
P 024 4

SCALE:

NOT TO SCALE

PROJECT NUMBER:

511-7A008



FOURTH FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSW	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BPD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z48	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

HAZMTRL DWN. BY:
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FLOORPLAN DWN. BY:
N.C.S.U.

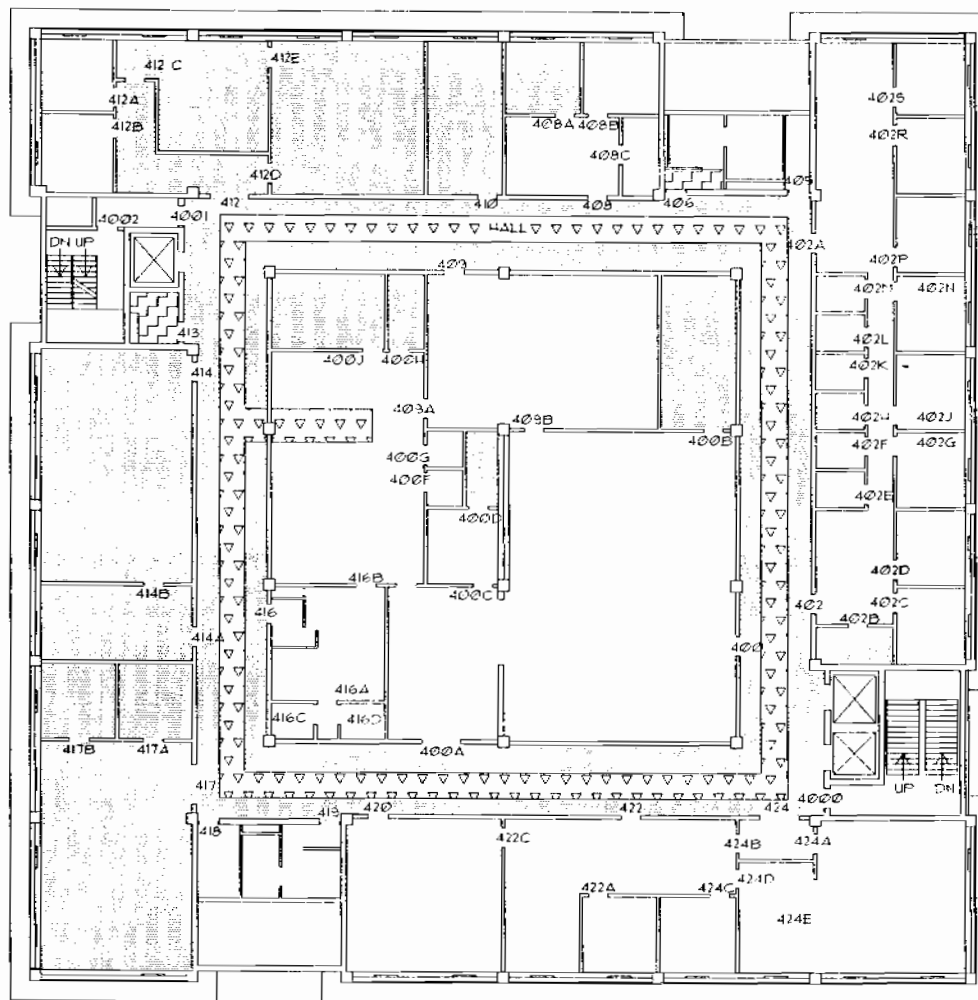
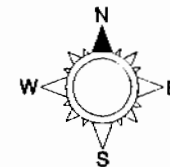
DATE:
MAY 1997

DRAWING NO.:
P 024 4

TITLE
**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



FOURTH FLOOR

BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	ZD1	FLOOR TILE
	ZD2	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIBL E ASBESTOS
	NF	MISC. NON-FRIBL E ASBESTOS
	BSA	SPRAYED ACoustICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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**NCSU
ASBESTOS SURVEY**

TITLE

**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMATL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

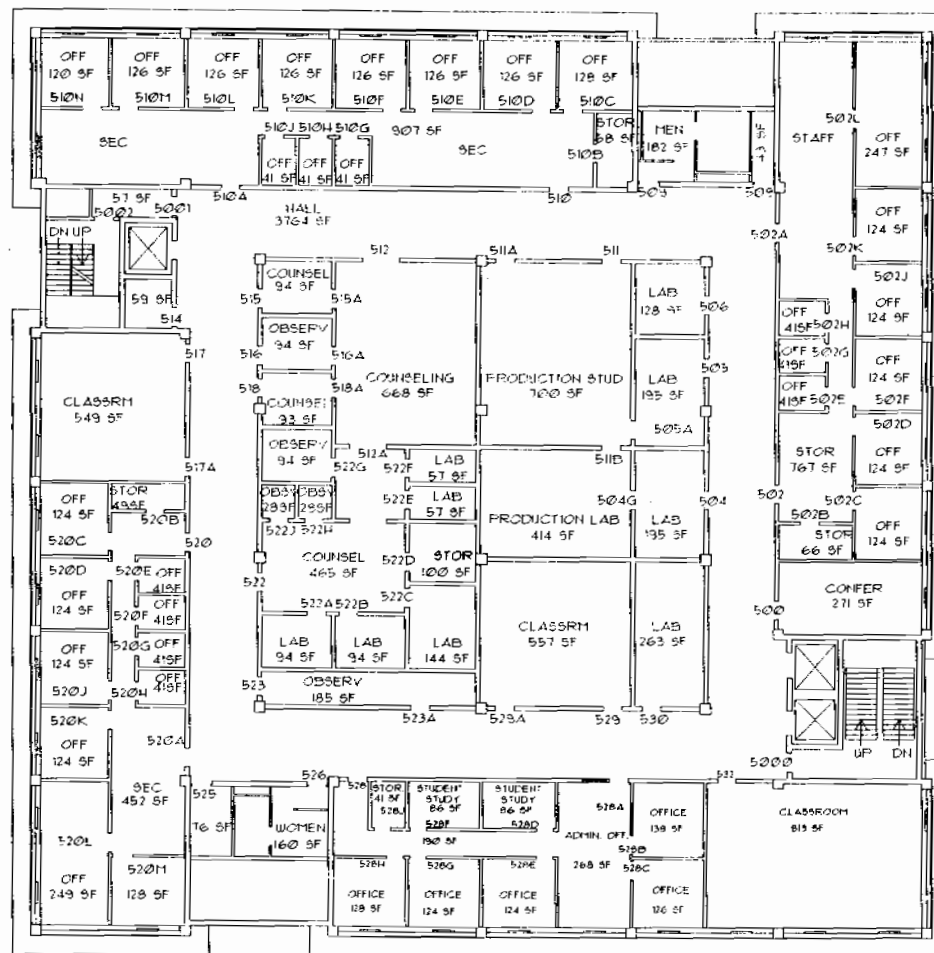
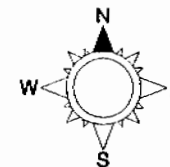
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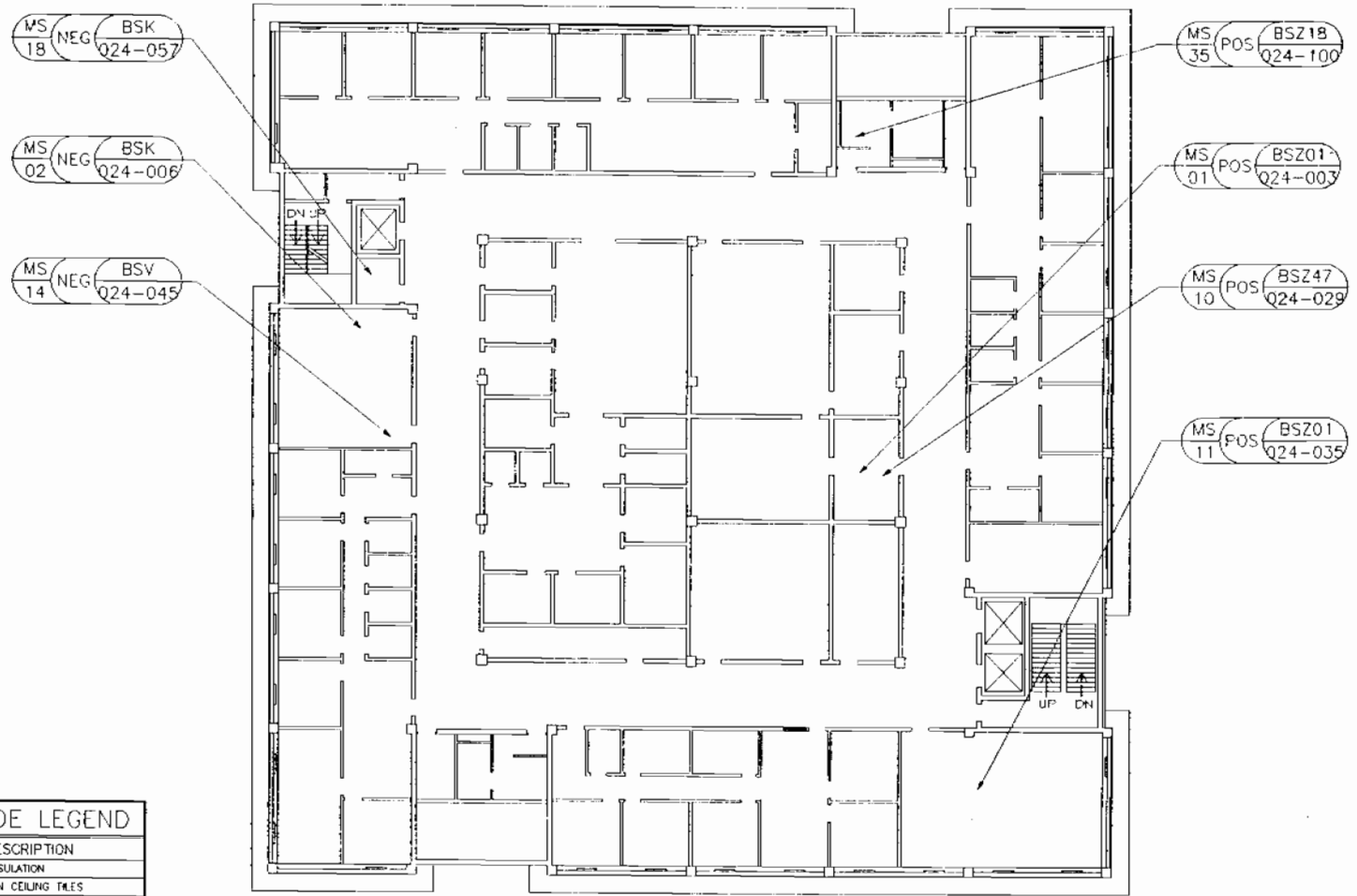
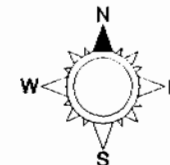
NOT TO SCALE

PROJECT NUMBER:

511-7A008



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BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

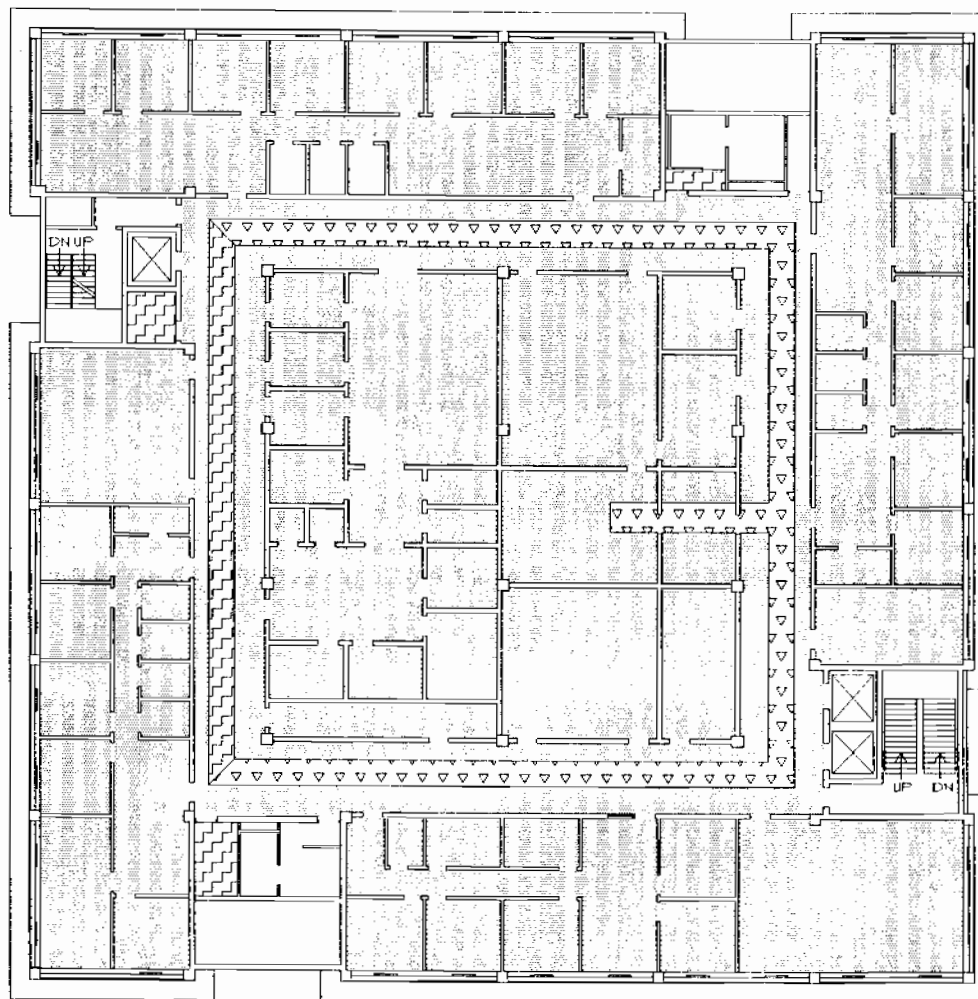
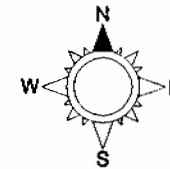
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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMATL DWN. BY: **A. ZDROBA**
 FLOORPLAN DWN. BY: **N.C.S.U.**
 SCALE: **NOT TO SCALE**
 DATE: **MAY 1997**
 DRAWING NO.: **P 024 5**
 PROJECT NUMBER: **7A008**



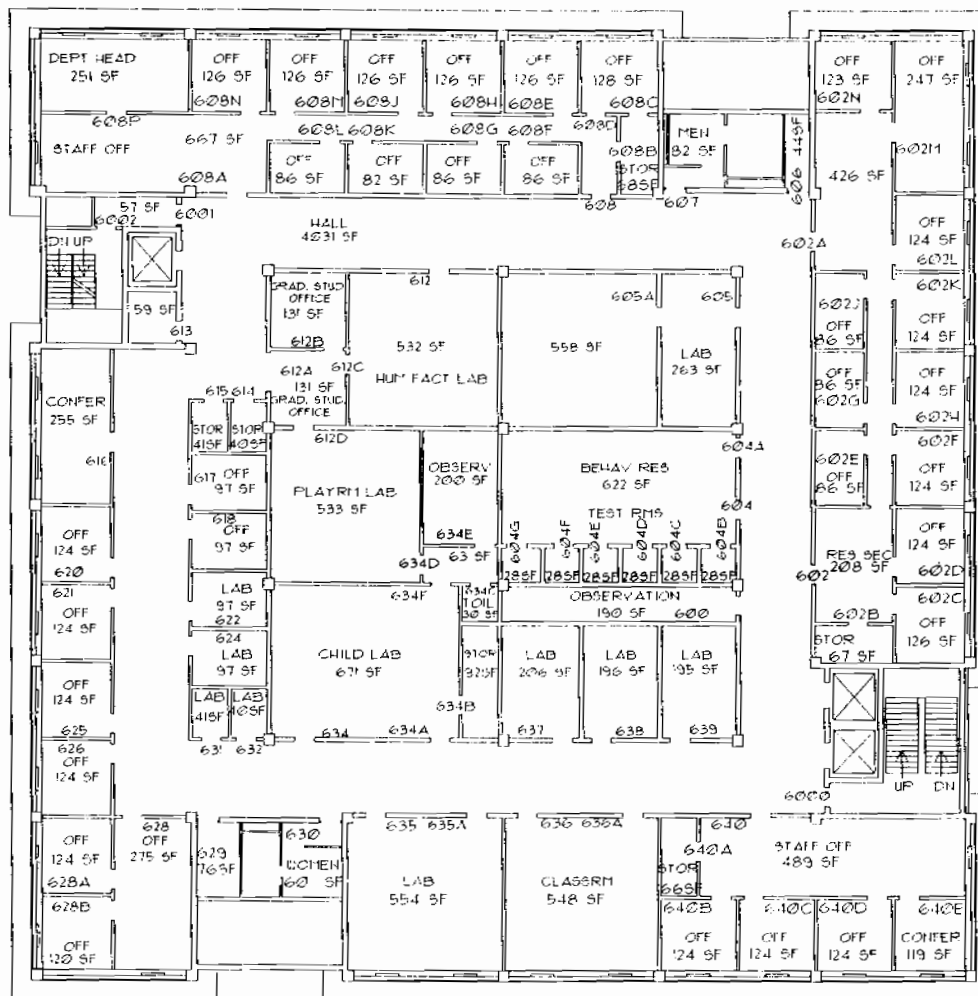
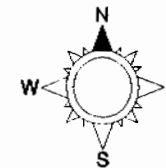
FIFTH FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSO	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME: NCSU ASBESTOS SURVEY	HAZMTRL DWN. BY: A. ZDROBA FLOORPLAN DWN. BY: N.C.S.U.	DATE: MAY 1997	DRAWING NO.: P 024 5
TITLE: POE HALL ASBESTOS-CONTAINING MATERIAL LOCATIONS	SCALE: NOT TO SCALE	PROJECT NUMBER: 511-7A008	



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PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

TITLE
POE HALL

HAZMATL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

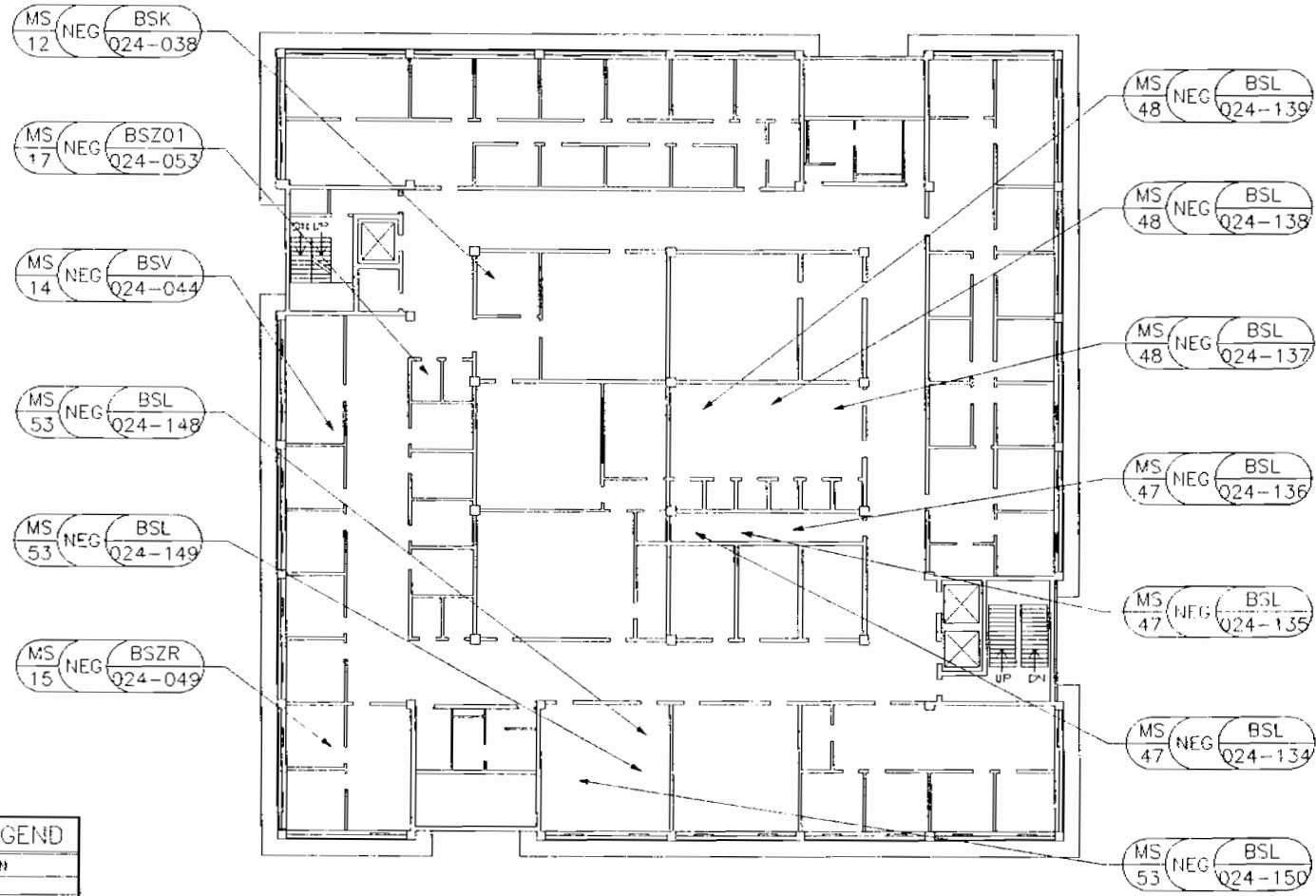
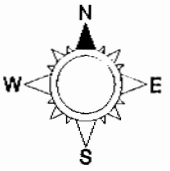
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DATE:
MAY 1997

PROJECT NUMBER:

DRAWING NO.:
P 024 6

7A008



SIXTH FLOOR

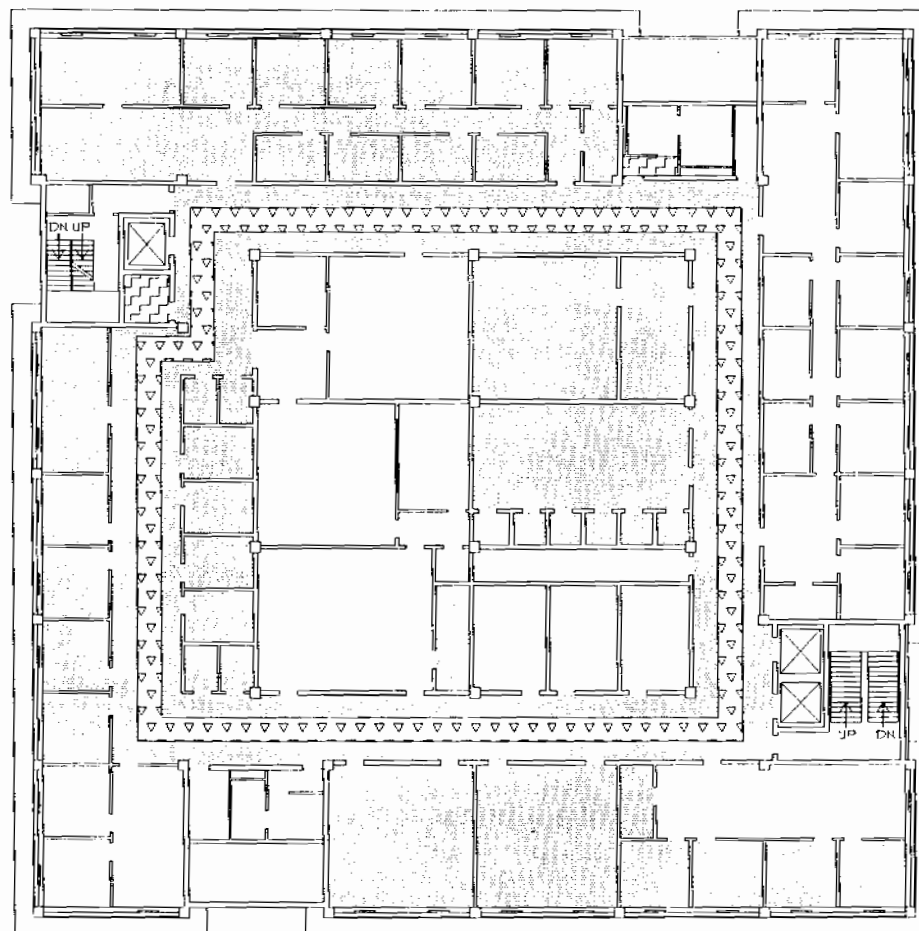
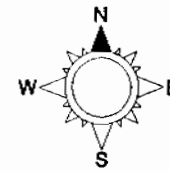
BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	201	FLOOR TILE
	202	CEMENTITIOUS PANELS
	251	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	219	LAB COUNTERTOPS
	241	COVERING UNDER TILE
	246	LINOLEUM
	247	MASTIC

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PROJECT NAME: **NCSU ASBESTOS SURVEY**
TITLE: **POE HALL SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMTRL DWN. BY: **A. ZDROBA**
FLOORPLAN DWN. BY: **N.C.S.U.**
SCALE: **NOT TO SCALE**
DATE: **MAY 1997**
DRAWING NO.: **P 024 6**
PROJECT NUMBER: **17A008**



SIXTH FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIBLE ASBESTOS
	NF	MISC. NON-FRIBLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

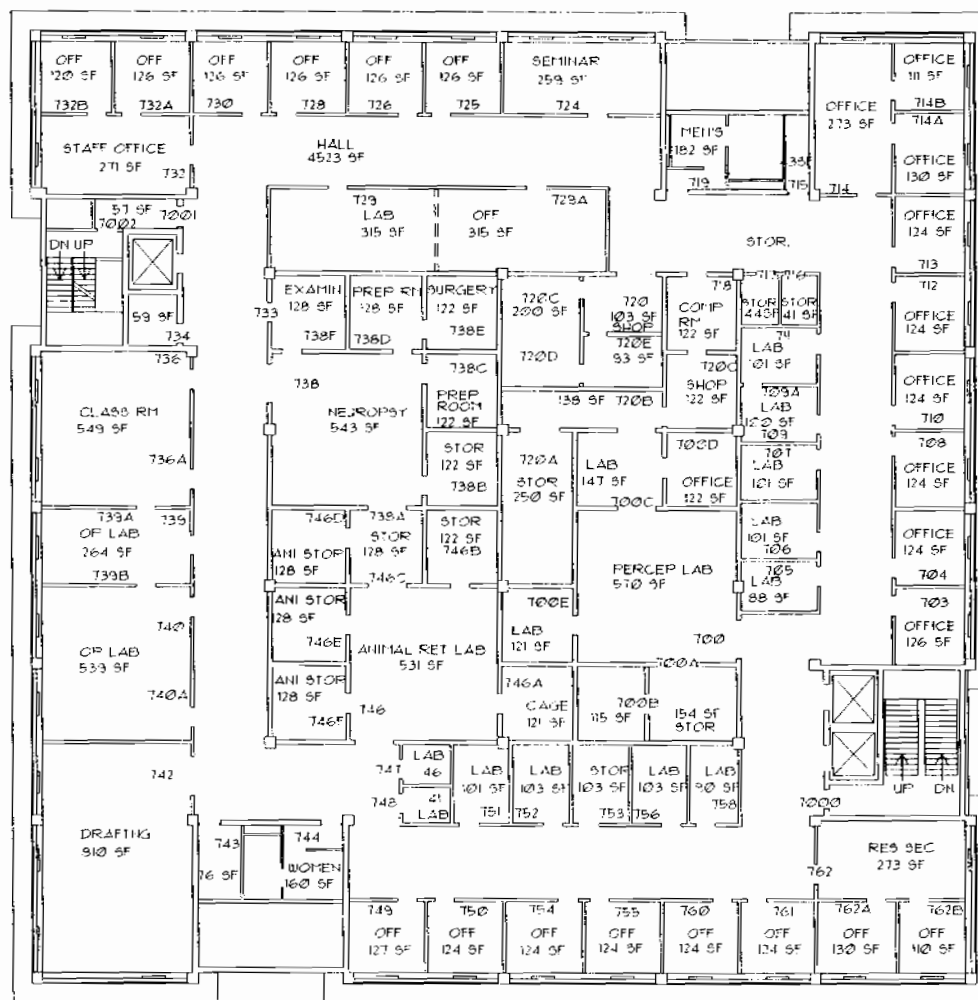
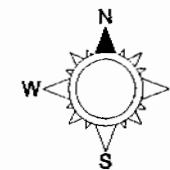
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 Fax. (704) 598-2236

PROJECT NAME: **NCSU ASBESTOS SURVEY**

TITLE: **POE HALL ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMTRL DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 6
FLOORPLAN DWN. BY: N.C.S.U.	PROJECT NUMBER: 511-7A008	
SCALE: NOT TO SCALE		



SEVENTH FLOOR



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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

POE HALL

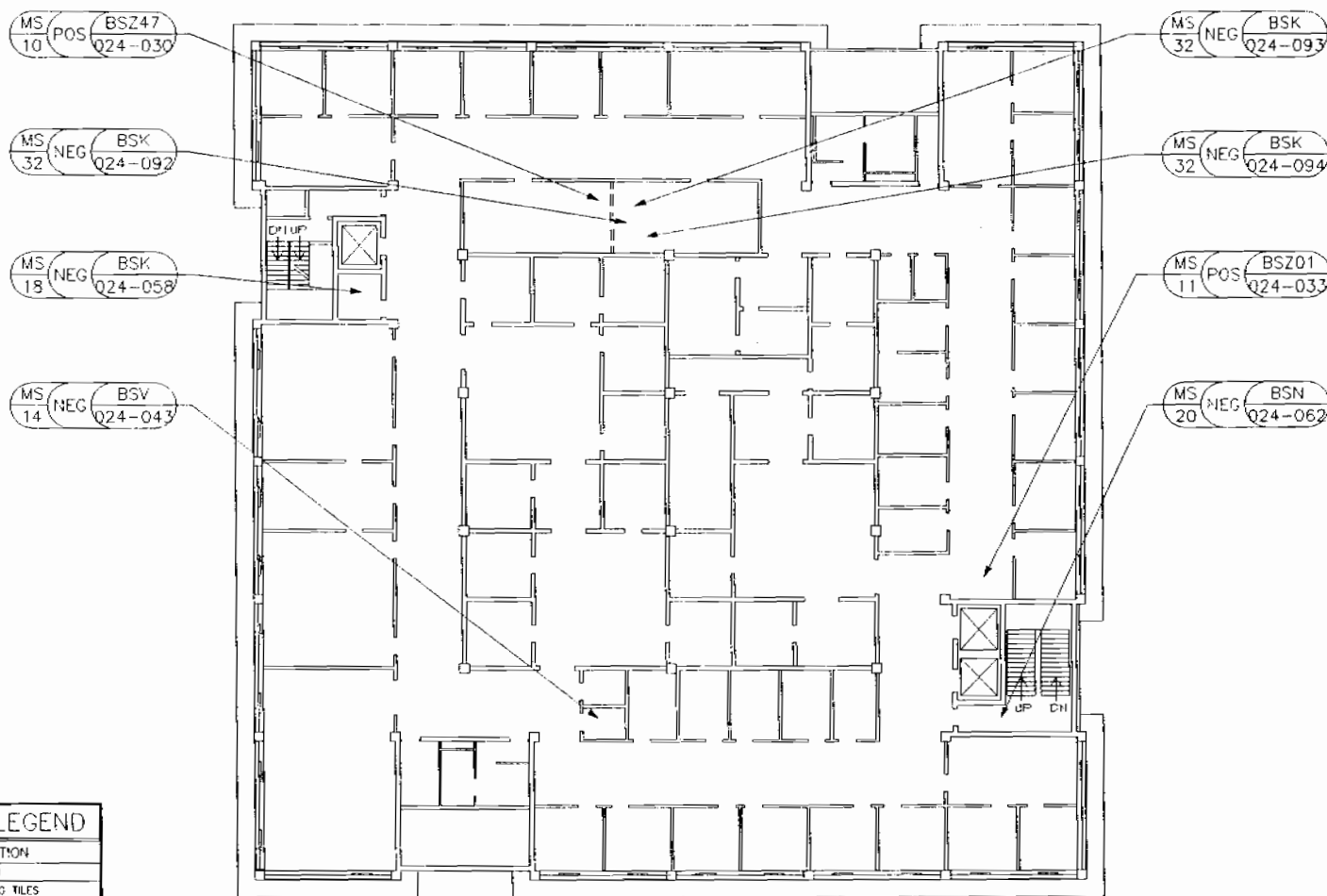
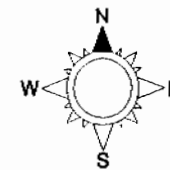
HAZMATRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

DRAWING NO.:
P 024 7

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSK	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	MF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

SEVENTH FLOOR

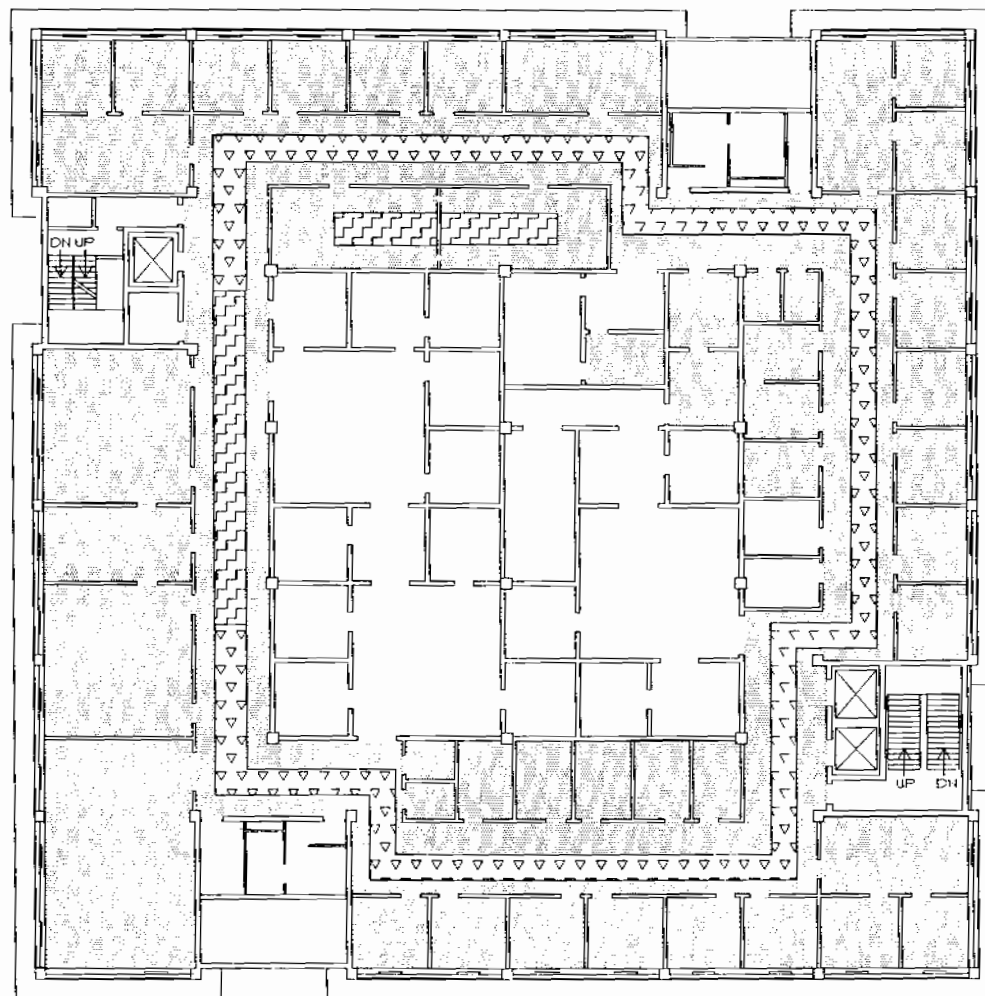
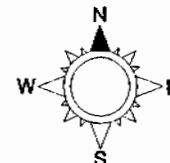
PSI Environmental
Geotechnical
Construction
Consulting • Engineering • Testing

Environmental Services
5035-A West W.T. Harris Blvd. Charlotte, NC 28269
Tel. (704) 598-2234
Fax. (704) 598-2236

PROJECT NAME: **NCSU
ASBESTOS SURVEY**
TITLE: **POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMTRL. DWN. BY: **A. ZDROBA**
FLOORPLAN DWN. BY: **N.C.S.U.**
SCALE: **NOT TO SCALE**

DATE: **MAY 1997**
DRAWING NO.: **P 024 7**
PROJECT NUMBER: **7A008**



SEVENTH FLOOR

BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	B50	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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Environmental Services
5035-A West W.T. Harris Blvd. Charlotte, NC 28269
Tel. (704) 598-2234
Fax. (704) 598-2236

PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

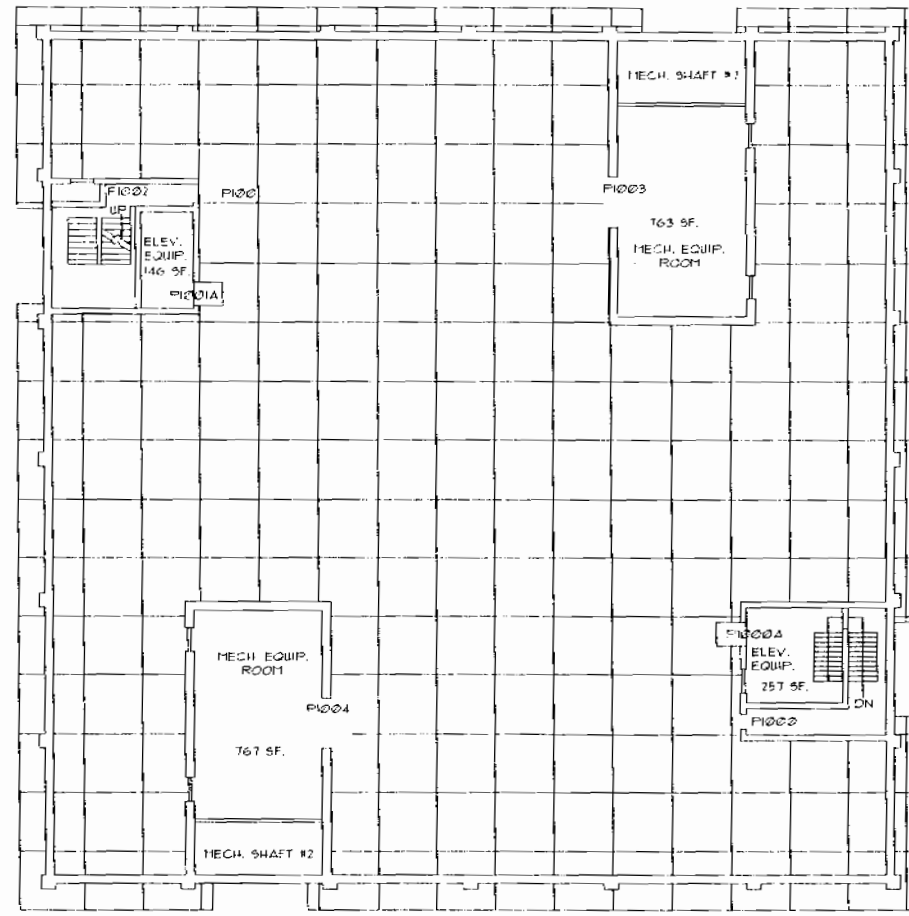
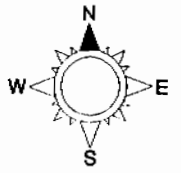
HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

SCALE:
NOT TO SCALE

DATE:
MAY 1997

PROJECT NUMBER:
1-7A008

DRAWING NO.:
P 024 7



ROOF

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Construction
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Environmental Services
5035-A West W.T. Harris Blvd. Charlotte, NC 28269
Tel. (704) 598-2234
Fax. (704) 598-2236

PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

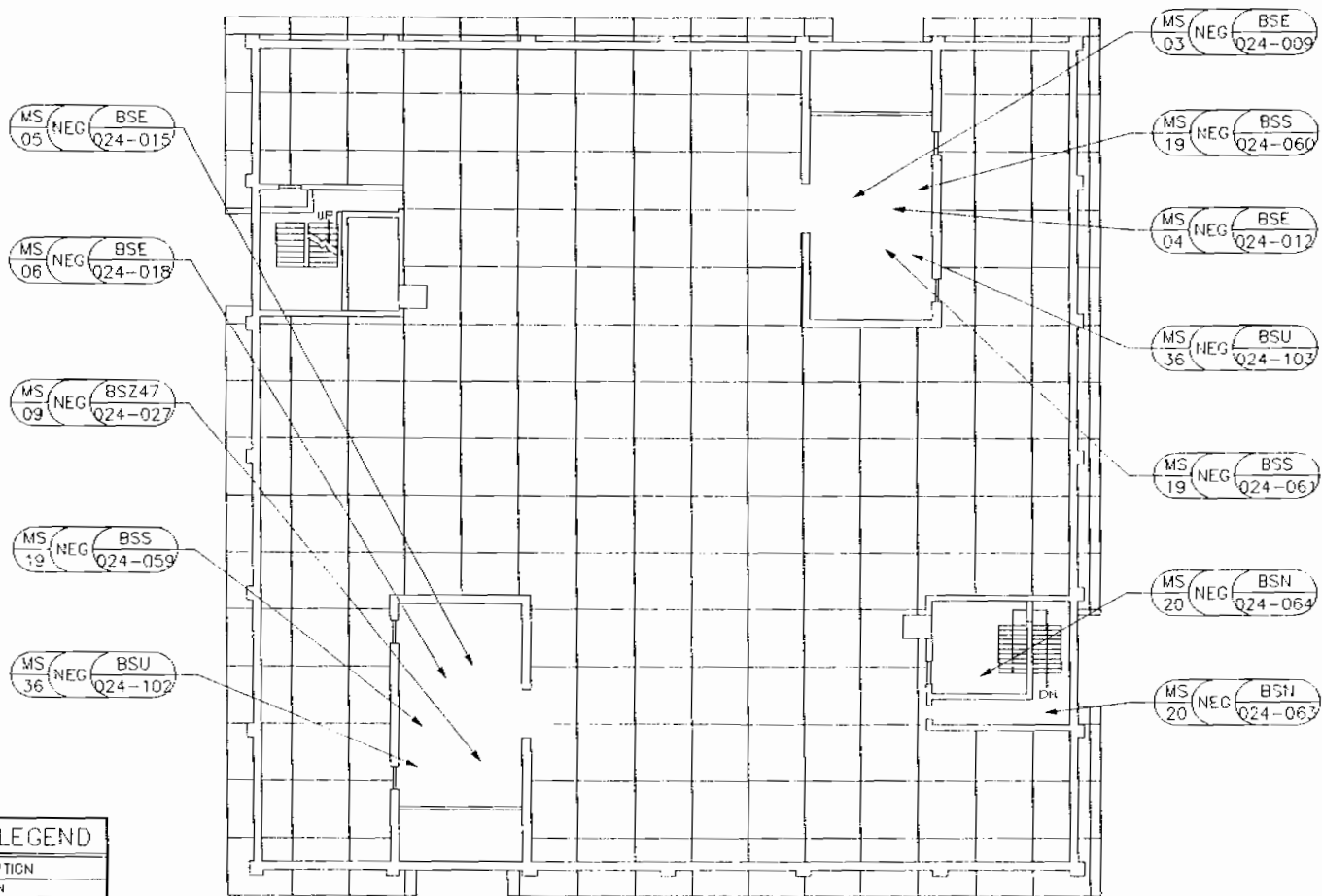
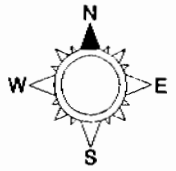
DATE:
MAY 1997

DRAWING NO.:
P 024 R

TITLE
POE HALL

SCALE:
NOT TO SCALE

PROJECT NUMBER:
11-7A008



ROOF

BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACoustICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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Environmental Services
5035-A West W.T. Harris Blvd. Charlotte, NC 28269
Tel. (704) 598-2234
Fax. (704) 598-2236

PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

HAZMATL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

P 024 R

TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

SCALE:

NOT TO SCALE

PROJECT NUMBER:

11-7A008

APPENDIX B.

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-01) 12" x 12" WHITE WITH BLACK STREAKS FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2, 3 and 4

(HGA-02) 2 " x 2" "CHICKEN TRACK" PATTERN CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-03) 8" O.D. WHITE CANVAS WRAP PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-04) MJF- PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-05) 4" O.D. WHITE CANVAS WRAP PIPE INSULATION

Reason for selecting the homogeneous area: Code A, B & C

Reason for selecting the sample location: Code 2 and 3

(HGA-06) MJP, PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-07) 1" O.D. GASKET TYPE ROPE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 & 3

(HGA-08) RED DUCT MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-09) YELLOW/TAN DUCT MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

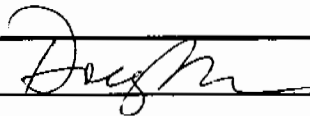
4. Previously damaged

5. Other

Inspector

Typed Name: G. Douglas Moore

Signature:



Date:

5/19/97

Accreditation Number:
10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-010) BLACK DUCT MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-011) 9" x 9" WHITE WITH BLACK STREAK FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-012) 2" x 2" "WORM TRACK" CEILING PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-013) 2" x 4" "CHICKEN TRACK" CEILING PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 1,2, and 3

(HGA-014) WALLBOARD AND JOINT COMPOUND

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2, 3 and 4

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

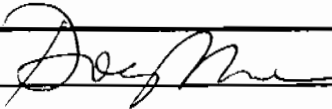
4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:



Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-015) BLACK BASEBOARD AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-016) GRAY BASEBOARD AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-017) BLACK THRESHOLD DOORWAY ACCENT STRIP

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2, 3 and 4

(HGA-018) 2" x 2" CEILING TILE WITH LINEAR FISSURE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-019) BLACK VIBRATION JOINT CLOTH

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

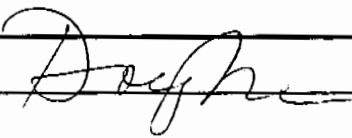
D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-020) MJP - PIPE FITTING INSULATION
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 2 and 3

(HGA-021) FOAM PANEL ADHESIVE
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

(HGA-024) (THERE IS NO HGA-22 or HGA-023) WELDING BLOCKS
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 2

(HGA-025) FURNACE BLOCK LINING
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

(HGA-026) CEILING PLASTER
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

- | | |
|---------------------------------|---------------------------|
| A. Similar color & texture | 1. Statistically random |
| B. Similar size | 2. Accessible |
| C. Similar date of installation | 3. Minimize visual impact |
| D. Other | 4. Previously damaged |
| | 5. Other |

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-027) PARTITION PANELING

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-028) LAB COUNTER TOP

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2, 3, and 4

(HGA-029) FUME HOOD LINING

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-030) PIPE INSULATION (E-TAR TYPE)

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-031) PIPE FITTING INSULATION (ASSOCIATED WITH E-TAR TYPE)

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF HOMOGENEOUS AREA

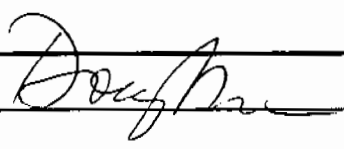
- A. Similar color & texture
- B. Similar size
- C. Similar date of installation
- D. Other

CODE: SELECTION OF SAMPLE LOCATION

- 1. Statistically random
- 2. Accessible
- 3. Minimize visual impact
- 4. Previously damaged
- 5. Other

Inspector

Typed Name: J. Silvestri/G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-032) 2" x 4" "WORM TRACK" PATTERN CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-033) 2" X 2" PINHOLE PATTERN CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-035) (THERE IS NO HGA-034) TAR COATED PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-036) WHITE PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-037) TANK INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: *J. Silvestri*

Date: 5-19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-038) 2" O.D. CANVAS WRAP PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-039) MJP - PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-040) GENERATOR EXHAUST PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-041) GRAY VIBRATION JOINT CLOTH

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-042) 2" x 2" WHITE QUAD TYPE CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

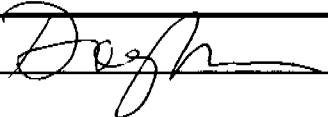
D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-043) PIPE INSULATION, TAR PAPER WRAP
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 2

(HGA-044) CEILING PLASTER PARTITION PANELS
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2 and 3

(HGA-045) WALL PLASTER
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 1,2 and 3

(HGA-046) LABORATORY SINK BOARD
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

(HGA-047) 1" x 1" ACOUSTICAL BLOCK AND ASSOCIATED MASTIC
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-048) 2" x 3" ACOUSTICAL PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-049) 12" x 12" TAN AND BROWN FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-050) 12" x 12" BROWN AND TAN STREAKS FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-051) 12" x 12" GREEN FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

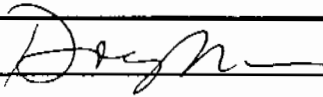
D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-052) 12" x 12" GRAY FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-053) 2" x 2" ACOUSTICAL WALL PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

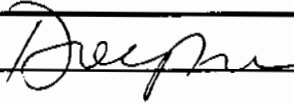
Accreditation Number: 11605/10763

Agency:
PSI

APPENDIX C.

DESCRIPTION OF SAMPLE AREA

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-01; "12x12" White with black streaks floor tile and associated	Miscellaneous material identified as an ACM. Both the floor tile and associated mastic have been identified as asbestos-containing. This material is located in Rooms 108, 504G, 120A and 114.
through		
3/14/97	024-001 Room 108	
	024-002 Room 108	
	024-003 Room 104	
3/10/97	HGA-02; "2x2" "chicken-track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Located throughout the building.
through		
3/14/97	024-004 Room 108	
	024-005 Room 218	
	024-006 Room 517	
3/10/97	HGA-03; 8" O.D. White canvas wrap pipe insulation	TSI identified as Non-ACM. Located primarily above ceiling, in Mech. Rooms, and chaseways..
through	024-007 Room 100	
3/14/97	024-008 Room 127	
	024-009 Room P1003	
3/10/97	HGA-04; MJP-Pipe Fitting Insulation	TSI identified as Non-ACM. Found in ground floor Mech. Rooms up to Penthouse, located in Pipe chases Mech. Rooms, and above some ceilings.
through	024-010 Room 100	
3/14/97	024-011 Room 127	
	024-012 Room P100	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Identification Number: 11605/10763	Agency: PSI	

DESCRIPTION OF SAMPLE AREA

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-05; 4" White canvas wrap pipe insulation	TSI identified as Non-ACM. Located primarily in Mech. Rooms, pipe chaseways and above some ceilings.
through		
3/14/97	024-013 Room 100	
	024-014 Room 127	
	024-015 Room P1004	
3/10/97	HGA-06; MJP-Pipe Fitting Insulation	TSI identified as Non-ACM. Pipe fitting insulation located primarily in Mech. Rooms, pipe chaseways, and above some ceilings.
through		
3/14/97	024-016 Room 100	
	024-017 Room 127	
	024-018 Room P1004	
3/10/97	HGA-07; 1" Gasket type rope	TSI identified as ACM. This asbestos-containing rope was located in Rooms 116 and 212..
through	024-019 Room 116	
3/14/97	024-020 Room 116	
	024-021 Room 212	
3/10/97	HGA-08; Red Duct Mastic	Miscellaneous material identified as ACM. Located throughout the building on ductwork.
through	024-022 Room 100	
3/14/97	024-023 Room 116	
	024-024 Room 116	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: <i>Doeg Moore</i>	Date: 5/20/97
Identification Number: 11605/10763	Agency: PSI	

**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97 through	HGA-09; Yellow/Tan duct mastic	Miscellaneous material identified as Non-ACM. Located throughout the building on duct work.
3/14/97	024-025 Room 100	
	024-026 Room 116	
	024-027 Room P1004	
3/10/97 through	HGA-10; Black duct mastic	Miscellaneous material identified as ACM. Located throughout the building on duct work. This ACM is Non-friable and is in good condition.
3/14/97	024-028 Room 200	
	024-029 Room 504	
	024-030 Room 729	
3/10/97 through	HGA-011; 9" x 9" White with Black streaks floor tile and associated mastic.	Miscellaneous material identifies as ACM. Both the floor tile and mastic were identified as asbestos-containing. This ACM is found in hall (floors 2-7) and in a variety of rooms throughout the building.
3/14/97	024-031 Room 200	
	024-032 Room 412	
	024-033 Room 700	
	024-034 Room 312	
	024-035 Room 532	
3/10/97 through	HGA-012; 2" x 2" "Worm track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Located sporadically throughout building.
3/14/97	024-036 Room 125	
	024-037 Room 225	
	024-038 Room 612B	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: <i>David Moore</i>	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

LEA: NCSU

School: _____

Building: Poe Hall

DESCRIPTION OF SAMPLE AREA

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-013; 2" x 4" "Chicken track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Located sporadically throughout the building.
through		
3/14/97	024-039 Room 200	
	024-040 Room 224	
	024-041 Room 228	
3/10/97	HGA-014; Wallboard and joint compound	Miscellaneous material identified as Non-ACM. Located throughout the building.
through		
3/14/97	024-042 Room 220	
	024-043 Room 748	
	024-044 Room 616	
	024-045 Room 517	
	024-046 Room 311	
3/10/97	HGA-015; Black baseboard and associated adhesive	Miscellaneous material identifies as Non-ACM located throughout the building
through		
3/14/97	024-047 Room 204	
	024-048 Room 422	
	024-049 Room 628A	
3/10/97	HGA-016; Gray baseboard and associated adhesive	Miscellaneous material identified as Non-ACM found in 310 offices.
through		
	024-050 Room 310P	
3/14/97	024-051 Room 310F	
	024-052 Room 310	

Inspector

Typed Name: J. Silvestri/G. Douglas Moore

Signature: *[Handwritten Signature]*

Date: 5/20/97

Accreditation Number: 11605/10763

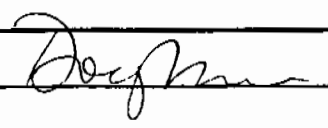
Agency: PSI
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**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-017; Black threshold door way accent strip	Miscellaneous material identified as Non-ACM. Found in classroom doorways throughout building, except the first floor.
through		
3/14/97	024-053 Room 615	
	024-054 Room 408	
	024-055 Room 208	
3/10/97	HGA-018; 2" x 2" Ceiling tile with linear fissures and random pinholes	Miscellaneous material identified as Non-ACM. Located throughout the building.
through		
3/14/97	024-056 Room 107	
	024-057 Room 514	
	024-058 Room 734	
3/10/97	HGA-019; Black vibration joint cloth	Miscellaneous material identifies as Non-ACM located at same penthouse air handlers.
through		
3/14/97	024-059 Room P1004	
	024-060 Room P1003	
	024-061 Room P1003	
3/10/97	HGA-020; MJP-Pipe fitting insulation	TSI identified as Non-ACM on drain bowls in chaseways and penthouse.
through		
3/14/97	024-062 Room 7000 (Stairs)	
3/14/97	024-063 Room P1000	
	024-064 Room P1000A	

Inspector

Typed Name: J. Silvestri/G. Douglas Moore

Signature: 

Date: 5/20/97

Accreditation Number: 11605/10763

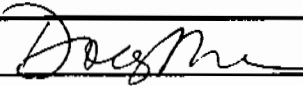
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DESCRIPTION OF

SAMPLE AREA

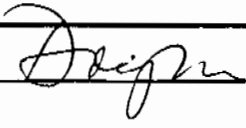
Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-021; Foam panel adhesive	Miscellaneous material identified as Non-ACM. Located in mechanical Room 100.
through		
3/14/97	024-065 Room 100	
	024-066 Room 100	
	024-067 Room 100	
3/10/97	HGA-024; (There is no HGA-22 or HGA-23) Welding Blocks	Miscellaneous material identified as Non-ACM. Located in Room 102B.
through		
3/14/97	024-068 Room 102B	
	024-069 Room 102B	
	024-070 Room 102B	
3/10/97	HGA-025; Furnace black lining	Miscellaneous material identified as Non-ACM. Located in Room 102B.
through		
3/14/97	024-071 Room 102B	
	024-072 Room 102B	
	024-073 Room 102B	
3/10/97	HGA-026; Ceiling Plaster (rough coat)	Surfacing identified as Non-ACM. Located in Room 102B
through		
3/14/97	024-074 Room 102B	
3/14/97	024-075 Room 102B	
	024-076 Room 102B	
	024-151 Room 102B	
	024-152 Room 102B	

Inspector

Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	


**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-027; Partition Paneling	Miscellaneous material identified as Non-ACM. Located in Room 102C.
through		
3/14/97	024-077 Room 102C	
	024-078 Room 102C	
	024-079 Room 102C	
3/10/97	HGA-028; Lab Counter tops	Miscellaneous material identified as ACM. Located in Room 102D, 312, and 317.
through		
3/14/97	024-080 Room 102D	
	024-081 Room 312	
	024-082 Room 312	
3/10/97	HGA-029; Fume hood lining	Miscellaneous material identified as ACM. Located in Room 102D and 317.
through		
3/14/97	024-083 Room 102D	
	024-084 Room 102D	
	024-085 Room 317	
3/10/97	HGA-030; Pipe insulation (E-Tar)	TSI identified as ACM. Found in Room 102C
through		
3/14/97	024-086 Room 102C	
3/14/97	024-087 Room 102C	
	024-088 Room 102C	
	There is no HGA-031	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

**DESCRIPTION OF
 SAMPLE AREA**

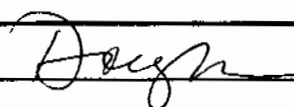
Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-032; 2" x 4" "Worm track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Found in Room 729.
through		
3/14/97	024-092 Room 729	
	024-093 Room 729	
	024-094 Room 729	
3/10/97	HGA-033; 2" x 2" Pinhole pattern ceiling tile	Miscellaneous material identified as Non-ACM. Found in Room 120A.
through		
3/14/97	024-095 Room 120A	
	024-096 Room 120A	
	024-097 Room 120A	
3/10/97	HGA-035; (there is not HGA-034) Tar coated pipe insulation	Miscellaneous material identified as ACM. Found throughout building in halls, and classrooms above ceilings.
through		
3/14/97	024-098 Room 100	
	024-099 Room 212	
	024-100 Room 509	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

DESCRIPTION OF

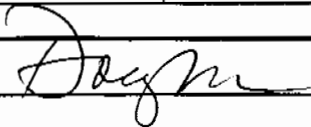
SAMPLE AREA

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-040; Generator exhaust insulation	TSI identified as ACM. Located in Mechanical Room 130.
through		
3/14/97	024-113 Room 127	
	024-114 Room 127	
	024-115 Room 127	
3/10/97	HGA-041; Gray vibration joint cloth	Miscellaneous material identified as ACM. Located in Room 130.
through		
3/14/97	024-116 Room 130	
	024-117 Room 130	
	024-118 Room 130	
3/10/97	HGA-042; 2"x 2" Ceiling tile, white quad type	Miscellaneous material identified as Non-ACM, located in same 208 office and 204 office.
through		
3/14/97	024-119 Room 208D	
	024-120 Room 208B	
	024-121 Room 204	
3/10/97	HGA-043; Pipe insulation, tar paper	TSI identified as ACM. Mixed analyzed results. Located in pipe chases, rooms 212, 312, 308, 324, 525, 509, and 500.
through	024-122 Room 212	
3/14/97	024-123 Room 312	
	024-124 Room 324	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

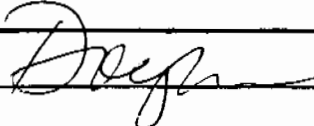
**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-044; Plaster ceiling panels	Surfacing identified as Non-ACM. Located in Room 216 Auditorium.
through		
3/14/97	024-125 Room 216	
	024-126 Room 216	
	024-127 Room 216	
3/10/97	HGA-045; Wall Plaster	Surfacing identified as Non-ACM. Located in Room 216B, Auditorium Projection room.
through		
3/14/97	024-128 Room 216B	
	024-129 Room 216B	
	024-130 Room 216B	
3/10/97	HGA-046; Laboratory sink board	Miscellaneous material identified as Non-ACM. Located in Rooms 312 and 317.
through		
3/14/97	024-131 Room 114	
	024-132 Room 114	
3/10/97	024-133 Room 317	
3/10/97	HGA-047; 1" x 1" Acoustical block and associated mastic	Miscellaneous material identified as Non-ACM. Found in Room 600.
through		
3/14/97	024-134 Room 600	
	024-135 Room 600	
	024-136 Room 600	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Asbestos Identification Number: 11605/10763	Agency: PSI	

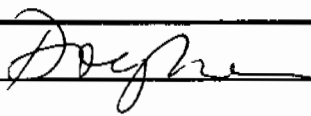
**DESCRIPTION OF
SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-048; 2" x 3" Acoustical Panel	Miscellaneous material identified as Non-ACM. Located in Room 604.
through		
3/14/97	024-137 Room 604	
	024-138 Room 604	
	024-139 Room 604	
3/10/97	HGA-049; 12" x 12" Tan and brown floor tile and associated mastic	Both floor tile and mastic are asbestos-containing. Located in Room 114.
through		
3/14/97	024-140 Room 114	
	024-141 Room 114	
3/10/97	HGA-050; 12" x 12" Brown with tan streaks floor tile and associated mastic	Both floor tile and mastic are asbestos-containing. Located in Room 114.
through		
3/14/97	024-142 Room 114	
3/10/97	024-143 Room 114	
3/10/97	HGA-051; 12" x 12" Green floor tile and associated mastic	
through		
3/14/97	024-144 Room 114	
3/10/97	024-145 Room 114	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-052; 12" x12" Gray floor tile and associated mastic	Both floor tile and mastic identified as asbestos-containing. Located in Room 114.
through		
3/14/97	024-146 Room 114	
	024-147 Room 114	
3/10/97	HGA-053; 2" x 2" Acoustical panel	Miscellaneous material identified as Non-ACM. Located in Room 635.
through		
3/14/97	024-148 Room 635	
	024-149 Room 635	
	024-150 Room 635	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

APPENDIX D.

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-01) ;12 x12" White with black streaks floor tile and associated mastic

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-001 (TILE)	CHRY	4		ACBM with potential for damage	Floor tile/mastic in good condition
024-001 (MASTIC)	CHRY	6			with low potential for damage.
024-002 (TILE)	CHRY	4			
024-002 (MASTIC)	CHRY	6			
024-003 (TILE)	ND	-			
024-003 (MASTIC)	CHRY	3			

Inspector
 Typed Name: J. Silvestri/G . Douglas Moore Signature: *Douglas Moore* 5/20/97
 Identification Number: 11605/10763 Agency: PSI

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-07); 1" Gasket Type Rope

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-019	CHRY	70	N/A	ACBM with potential for damage	Good condition, located in restricted
024-020	CHRY	70			areas, potential for damage, total
024-021	CHRY	70			quality is approx 5 linear feet.

Inspector

Typed Name: J. Silvestri/G. Douglas Moore	Signature: <i>Dejve</i>	5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

LEA: NCSU

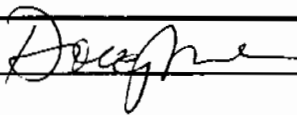
School: _____

Building: Poe Hall-Facility No. 024

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-08): Red Duct Mastic

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-022	CHRY	2	N/A	ACBM with potential for damage	Non-friable duct mastic in good
024-023	CHRY	2			condition, not accessible to public.
024-024	CHRY	2			

Inspector
Typed Name: J. Silvestri/G. Douglas Moore Signature:  5/20/97
Identification Number: 11605/10763 Agency: PSI

LEA: NCSU

School: _____

Building: Poe Hall-Facility No. 024

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-10); Black Duct Mastic

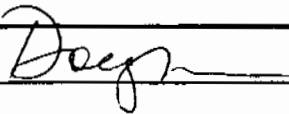
Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-028	CHRY	10	N/A	ACBM with potential for damage	Non-friable duct mastic in good
024-029	CHRY	10			condition, not accessible to public.
024-030	CHRY	10			

Inspector
 Typed Name: J. Silvestri/G. Douglas Moore Signature: *Doeghe* 5/20/97
 Identification Number: II605/10763 Agency: PSI

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-011); 9" x 9" White with black streaks floor tile and associated mastic

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-031 (TILE)	CHRY	4	N/A	ACBM with potential for damage	Floor tile and mastic in good
024-031(MASTIC)	CHRY	5			condition with low potential for damage
024-032 (TILE)	CHRY	4			
024-032 MASTIC)	CHRY	5			
024-033 (TILE)	CHRY	4			
024-033(MASTIC)	CHRY	5			
024-034 (TILE)	CHRY	4			
024-034(MASTIC)	CHRY	5			
024-035 (TILE)	CHRY	4			
024-035(MASTIC)	CHRY	5			

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	5/20/97
Identification Number: 11605/10763	Agency: PSI	

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-028): Lab Counter

HGA-029: Fume Hoodlining

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-080	CHRY	8	N/A	ACBM with potential for damage	Very hard non-friable material with potential for damage . Accessible
024-081	CHRY	8			
024-082	CHRY	8			
024-080	AMOSITE	2			
024-081	AMOSITE	2			
024-082	AMOSITE	2			
024-083	CHRY	12	N/A	ACBM with potential for damage	Non-friable material in good condition
024-084	CHRY	12			
024-085	CHRY	12			

Inspector
Typed Name: J. Silvestri/G. Douglas Moore Signature: 5/20/97
Identification Number: 11605/10763 Agency: PSI

LEA: NCSU

School: _____

Building: Poe Hall-Facility No. 024

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-035); Tar Coated Pipe Insulation
(HGA-040); Generator Exhaust Insulation

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-098	CHRY	3	N/A	ACBM with potential for amage	TSI in good condition non-
024-099	CHRY	3		damage	friable tar layer.
024-100	CHRY	3			
024-113	Amosite	10	N/A	ACBM with potential for	Friable TSI in fair condition,
024-114	Amosite	10		damage	in Mech. Room 130, not accessible
024-115	Amosite	10			to public

Inspector
 Typed Name: J. Silvestri/G. Douglas Moore Signature: *Douglas Moore* 5/20/97
 Identification Number: 11605/10763 Agency: PSI

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-041): Gray Vibrator Joint Cloth
(HGA-043): Pipe Insulation-felt/tac Coat

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-116	CHRY	60	N/A	ACBM with potential for amage	ACM in good condition, area not
024-117	CHRY	60		damage	accessible to public. ACM is friable.
024-118	CHRY	60			
024-122	ND	-	N/A	ACBM with potential for	Analytical results are mixed,
024-123	Chry	3		damage	TSI is in good condition.
024-124	ND	-			Potential for distrubance is low.

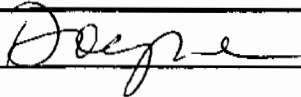
Inspector		
Typed Name: <u>J. Silvestri/G. Douglas Moore</u>	Signature: <u><i>J. Silvestri</i></u>	<u>5/20/97</u>
Identification Number: <u>11605/10763</u>	Agency: <u>PSI</u>	

ASSESSMENT OF MATERIALS

HOMOGENEOUS AREA(S): (HGA-049): "12x 12" Tan and Brown floor tile and Mastic; HGA-050: "12x12" Brown and Tan floor tile and Mastic; HGA-051: "12x12" Green floor tile and Mastic; HGA-052: "12x12" Gray floor tile and Mastic

Sample ID	Asbestos		Photo	Assessment	Comments
	Type	%			
024-0140 (tile)	CHRY	3	N/A	ACBM with potential for amage	Non-Friable ACM in good .non-
024-0140(mastic)	CHRY	5		damage	condition. 20 square ft.
024-0141 (tile)	CHRY	3			Mosiac pattern floor tile and
024-0141(mastic)	CHRY	5			associated mastic. Restricted
024-0142 (tile)	CHRY	2			closet with low potential for
024-0142(mastic)	CHRY	5			damage.
024-143 (tile)	CHRY	2			
024-143(mastic)	CHRY	5			
024-144 (tile)	CHRY	3			
024-144(mastic)	CHRY	5			
024-145 (tile)	CHRY	3			
024-145(mastic)	CHRY	5			

Inspector

Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	5/20/97
Identification Number: 11605/10763	Agency: PSI	

APPENDIX E.

BULK SAMPLE CODES

BSA	sprayed acoustical plaster (square feet)	BSZ18	roofing tar paper/felt (square feet)
BSB	trowelled acoustical plaster (square feet)	BSZ19	lab countertops (square feet)
BSC	acoustical/thermal insulation (square feet)	BSZ21	fire hose (linear feet)
BSD	hard wall/ceiling plaster (square feet)	BSZ22	fire cabinet (square feet)
BSE	pipe covering (linear feet) ___ inches O.D.	BSZ23	tongs (pair)
BSF	corrugated pipe covering (linear feet)	BSZ24	poured-in insulation (cubic feet)
BSG	wrapped cardboard/paper pipe covering (linear feet)	BSZ25	burner screen (each)
BSH	boiler/tank insulation (square feet)	BSZ26	concrete block wall (square feet)
BSI	breaching insulation (square feet)	BSZ27	contaminated soil (square feet)
BSJ	woven paper/tape (square feet)	BSZ28	fire blanket (square feet)
BSK	drop or lay-in ceiling panel (square feet)	BSZ29	metal-wrapped pipe insulation, 4 inch O.D. (linear feet)
BSL	acoustical tile (square feet)	BSZ30	metal-wrapped pipe insulation, 6 inch O.D. (linear feet)
BSM	batt-type insulation (square feet)	BSZ31	radiator blanket (square feet)
BSN	MJP on nonsuspect pipe cover (each) ___ inches O.D.	BSZ32	asbestos cloth (square feet)
BSO	MJP on pipe covering (BSE) (each) ___ inches O.D.	BSZ33	weatherproofing (square feet)
BSP	MJP on corrugated pipe covering (BSF) (each) ___ inches O.D.	BSZ34	clamp (each)
BSQ	MJP on wrapped cardboard/paper pipe covering (BSG) (each) ___ inches O.D.	BSZ35	material on meter (square feet)
BSR	fireproofing (square feet)	BSZ36	packing compound (square feet)
BSS	vibration joint cloth (square feet)	BSZ37	stored gasket (square feet)
BST	interior duct insulation (square feet)	BSZ38	stored vinyl floor tiles (square feet)
BSU	exterior duct insulation (square feet)	BSZ39	stored drop or lay-in ceiling panels (square feet)
BSV	wall/ceiling board (square feet)	BSZ40	stored rope (linear feet)
BSW	blown-in insulation (square feet)	BSZ41	covering under tile (square feet)
BSX	debris (square feet)	BSZ42	metal-wrapped pipe insulation, 8 inch O.D. (linear feet)
BSY	stored insulations/materials (cubic feet)	BSZ43	metal-wrapped pipe insulation, 10 inch O.D. (linear feet)
BSZ01	vinyl floor tiles (square feet)	BSZ44	metal-wrapped pipe insulation, 12 inch O.D. (linear feet)
BSZ02	cementitious panels (square feet)	BSZ45	honeycombed cementitious material (square feet)
BSZ03	asbestos rope (linear feet)	BSZ46	linoleum (square feet)
BSZ04	fire suit (each)	BSZ47	mastic (square feet)
BSZ05	gasket (square feet)	BSZ48	mortar and grout (square feet)
BSZ06	fire doors (each)	BSZ49	tectum (square feet)
BSZ07	asbestos gloves (pair)	BSZ50	floor underlay (square feet)
BSZ08	firebrick (square feet)	BSZ51	brown or scratch coat (square feet)
BSZ09	raw asbestos (cubic feet)	BSZ52	oven/autoclave lining (square feet)
BSZ10	cementitious piping (linear feet)	BSZ53	brake lining (square feet)
BSZ11	asbestos curtain (square feet)	BSZB	black felt covering (square feet)
BSZ12	cementitious hood (each)	BSZC	seat covering (square feet)
BSZ13	asbestos pads (each)	BSZI	black insulation (square feet)
BSZ14	kiln (square feet)	BSZR	rubberized flooring (square feet)
BSZ15	electric wire covering/insulation (linear feet)	BSZS	black screen curtain (square feet)
BSZ16	asbestos siding (square feet)	BSZW	wall covering (square feet)
BSZ17	shingles (square feet)		

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

BULK SAMPLE SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-001	01	108	BS201	12x12 floor tile		Y Y ✓
002	↓	108	↓	(white w/black streak)		Y Y ✓
003	↓	504	↓	↓		N Y ✓
004	02	108	BSK	2x2 ceiling tile		N ✓
005	↓	218	↓	(chicken track)		N ✓
006	↓	517	↓	↓		N ✓
007	03	100	BSE	Canvas wrap pipe lns (8")	116, 117, 127	N ✓
008	↓	127	↓	↓		N ✓
009	↓	P1003	↓	↓		N ✓
010	04	100	↓	Canvas wrap pipe lns MJP (8")		N ✓
011	↓	127	↓	↓		N ✓
012	↓	P1003	↓	↓		N ✓
013	05	100	↓	Canvas wrap pipe lns (4")		N ✓
014	↓	127	↓	↓		N ✓
015	↓	P1004	↓	↓		N ✓
016	06	100	↓	Canvas wrap pipe lns MJP (4")		N ✓
017	↓	127	↓	↓		N ✓
018	↓	P1004	↓	↓		N ✓
019	07	116	BS203	Gasket type rope (1")		Y ✓
020	↓	116	↓	↓		Y ✓
021	↓	212	↓	↓		Y ✓
022	08	100	BS247	Duct Mastic (Red)		Y ✓
023	↓	116	↓	↓		Y ✓
024	↓	116 116	↓	↓		Y ✓
025	09	100	↓	Duct Mastic (Tan)		N ✓
026	↓	116	↓	↓		N ✓
027	↓	P1004	↓	↓		N ✓
028	10	200 (Hall)	↓	Duct Mastic (Black)	504, 200, 729	Y ✓
029	↓	504	↓	↓		Y ✓
030	↓	729	↓	↓		Y ✓
031	11	200	BS201	9x9 floor tile		Y Y ✓
032	↓	412	↓	(white w/black streak)		Y Y ✓
033	↓	700	↓	↓		Y Y ✓
034	↓	312	↓	↓		Y Y ✓
035	↓	532	↓	↓		Y Y ✓
036	12	125	BSK	2x2 ceiling tile		N ✓
037	↓	225	↓	(worm track)		N ✓
038	↓	102B	↓	↓		N ✓

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

BULK SAMPLE SHEET

Building No.: 024
Building Name: Pea Hall
Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-039	13	220	BSK	2x4 ceiling tile		N
-040	↓	224	↓	↓ (chicken track)		N
-041	↓	228	↓	↓ ↓ ↓		N
-042	14	220	BSV	Wall Board (Drywall)		<1
-043	↓	748	↓	↓ ↓ ↓		<1
-044	↓	616	↓	↓ ↓ ↓		<1
-045	↓	517	↓	↓ ↓ ↓		<1
-046	↓	311	↓	↓ ↓ ↓		<1
-047	15	200	BSZR	Baseboard w/mastic		N N
-048	↓	422	↓	↓ (black)		N N
-049	↓	628A	↓	↓ ↓ ↓		N N
-050	16	310P		Baseboard w/mastic		N N
-051	↓	310F		↓ (grey)		N N
-052	↓	310	↓	↓ ↓ ↓		N N
-053	17	615	BSZ01	Threshold (black)		N N
-054	↓	408	↓	↓ ↓ ↓		N N
-055	↓	208	↓	↓ ↓ ↓		N N
-056	18	107	BSK	2x2 ceiling tile	107, 109, 109A, 514	N
-057	↓	514	↓	↓ (linear fissures)	734	N
-058	↓	734	↓	↓ ↓ ↓		N
-059	19	P1004	BSS	Vibration Joint Cloth		N
-060	↓	P1003	↓	↓ (Black)		N
-061	↓	P1003	↓	↓ ↓ ↓		N
-062	20	7000	BSN	Mudded Packings	Stairs Stairs	N
-063	↓	P1000	↓	↓ (Drain bowls)	stairs	N
-064	↓	P1000A	↓	↓ ↓ ↓	switch room	N
-065	21	100	BSZ47	Foam Panel Adhesive		N
-066	↓	100	↓	↓ ↓ ↓		N
-067	↓	100	↓	↓ ↓ ↓		N
-068	24	102B	BSZ08	Welding Blocks		N
-069	↓	102B	↓	↓ ↓ ↓		N
-070	↓	102B	↓	↓ ↓ ↓		N
-071	25	102B	BSZ14	Kiln/Furnace lining		N
-072	↓	102B	↓	↓ ↓ ↓		N
-073	↓	102B	↓	↓ ↓ ↓		N
-074	26	102B	BSD	Ceiling Plaster		N
-075	↓	102B	↓	↓ (rough coat)		N
-076	↓	102B	↓	↓ ↓ ↓		N

Notes: Homogeneous Material Number "22" Not Used
" " " "23" " "

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

BULK SAMPLE SHEET

Building No.: 024
 Building Name: Pop Hall
 Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-077	27	102C	BSL	Partition Paneling		N
-078	↓	102C	↓	↓ ↓ ↓		N
-079	↓	102C	↓	↓ ↓ ↓		N
-080	28	102D	BSZ19	Lab Counter top		Y
-081	↓	312	↓	↓ ↓ ↓		Y
-082	↓	312	↓	↓ ↓ ↓		Y
-083	29	102D	BSZ02	Fume Hood Lining		Y
-084	↓	102D	↓	↓ ↓ ↓		Y
-085	↓	317	↓	↓ ↓ ↓		Y
-086	30	102C	BSZ18	Pipe Insulation (E-TAR, 12")		Y
-087	↓	102C	↓	↓ ↓ ↓		Y
-088	↓	102C	↓	↓ ↓ ↓		Y
-089	31	VOID	BSQ	Pipe Insulation (E-Tar, 12") MSP	NOT SAMPLE	VOID
-090	↓	VOID	↓	↓ ↓ ↓		VOID
-091	↓	VOID	↓	↓ ↓ ↓		VOID
-092	32	729	BSK	2x4 Ceiling tile		N
-093	↓	729	↓	(worm track)		N
-094	↓	729	↓	↓ ↓ ↓		N
-095	33	120A	BSK	2x2 Ceiling tile	(Room 120A)	N
-096	↓	120A	↓	(pin hole)	(After 4:30)*	N
-097	↓	120A	↓	↓ ↓ ↓		N
-098	35	100	BSZ18	Tar Coated Pipe Ins.	Hallway Ceiling	Y
-099	↓	212	↓	↓ ↓ ↓		Y
-100	↓	509	↓	↓ ↓ ↓		Y
-101	36	127	BSU	Duct Insulation		N
-102	↓	P1004	↓	(white canvas)		N
-103	↓	P1063	↓	↓ ↓ ↓		N
-104	37	127	BSH	Tank Insulation		N
-105	↓	127	↓	↓ ↓ ↓		N
-106	↓	127	↓	↓ ↓ ↓		N
-107	38	127	BSE	Canvas Wrap pipe Ins (2")	(Grand Floor MEK)	N
-108	↓	127	↓	↓ ↓ ↓		N
-109	↓	127	↓	↓ ↓ ↓		N
-110	39	127		Canvas Wrap pipe Ins (2") MSP		N
-111	↓	127	↓	↓ ↓ ↓		N
-112	↓	127	↓	↓ ↓ ↓		N
-113	40	#T30	BSE	Generator Exh. Insulation		Y
-114	↓	#T30	↓	↓ ↓ ↓		Y

Notes: Homogeneous Material Number "34" Not Used

BULK SAMPLE SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-115	40	130 TT7	BSE	Generator Exh. Insulation		Y
116	41	130	BSS	Vibration Joint Cloth		Y
117	↓	130	↓	↓	(Grey)	Y
118	↓	130	↓	↓	↓	Y
119	42	208D	BSK	2x2 white Quad Type Lay In.		N
120	↓	208B	↓	↓	ceiling tile	N
121	↓	204	↓	↓	↓	N
122	43	212	BSE1B	Pipe Insulation	Chasewong	N
123	↓	312	↓	↓	(felt/Tar coat)	Y
124	↓	324	↓	↓	↓	N
125	44	216	BSD	Plaster Ceiling Panels	(Auditorium)	N
126	↓	216	↓	↓	↓	N
127	↓	216	↓	↓	↓	N
128	45	216B	BSD	Wall Plaster (smooth)	(projection rm.)	N
129	↓	216B	↓	↓	↓	N
130	↓	216B	↓	↓	↓	N
131	46	312	BS202	Laboratory Sink		N
132	↓	312	↓	↓	↓	N
133	↓	317	↓	↓	↓	N
134	47	600	BSL	Acoustical Block (1x1)	(Room 600)	N
135	↓	600	↓	↓	with mastic	N
136	↓	600	↓	↓	↓	N
137	48	604	BSL	2'x3' Acoustical Panels	(Room 604)	N
138	↓	604	↓	↓	↓	N
139	↓	604	↓	↓	↓	N
140	49	114	BS201	12x12 Flex tile w/mastic	(tan w/brown)	Y
141	↓	114	↓	↓	↓	Y
142	50	114	↓	↓	(Brown w/Tan)	Y
143	↓	114	↓	↓	↓	Y
144	51	114	↓	↓	(Green)	Y
145	↓	114	↓	↓	↓	Y
146	52	114	↓	↓	(Green)	Y
147	↓	114	↓	↓	↓	Y
148	53	635	BSL	2x2 Acoustical panel	(Room 635)	N
149	↓	635	↓	↓	↓	N
150	↓	635	↓	↓	↓	N
151	26	102B	BSD	Ceiling Plaster		N
152	↓	102B	↓	↓	(Rough)	N

Notes: _____

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	01-001		01-002		01-003	
layer no.:	1	2	1	2	1	2
Material Type	Z01	Z01	Z01	Z01	Z01	Z01
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic	Floor Tile	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	White	Black	White	Black	White	Black
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes	None Detected	Yes
ASBESTOS(Type & Percent)						
Chrysotile	4	6	4	6		3
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	4	6	4	6	0	3
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	46	94	46	94	40	97
Calcite	50		50		60	
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A 1 Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,

David Griffin
 Microscopist

Wayne Johnson
 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.

Bldg 024

Charlotte, NC 28269

Poe Hall ACM Survey

Attn: Brian Ball

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21215

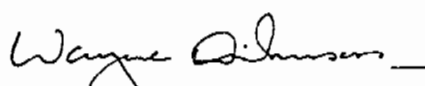
Sample number: layer no.:	02-004	02-005	02-006	03-007	03-008	03-009
Material Type	K	K	K	E	E	E
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Pipe Wrap	Pipe Wrap	Pipe Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Beige	Beige	Beige	Yellow/Tan	Yellow/Tan	Yellow/Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	20	20	20	68	68	68
Cellulose	50	50	50	10	10	10
Synthetic Fiber						
Other (specify Cotton)				10	10	10
NONFIBROUS MATERIALS %	30	30	30	12	12	12
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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Respectfully submitted, PSI,


 Microscopist


 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number: layer no.:	04-010	04-011	04-012	05-013	05-014	05-015
Material Type	E	E	E	E	E	E
Gross Appearance/Texture	MJP	MJP	MJP	Pipe Wrap	Pipe Wrap	Pipe Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Yellow/Tan	Yellow/Tan	Yellow/Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30	68	68	68
Cellulose				10	10	10
Synthetic Fiber						
Other (specify Cotton	5	5	5	10	10	10
NONFIBROUS MATERIALS %	65	65	65	12	12	12
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Respectfully submitted, PSI,

David Griffin
 Microscopist

Wayne Johnson
 Division M

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number: layer no.:	06-016	06-017	06-018	07-019	07-020	07-021
Material Type	E	E	E	Z03	Z03	Z03
Gross Appearance/Texture	MJP	MJP	MJP	Rope	Rope	Rope
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	White	White	White
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	Yes	Yes	Yes
ASBESTOS(Type & Percent)						
Chrysotile				70	70	70
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	70	70	70
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30			
Cellulose				20	20	20
Synthetic Fiber				10	10	10
Other (specify Cotton	5	5	5			
NONFIBROUS MATERIALS %	65	65	65			
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Respectfully submitted, PSI,

David Griffin
 Microscopist

Wayne Johnson
 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

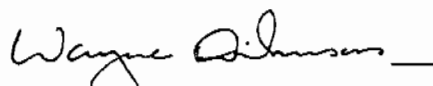
Sample number:	08-022	08-023	08-024	09-025	09-026	09-027
layer no.:						
Material Type	Z47	Z47	Z47	Z47	Z47	Z47
Gross Appearance/Texture	Mastic	Mastic	Mastic	Mastic	Mastic	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Red	Red	Red	Tan	Tan	Tan
IS ASBESTOS PRESENT?	Yes	Yes	Yes	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile	2	2	2			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	2	2	2	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify Cotton						
NONFIBROUS MATERIALS %	98	98	98	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,


 Microscopist


 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	10-028	10-029	10-030			
layer no.:						
Material Type	Z47	Z47	Z47			
Gross Appearance/Texture	Mastic	Mastic	Mastic			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	No	No	No			
What color is it?	Black	Black	Black			
IS ASBESTOS PRESENT?	Yes	Yes	Yes			
ASBESTOS(Type & Percent)						
Chrysotile	10	10	10			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	10	10	10			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	90	90	90			
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A 1 Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,

David Griffin
 Microscopist

Wayne Johnson
 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	11-031		11-032		11-033	
layer no.:	1	2	1	2	1	2
Material Type	Z01	Z01	Z01	Z01	Z01	Z01
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic	Floor Tile	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	White	Black	White	Black	White	Black
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes	Yes	Yes
ASBESTOS(Type & Percent)						
Chrysotile	4	5	4	5	4	5
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	4	5	4	5	4	5
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	50	95	50	95	50	95
Calcite	46		46		46	
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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David Griffin
 Microscopist

Wayne Johnson
 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	11-034		11-035			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	White	Black	White	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	4	5	4	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	4	5	4	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	50	95	50	95		
Calcite	46		46			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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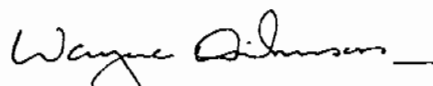
Sample number: layer no.:	12-036	12-037	12-038	13-039	13-040	13-041
Material Type	K	K	K	K	K	K
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Friable Tile	Friable Tile	Friable Tile
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Beige	Beige	Beige	Beige	Beige	Beige
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	20	20	20	20	20	20
Cellulose	50	50	50	50	50	50
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	30	30	30	30	30	30
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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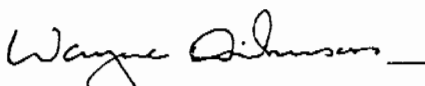
Sample number:	14-042			14-043		
layer no.:	1	2	Composite	1	2	Composite
Material Type	V	V	V	V	V	V
Gross Appearance/Texture	Jt Cmpd	Sheetrock	Drywall	Jt Cmpd	Sheetrock	Drywall
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	Yes	No	No	Yes
Is it fibrous?	No	Yes	Yes	No	Yes	Yes
What color is it?	White	White	White	White	White	White
IS ASBESTOS PRESENT?	Yes	None Detected	Yes	Yes	None Detected	Yes
ASBESTOS (Type & Percent)						
Chrysotile	<1		<1	<1		<1
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	<1	0	<1	<1	0	<1
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose		10	9		10	9
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	10	19	40	10	13
Calcite				60		6
Gypsum		80	72		80	72
Granular Minerals						
Other (specify)						

COMMENTS:

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PROJECT: NCSU

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Charlotte, NC 28269

Poe Hall ACM Survey

Attn: Brian Ball

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21215

Sample number:	14-044			14-045		
layer no.:	1	2	Composite	1	2	Composite
Material Type	V	V	V	V	V	V
Gross Appearance/Texture	Jt Cmpd	Sheetrock	Drywall	Jt Cmpd	Sheetrock	Drywall
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	Yes	No	No	Yes
Is it fibrous?	No	Yes	Yes	No	Yes	Yes
What color is it?	White	White	White	White	White	White
IS ASBESTOS PRESENT?	Yes	None Detected	Yes	Yes	None Detected	Yes
ASBESTOS(Type & Percent)						
Chrysotile	<1		<1	<1		<1
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	<1	0	<1	<1	0	<1
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose		10	9		10	9
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	50	10	14	30	10	12
Calcite	50		5	70		7
Gypsum		80	72		80	72
Granular Minerals						
Other (specify						

COMMENTS:

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Attn: Brian Ball

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21215

Sample number:	14-046				
layer no.:	1	2	Composite		
Material Type	V	V	V		
Gross Appearance/Texture	Jt Cmpd	Sheetrock	Drywall		
Is it homogeneous?	Yes	Yes	Yes		
Are there obvious layers?	No	No	Yes		
Is it fibrous?	No	Yes	Yes		
What color is it?	White	White	White		
IS ASBESTOS PRESENT?	Yes	None Detected	Yes		
ASBESTOS (Type & Percent)					
Chrysotile	< 1		< 1		
Amosite					
Crocidolite					
Anthophyllite					
Actinolite					
Tremolite					
TOTAL PERCENT ASBESTOS	< 1	0	< 1		
OTHER FIBROUS MATERIALS					
(Type & Percent)					
Fibrous Glass					
Cellulose		10	9		
Synthetic Fiber					
Other (specify)					
NONFIBROUS MATERIALS %	50	10	14		
Calcite	50		5		
Gypsum		80	72		
Granular Minerals					
Other (specify)					

COMMENTS:

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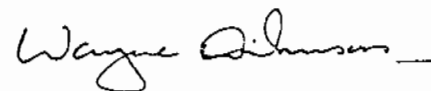
Sample number:	15-047		15-048		15-049	
layer no.:	1	2	1	2	1	2
Material Type	ZR	Mastic	ZR	Mastic	ZR	Mastic
Gross Appearance/Texture	Flexible	Clumpy	Flexible	Clumpy	Flexible	Clumpy
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Black	White	Black	White	Black	White
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	100	100	100	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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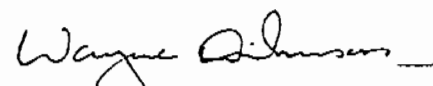
Sample number:	16-050		16-051		16-052	
layer no.:	1	2	1	2	1	2
Material Type	ZR	Mastic	ZR	Mastic	ZR	Mastic
Gross Appearance/Texture	Flexible	Clumpy	Flexible	Clumpy	Flexible	Clumpy
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Gray	White	Gray	White	Gray	White
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	100	100	100	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Sample number:	17-053		17-054		17-055	
layer no.:	1	2	1	2	1	2
Material Type	Z01	Z01	Z01	Z01	Z01	Z01
Gross Appearance/Texture	Floor Tile	Backing/Mastic	Floor Tile	Backing/Mastic	Floor Tile	Backing/Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	Yes	No	Yes	No	Yes
Is it fibrous?	No	Yes	No	Yes	No	Yes
What color is it?	Black	Brown	Black	Brown	Black	Brown
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose	7	90	7	90	7	90
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	73	10	73	10	73	10
Calcite	20		20		20	
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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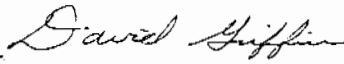
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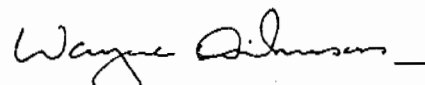
Sample number:	18-056	18-057	18-058	19-059	19-060	19-061
layer no.:						
Material Type	K	K	K	S	S	S
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Vib Jt Cloth	Vib Jt Cloth	Vib Jt Cloth
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Beige	Beige	Beige	Black	Black	Black
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	20	20	20	25	25	
Cellulose	50	50	50			
Synthetic Fiber						
Other (specify Cotton						80
NONFIBROUS MATERIALS %	30	30	30	75	75	20
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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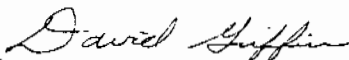
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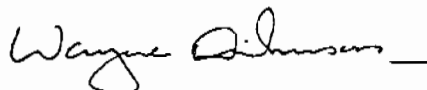
Sample number: layer no.:	20-062	20-063	20-064	21-065	21-066	21-067
Material Type	N	N	N	Z47	Z47	Z47
Gross Appearance/Texture	MJP	MJP	MJP	Mastic	Mastic	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	No	No	No
What color is it?	Gray	Gray	Gray	Tan	Tan	Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	30	30	30			
Cellulose						
Synthetic Fiber						
Other (specify Cotton)	10	10	10			
NONFIBROUS MATERIALS %	60	60	60	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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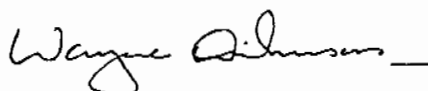
Sample number:	24-068	24-069	24-070	25-071	25-072	25-073
layer no.:						
Material Type	Z08	Z08	Z08	Z14	Z14	Z14
Gross Appearance/Texture	Brick	Brick	Brick	Cementitious	Cementitious	Cementitious
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Tan	Tan	Tan	Tan	Tan	Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	100	100	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 1215

Sample number:	26-074	26-075	26-076			
layer no.:						
Material Type	D	D	D			
Gross Appearance/Texture	Plaster	Plaster	Plaster			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	No	No	No			
What color is it?	Off White	Off White	Off White			
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected			
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	80	80	80			
Calcite						
Gypsum						
Granular Minerals						
Other (specify Perlite	20	20	20			

COMMENTS:

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Respectfully submitted, PSI,

David Griffin

Microscopist

Wayne Johnson
 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

Sample number:	27-077	27-078	27-079	28-080	28-081	28-082
layer no.:						
Material Type	L	L	L	Z19	Z19	Z19
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Counter Top	Counter Top	Counter Top
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Lt Green	Lt Green	Lt Green
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	Yes	Yes	Yes
ASBESTOS(Type & Percent)						
Chrysotile				8	8	8
Amosite				2	2	2
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	10	10	10
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	40	40	40			
Cellulose	40	40	40			
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	20	20	20	90	90	90
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21216

Sample number: layer no.:	29-083	29-084	29-085	30-086	30-087	30-088
Material Type	Z02	Z02	Z02	Z18	Z18	Z18
Gross Appearance/Texture	Hood Lining	Hood Lining	Hood Lining	Insul/Wrap	Insul/Wrap	Insul/Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Black	Black	Black	Black/Tan	Black/Tan	Black/Tan
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes	Yes	Yes
ASBESTOS (Type & Percent)						
Chrysotile	12	12	12	3	3	3
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	12	12	12	3	3	3
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass				15	15	15
Cellulose				20	20	20
Synthetic Fiber						
Other (specify Cotton)				15	15	15
NONFIBROUS MATERIALS %	88	88	88	47	47	47
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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Division IV

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TESTED FOR: PSI

PROJECT: NCSU

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RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

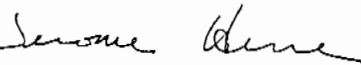
BATCH NO.: 21216

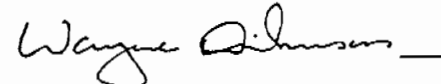
Sample number: layer no.:	32-092	32-093	32-094	33-095	33-096	33-097
Material Type	K	K	K	K	K	K
Gross Appearance/Texture	Ceiling Tile	Ceiling Tile	Ceiling Tile	Ceiling Tile	Ceiling Tile	Ceiling Tile
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Gray	Gray	Gray
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	35	35	35	35	35	35
Cellulose	35	35	35	35	35	35
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	30	30	30	30	30	30
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

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RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21216

Sample number: layer no.:	35-098	35-099	35-100	36-101	36-102	36-103
Material Type	Z18	Z18	Z18	U	U	U
Gross Appearance/Texture	Insul/Wrap	Insul/Wrap	Insul/Wrap	Insul/Wrap	Insul/Wrap	Insul/Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	Yes	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Black/Yellow	Black/Yellow	Black/Yellow	White/Yellow	White/Yellow	White/Yellow
IS ASBESTOS PRESENT?	Yes	Yes	Yes	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile	3	3	3			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	3	3	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	80	40	80	60	60	60
Cellulose		20				
Synthetic Fiber						
Other (specify Cotton)				20	20	20
NONFIBROUS MATERIALS %	17	37	17	20	20	20
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Charlotte, NC 28269
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PROJECT: NCSU
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 Poe Hall ACM Survey

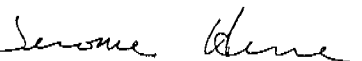
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

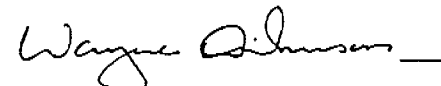
Sample number: layer no.:	37-104	37-105	37-106	38-107	38-108	38-109
Material Type	H	H	H	E	E	E
Gross Appearance/Texture	Insul/Wrap	Insul/Wrap	Insulation	Insul/Wrap	Insul/Wrap	Insul/Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	No	Yes	Yes	Yes
What color is it?	Black/Yellow	Gray	Gray	Tan/Yellow	Tan/Yellow	Tan/Yellow
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30	30	30	30
Cellulose	10			30	30	30
Synthetic Fiber						
Other (specify Cotton)	30	20		30	30	30
NONFIBROUS MATERIALS %	30	50	70	10	10	10
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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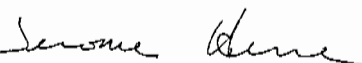
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

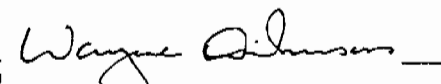
Sample number: layer no.:	39-110	39-111	39-112	40-113	40-114	40-115
Material Type	E	E	E	E	E	E
Gross Appearance/Texture	Wrap/Insul	Wrap/Insul	Wrap/Insul	Insulation	Insulation	Insulation
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	Yes	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Tan/Gray	Tan/Gray	Tan/Gray	Gray	Gray	Gray
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	Yes	Yes	Yes
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite				10	10	10
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	10	10	10
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	5		5			
Cellulose						
Synthetic Fiber						
Other (specify Cotton)	75	90	75			
NONFIBROUS MATERIALS %	20	10	20	90	90	90
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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Respectfully submitted, PSI,


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 Division N

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REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

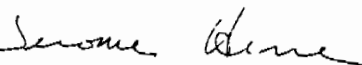
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

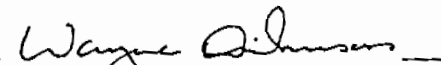
Sample number: layer no.:	41-116	41-117	41-118	42-119	42-120	42-121
Material Type	S	S	S	K	K	K
Gross Appearance/Texture	Vib Jt Cloth	Vib Jt Cloth	Vib Jt Cloth	Ceiling Tile	Ceiling Tile	Ceiling Tile
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Gray	Gray	Gray
IS ASBESTOS PRESENT?	Yes	Yes	Yes	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile	60	60	60			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	60	60	60	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass				30	30	30
Cellulose				45	45	45
Synthetic Fiber						
Other (specify Cotton)	30	30	30			
NONFIBROUS MATERIALS %	10	10	10	25	25	25
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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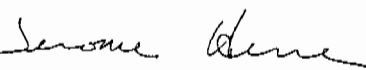
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

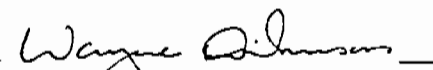
Sample number: layer no.:	43-122	43-123	43-124	44-125	44-126	44-127
Material Type	Z18	Z18	Z18	D	D	D
Gross Appearance/Texture	Insul/Wrap	Insul/Wrap	Insul/Wrap	Plaster	Plaster	Plaster
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	Yes	No	No	No
Is it fibrous?	Yes	Yes	Yes	No	No	No
What color is it?	Gray/Yellow	Gray/Yellow	Gray/Yellow	Tan	Tan	Tan
IS ASBESTOS PRESENT?	None Detected	Yes	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile		3				
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	3	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	60	60	60			
Cellulose	20	20	20			
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	20	17	20	50	50	50
Calcite						
Gypsum						
Granular Minerals				50	50	50
Other (specify)						

COMMENTS:

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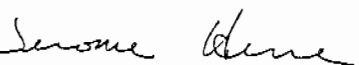
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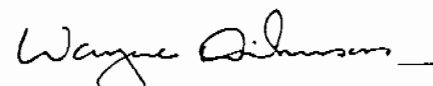
Sample number:	45-128		45-129		45-130	
layer no.:	1	2	1	2	1	2
Material Type	D	D	D	D	D	D
Gross Appearance/Texture	Smooth Plaster	Rough Plaster	Smooth Plaster	Rough Plaster	Smooth Plaster	Rough Plaster
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	White	Tan	White	Tan	White	Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	50	100	50	100	50
Calcite						
Gypsum						
Granular Minerals		50		50		50
Other (specify)						

COMMENTS:

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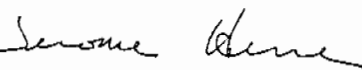
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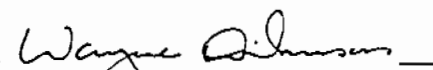
Sample number:	46-131	46-132	46-133			
layer no.:						
Material Type	Z02	Z02	Z02			
Gross Appearance/Texture	Sink Material	Sink Material	Sink Material			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	No	No	No			
What color is it?	Black	Black	Black			
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected			
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	100	100			
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,


 Microscopist


 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

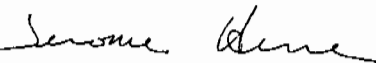
BATCH NO.: 21216

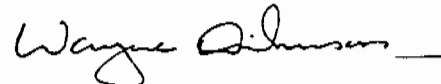
Sample number:	47-134		47-135		47-136	
layer no.:	1	2	1	2	1	2
Material Type	L	L	L	L	L	L
Gross Appearance/Texture	Acoust Block	Mastic	Acoust Block	Mastic	Acoust Block	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	No	Yes	No	Yes	No
What color is it?	White	Brown	White	Brown	White	Brown
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	70		70		70	
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	30	100	30	100	30	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.

Bldg 024

Charlotte, NC 28269

Poe Hall ACM Survey

Attn: Brian Ball

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

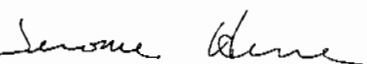
BATCH NO.: 21216

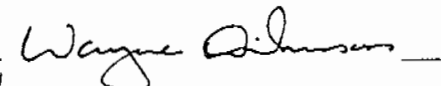
Sample number:	48-137	48-138	48-139			
layer no.:						
Material Type	L	L	L			
Gross Appearance/Texture	Acoust Panel	Acoust Panel	Acoust Panel			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	Yes	Yes	Yes			
What color is it?	Gray	Gray	Gray			
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected			
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	40	40	40			
Cellulose	40	40	40			
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	20	20	20			
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,


 Microscopist


 Division N

Information To Build On

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

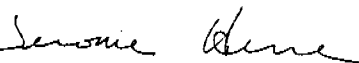
BATCH NO.: 21216


Sample number:	49-140		49-141			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Tan	Black	Tan	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	3	5	3	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	5	3	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	37	95	37	95		
Calcite	60		60			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F. July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,


 Microscopist


 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

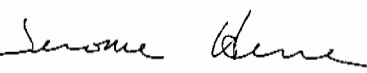
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

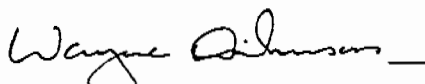
Sample number:	50-142		50-143			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Brown	Black	Brown	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS (Type & Percent)						
Chrysotile	2	5	2	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	2	5	2	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	33	95	33	95		
Calcite	65		65			
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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 Microscopist


 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

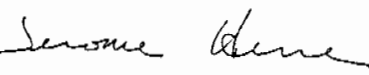
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

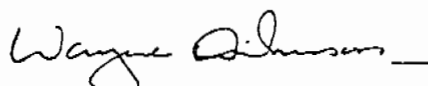
Sample number:	51-144		51-145			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Green	Black	Green	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS (Type & Percent)						
Chrysotile	3	5	3	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	5	3	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	32	95	32	95		
Calcite	65		65			
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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 Microscopist


 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21216

Sample number:	52-146		52-147			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Gray	Black	Gray	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	3	5	3	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	5	3	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	32	95	32	95		
Calcite	65		65			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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Microscopist

Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

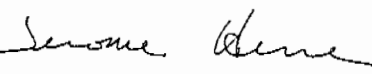
BATCH NO.: 21216

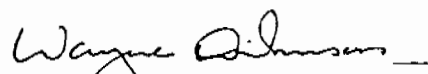
Sample number: layer no.:	53-148	53-149	53-150	26-151	26-152	
Material Type	L	L	L	D	D	
Gross Appearance/Texture	Acoust Panel	Acoust Panel	Acoust Panel	Ceiling Plaster	Ceiling Plaster	
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	
Are there obvious layers?	No	No	No	No	No	
Is it fibrous?	Yes	Yes	Yes	No	No	
What color is it?	Gray	Gray	Gray	Tan	Tan	
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	20	20	20			
Cellulose	50	50	50			
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	30	30	30	65	65	
Calcite						
Gypsum						
Granular Minerals				20	20	
Other (specify Perlite				15	15	

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI.


 Microscopist


 Division N

Information To Build On



Professional Service Industries, Inc.

SAMPLE SUBMISSION REPORT

To: Acmlab / Joel Davison	(1)	PSI Order No. 511-7A008	(5)	<input type="checkbox"/> Q <input checked="" type="checkbox"/> Non Q	(8)
From: Charlotte EMG	(2)	Date Shipped 3/11/97	(6)	Carrier Airborne Ex.	(9)
Client NCSU	(3)	Date Sample Obtained	(7)	Sampled By Day Moore	(10)
Project POE HALL - ACM Survey					(4)
Type of Sample Suspect bulk ACM	(11)	Sample Size/Quantity (152)	(12)		
Type of Sample Containers "WHEATON" CONTAMINATION VIALS	(13)	No. of Containers	(14)		
Identification Markings on Sample/Container NUMERIC, 024 prefix designates POE HALL					(15)
Sample Represents Suspect ACM					(16)
Required Tests PLM - wallboard/joint compound composite samples					(17)
Specifications Fax results to 704-558-2236 Day Moore					(18)
Disposition of Residual Sample <input checked="" type="checkbox"/> Discard <input type="checkbox"/> Return to Client <input type="checkbox"/> Return to PSI Office Submitting Sample <input type="checkbox"/> Other (See Remarks)					(19)
Reporting Instructions <input checked="" type="checkbox"/> Report to PSI Office Submitting Sample <input type="checkbox"/> Report to Client per PSI Order <input type="checkbox"/> Other (See Remarks)					(20)
Special Instructions <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (See Remarks)	(21)	Submitted & Reviewed By:		(23)	
Attachments <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (Number)	(22)				
Remarks - Wallboard/joint compound analyzed + reported as composite sample - Bulk sample sheet attached for Sample description					(24)

ACKNOWLEDGEMENT

Date Received	(25)	Received by (Dept./Office)	(26)
STATUS (27)			
<input type="checkbox"/> Work proceeding, estimated reporting date: _____			
<input type="checkbox"/> Work NOT proceeding, incomplete instructions (See Remarks).			
<input type="checkbox"/> Work NOT proceeding, insufficient sample quantity/size (See Remarks).			
<input type="checkbox"/> Work NOT proceeding, (See Remarks).			
Lab No. Assigned	(28)	Receiving Office Representative	(29)
Remarks (30)			

INSTRUCTIONS ON REVERSE SIDE

APPENDIX F.

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: Ground Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
100	21	Foam panel Adhesive		200 #	G	1	MER
	03	8' Pipe Ins		165 LF	G		F.G.
	05	4" Pipe Ins		48 LF	G		F.G.
	09	Yellow Duct Mastic		115 #	G		
	04	MJP - 8"		30 Ea	G		
	06	MJP - 4"		12 Ea.	G		
100 (Hall)	03,05	Above ceiling piping		N/A	G		
101	09	Yellow Duct Mastic		15 #			
102	09	Yellow Duct Mastic		22 #			
	14	Sheetrock		140 #			
102B	24	Welding Blocks		54 Ea.			
	25	Furnace Block lining		86 #			(3 Furnaces)
	26	Ceiling Plaster		1070			
102C	27	Partition Paneling		30 #			
102D	29	Lab Counter top		12 #			
	29	hood lining		32 #			
102C	30	Pipe Ins. - 12" (E-Tan)		12 LF			
	31	ASOC MJP		1 Ea			
106	N/A	F.G. Pipe Ins (8")		35 LF			Not Sampled
	N/A	F.G. Pipe Ins (4")		10 LF			
	09	Yellow duct Mastic		36 #			
108B	02	2x2 C.T.		1 Box (12)			Stored
108	01	12x12 F.T.		286 #			
	02	2x2 C.T. (fissure)		164 #			
	15	Black baseboard		78 LF			
	N/A	F.G. Pipe Ins (8")		20 LF			Not Sampled
107	18	2x2 C.T. (fissure)		62 #			
109	18	2x2 C.T. (fissure)		140 #			
110	13	2x4 C.T. (chicken)		249 #			
112	14	Sheetrock		104 #			
	15	Black baseboard		112 LF			
116	08	Red Duct Mastic		8 #			
	09	Yellow Duct Mastic		28 #			
	03	8" Pipe Ins.		152 LF			
	05	4" Pipe Ins.		95 LF			
	04	8" MJP		32 Ea			
	06	4" MJP		32 Ea			
	07	gasket rope		3 LF			

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: Ground Floor

Inspector(s): J. Silvestri
D. Moore
Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
120	07	2x2 C.T.		104 ϕ	G	L	
	15	Black Board		20 LF			
	14	Sheetrock		280 ϕ			
120A	01	2x12 FT.		315 ϕ			
	15	Black Board		63 LF			
	14	Sheetrock		205 ϕ			
	18	2x2 C.T. (fissure)		12 ϕ			
	33	2x2 C.T. (Pin hole)		2 108 ϕ			
122	15	Black Board		30 LF			
	14	Sheetrock		390 ϕ			
123	08	Red duct mastic		8 ϕ			
125	12 12	2x2 C.T. (worm)		64 ϕ			Jan. Closet
	35	Pipe Ins. (Tar coat)		22 LF			
127	03	8" pipe Ins		46 LF			
	05	4" pipe Ins		112 LF			
	04 4	8" MSP		18 Ea			
	06 6	4" MSP		26 Ea			
	36	Duct Ins		84 ϕ			
	11A	F.G. (12")		55 LF			
	08	Red Duct Mastic		12 ϕ			
	37	Tank Insulation		76 ϕ			
	58	Pipe Ins (2")		32 LF			
	39	2" MSP		3 Ea.			
130	40	EXHAUST INSULATION		18 LF			
	41	VJP - Green		2 ϕ			
	08	Red duct Mastic		6 ϕ			
	09	Tan duct Mastic		4 ϕ			
114	49	Mosaic Floor Tile (12x12)		5 ϕ			
	50	↓ ↓		5 ϕ			
	51	↓ ↓		5 ϕ			
	01 ✓	↓ ↓		5 ϕ			
100	98	Tar Coated Pipe Ins	Above Hallway ceiling	320 LF	↓	↓	Water supply (Electro rooms)

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: POE HALL
Specific Area: 2nd Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
200	11 ✓	9x9 white w/Black F.T.		4923 #	G	L	Hallway
	10	Black Duct Mastic	Above ceiling	?			
200	None	None					Electrical
201	None	None					Wanna's
202	14	Sheetrock		856 #			
	11 ✓	9x9 white F.T.		1182			
204	42	2x2 C.T. (Quad)		495 #			Carpet
	14	Sheetrock		1075 #			
	15	Black Baseboard		82 LF			
204A	14	S. Rock		210 #			Carpet
	15	B. Base		20 LF			
204B	14	S. Rock		320 #			
	15	B. Board		30 LF			
204C	14	S. Rock		320 #			
	15	B. Board		30 LF			
204D	14	S. Rock		365 #			
	15	B. Board		38 LF			
204E	14	S. Rock		370 #			
	15	B. Board		28 LF			
204A,B,C,D,E	#42	2x2 C.T. (Quad)		120 # Ea.			
208	14	S. Rock		520 #			
	15	B. Board		60			
	42	2x2. C.T. (Quad)		293 #			
208B	14			360 #			
	15			28 LF			
	42			36 LF			
208C	14			260 #			
	15			28 LF			
	42			100 #			
208D	14			315 #			
	15			32 LF			
	42			214 #			
208H	14			105 #			
	15			24 LF			
	42			146 #			
208G	14			210 #			
	15			32 #			
	42			127 #			

Notes:

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: 2nd floor

Inspector(s): J. Silvestri
 Date of Inspection: 5/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
205	11 ✓	9x9 Floor tile	Basement	382 #	←	←	
	14	Sheetrock		385 #	←	←	
206	14	Sheetrock		425 #			Carpets
	15	Baseboard		55 LF			
206A	14	Sheetrock		185 #			
212	07	Gasket type rope	Penetration	2 #			
	43	Tar paper pipe ins.	Chaseway	20 LF	↓	↓	8" O.D.
	35	Tar coated pipe ins.	Chaseway	10 LF			4" O.D.
216	44	Conduits Panel	Ceiling	450 #			Aluminum
	14	Sheetrock	lecture area	25 #			
219	14	Sheetrock		835 #			
	15	baseboard		94 LF			
221	14	Sheetrock		315 #			
	15	baseboard		32 LF			
225	12	2x2 C.T. (warm)		104 #			
	14	Sheetrock		310 #			
	15	baseboard		36 LF			
225 B	12	2x2 C.T. (warm)		98 #			
	14	Sheetrock		360 #			
	15	baseboard		32 LF			
226	12	2x2 C.T.		214 #			
	14	Sheetrock		365 #			
	15	baseboard		42 #			
226A	12			98 #			
	14			340 #			
	15			34 #			
226B	12			98 #			
	14			340 #			
	15			34 #			
226C	11 ✓	9x9 F.T.		140 #			
	14	Sheetrock		350 #			
	15						
216B	11 ✓	9x9 Floor tile		153 #			Proj. Book
	45	Wall plaster		872 #			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: 2ND Floor

Inspector(s): Don Moore
John S. Vestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
Flw (2)	11 ✓	9"x5" w/ w/ bk SF2 Ffrcnt	elevation	72 SF	G	L	
209	15	tile board + mastic		23 LF	G		+17 (3 SF)
	11 ✓	FT		553 SF	↓		
	13	02 2'x2' CP		553 SF	↓		
	14	wood board + joint mastic		437 SF	G		
211	15			39 LF	G		+17 (3 SF)
	11 ✓				G		
	13 02				G		
	14			565 SF	G		
213	NS	Ceramic Floor + w/ tile					
	NS	metal CP w/ FG					
	35 ✓	Pipe Mastic	Pipe Chase	3 LF	G		pipe chase
214	11 ✓			553	↓		
	13 02			553	↓		
	14			647 SF	↓		
218	11			1220 SF	G		
	13 02			929	↓		
	17			6 SF			
	14			838 SF			
220	11						
	13						
	14			232 SF			
	17			78 SF			
224	11			550			
	13			550			
	14			217 SF			
	17			6 SF			
228	11			544			
	13			544			
	14			640 SF			
	17			5 SF			
200	17	threshold		80 LF			hallway
	10	Back Duct Mastic	Above Ceiling	1200 1200			↓
	08	Red Duct Mastic	↓	30 LF	↓	↓	↓

Notes:

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: 3rd Floor

Inspector(s): J. Silverstri
D. Moore
Date of Inspection: 3/10/07

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
300	11 ✓	9x9 floor tile		3749 #	G	L	Hallway
300	14	Sheetrock		930 #			
	15	Baseboard		214 LF			
300B	11	9x9 F.T.		64 #			
300C	14	Sheetrock		200 #			
	15	Baseboard		38 LF			
300D	14	Sheetrock		290 #			
	15	Baseboard		38 LF			
300E	12	2x2 C.T. w/w m		96			
	14	Sheetrock		340 #			
	15	Baseboard		36 #			
300G	12	S. Rock		320 #			
	14	Baseboard		34 LF			
300H	14	Sheetrock		340 #			
	15	Baseboard		36 #			
	12	2x2 C.T.		96 #			
300J	14	S. Rock		320 #			
	15	b. board		34 LF			
300L	14	S. Rock		340 #			
	15	b. Board		36 LF			
300M	12	2x2 C.T.		96 #			
300M	14	S. Rock		340 #			
	15	b. Board		34 LF			
300N	14	S. Rock		340 #			
	15	b. Board		34 LF			
300P	14	S. Rock		420 #			
	15	b. Board		46 LF			
300S	14	S. Rock		340 #			
	15	b. board		32 LF			
308	43	Tar paper pipe ins	Chowway	180 LF			3rd → Penthouse
	35 ✓	Tar coated pipe ins.		90 LF			"
306	11 ✓	9x9 F.T.		136 #			
	14	Sheetrock		335 #			
309	35 ✓	Tar coated pipe ins	Chowway	10 LF			Men's
310	16	Grey base board		185 LF			
	14	Sheetrock		1410 #			

Notes: 300 - Hallway

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: Third Floor

Inspector(s): J. Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments		
310B	11	9x9 F.T.		680 #	G	L			
	14	Sheetrock		145 #					
	15	Baseboard		48 LF					
310C	11	9x9 F.T.		128 #	↓				
	14	Sheetrock		210 #					
310D	11	9x9		128 #					
	14	Sheetrock		320 #					
310E	11	9x9		41 #					
	14	Sheetrock		220 #					
310F	16	Grey baseboard		22 LF			↓		
	14	Sheetrock		280 #					
310G	11	9x9 F.T.		126 #			↓		
	14	Sheetrock		320 #					
310H	11	9x9		126 #					
	14	S.R.		320 #					
310J	11	9x9		86 #					
	14	S.R.		280 #					
310K	11	9x9		41 #					
	14	S.R.		220 #					
310L	11	9x9		126 #					
	14	S.R.		320 #					
310M	11	9x9		126 #					
	14	S.R.		320 #					
310N	11	9x9		126 #					
	14	S.R.		320 #					
310P	16	grey baseboard		48 LF					
	14	S. Rock		610 #					
311	11	9x9		263 #					
	14	Sheetrock		685 #					
	15	black baseboard		12 LF					
312	11	9x9 F.T.		1123 #					
	14	Sheetrock		892 #					
	28	Lab counter top		128 #			green		
314	14	Sheetrock		240 #					
	15	Black baseboard		28 #					
314A	14	Sheetrock		180 #					
	15	Black baseboard		18 LF					

Notes: 310A - 11

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Pop. Hall
Specific Area: Third Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
315	14	Sheetrock		4200	G	L	
	15	Black baseboard		42 LF			
315A	14	S.P.		310			
	15	B. Board		42 LF			
315B	14	S.P.		810			
	15	B. Board		42 LF			
316	11	9x9 F.T.		203			
	14	S.P.		315			
	15	Black Baseboard		16 LF			
317	11	9x9 F.T.		1070			
	14	Sheetrock		880			
	28	Lab counter tops		275			green
	15	Black Baseboard		180 LF			* TRANSITE exhaust pipe - RUNS INTO HALL
	29	Fume hood lining		32			
	46	Lab sink		5 Ea			
320	11	9x9 F.T.		1123			
	14	Sheetrock		895			
	15	Black baseboard		22 LF			
324	43	Tar paper pipe ins.	Chaseway	270 LF			3rd - paint
	35	Tar coated pipe ins.	↓	180 LF			"
325	02	2x2 CT. (chicken)		52			Women's
326	14	Sheetrock		185 LF			
	15	black baseboard		1410			
326c	14	sheetrock		145			
	15	black base		46 LF			
326B	11	9x9 F.T.		68			
	14	sheetrock		140			
326D	14	sheetrock		210			
	15	baseboard		42 LF			
326E	14			200			
	15			22 LF			
326F	14			200			
	15			22 LF			
326G	14			200			
	15			22 LF			
326J, L, M	14			200			
	15			22 LF			

Notes:

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Pe Hall
Specific Area: 3rd Floor

Inspector(s): J. Silvestro

Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
326K	14			210 #	G	2	
	15			42 LF			
326 H	14			210 #		1	
	15			42 LF			
326 N	14			210 #			
	15			42 LF			
326 P	14			210 #			
	15			42 LF			
326 R	14			210 #			
	15			42 LF			
326 S	14			215 #			
	15			62 LF			
300	17	Threshold		80 #			Hallway
	08	Red Duct Mastic	Above Ceiling	30 #			
	09	Yellow/Tan Duct Mastic		50 #			
	10	Black Duct Mastic		120 #			
	98	Tar Coated Pipe Ins		320 LF			
	NS	Transite Pipe (12")	↓	30 LF			↓
324	NS	Transite Pipe (12")	Chimney	55 LF			Exhaust to 20

Notes: * Not Sampled / destructive measures required

FIELD ASSESSMENT SHEET

Building No.: 0244
 Building Name: Poe Hall
 Specific Area: Fourth Floor

Inspector(s): J. Silvestri
 Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
400	11	9x9 F.T.		3749 #	✓	✓	Hallway carpet
400	14	Sheetrock		3612 #			
	15	Black Baseboard		379 LF			
400B	11	9x9 F.T.		271 #			
	14	Sheetrock		340 #			
	15	Black Baseboard		28 LF			
409	14	Sheetrock		760 #			
	15	Baseboard		22 LF			
400C	14	S. Rock		2100			
	15	Baseboard		60 LF			
400D	14	Sheetrock		210 #			
	15	Baseboard		16 LF			
	11	9x9 F.T.		56 #			
400F	14	Sheetrock		180 #			
	15	B. Board		15 LF			
400G	14	Sheetrock		170 #			
	15	Baseboard		15 LF			
400H	11	9x9 F.T.		63 #			
	14	Sheetrock		125 #			
400J	11	9x9 F.T.		199 #			
	14	Sheetrock		235 #			
402	14	Sheetrock		2100 #			
	15	Baseboard		240 LF			
402B	11	9x9 F.T.		68 #			
	14	Sheetrock		138 #			
402C	14	Sheetrock		210 #			
	15	Baseboard		62 LF			
402D	14	Sheetrock		325 #			
	15	Baseboard		62 LF			
402E	14			205 #			
	15			28 LF			
402F	14			205 #			
	15			28 LF			
402H	14			205 #	✓	✓	
	15			28 LF			
402K	14			205 #			
	15			28 LF			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Boe Hall
Specific Area: 4th Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
402L	14			205 #	G	L	
	15			28 LF			
402M	14			205 #			
	15			28 LF			
402G	14			325 #			
	15			62 LF			
402J	14			325 #			
	15			62 LF			
402N	14			325 #			
	15			62 LF			
402P	14			325 #			
	15			62 LF			
402R	14			325 #			
	15			62 LF			
402S	14			225 #			
	15			62 LF			
405		- CONCRETE					Telecom
406	35	tar coated pipe lvs		10 LF			Men's
408	14			400 #			
	15			42 LF			
409A	11	9x9 F.T.		68 #			
	14			138			
	15			0			
408B	14			210			
	15			36 LF			
408C	14			330 #			
	15			36 LF			
410	11	9x9 F.T.		268 #			
	14	Sheetrock		450 #			
412	11	9x9		209 #			
	14	Sheetrock		415 #			
	15	Base board		33 LF			
412A	14			210 #			
	15			42 LF			
412C	14			436 #			
	15			31 LF			
	11			225			

Notes: Sheetrock = drywall

North Carolina State University Asbestos Assessment Survey
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FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Pre Hall
 Specific Area: 4th Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
412 B	14			2300 #	G	L	
	15			31 LF			
412 D	11			548 #			
	14			720 #			
	15			28 LF			
413	12	2x2 C.T. (worm)		59 #			
	35	Tar coated pipe Ins	Above ceiling	12 LF			
414	11	9x9		828 #			
	14	Sheetrock		5200 #			
	15	Baseboard		24 LF			
414 A	11	9x9		266 #			
	14			315 #			
	15			24 LF			
417	11			812			
	14			265 #			
417 A	11			131 #			
	14			420 #			
	15			20 LF			
417 B	11			131 #			
	14			320 #			
	15			20 LF			
418		None	None				
419		None	None				Women's
420	12	2x2 C.T. (worm)		556 #			
	14	Sheetrock		640 #			
	15	baseboard		64 LF			
422	12	2x2 C.T. (worm)		1008 #			
	14			1100 #			
	15			110 # LF			
424	12	2x2 C.T. (worm)		67 #			
	14			250 #			
	15			20 LF			
424 A	12	2x2 C.T. (worm)		538 #			
	14	Sheetrock		240 #			
	15	baseboard		24 LF			
400	17	Threshold		80 #			Hallway
	10	Black Ductastic	Above ceiling	105 #			

Notes:

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: 5th Floor

Inspector(s): Doug Moore
John S. Washki
Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
50001	011	9'x9' FT		3762SF	G	L	HALL
	NS	1'x4' Metal Glue w/ EG		3762SF	G		
517	011			549 SF	G		
	02			549 SF	G		
	17			5 SF	G		
	014	wallboard		403 SF	G		
0514	NS	Conc/Tile Floor		94 SF	G		
	18	2'x2 linear		94 SF	G		
0520A	011	Carpet (Erie Co)		452	G		
	014			860	G		EXPOSED
520H	014			210 SF	G		CONCRETE
	011			41	G		PERK
520G	014			210 SF			
	011			41			
520F	011			41			
	014			210			
520E	011			41			
	014			210			
520B	011			49			
	014			220			
520C	011			124			
	014			535			
520D	011			124			
	014			535			
520J	011			124			
	014			535			
520K	011			124			
	014			535			
520L	011						
	014			560			
520M	011			128			
	014			240			✓
	02	2x2 CP		128			CP
525	NS	CONC FL / CONC WALLS		76 SF			
	43			73 LF			Pipe Chase

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10-1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
500	014			380	G	L	
	011			271	G		
		open conc. deck					
502A	011					↑	MEASURE! OPEN TO CONC. DECK
	014			600SF			
	015			67LF			
502B	011			66		↑	
	014			165SF			
	015						
502C	011			124		↑	
	014			260			
	015			30			
502D	011			124		↑	
	014			280			
	015			32			
502E	011			41		↑	
	014			200			
	015			24			
502F	011			280 124		↑	
	014			280			
	015			32			
502G	011			41		↑	
	014			200			
	015			24			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
510D	011	Fiber Ce		126	G	L	
	014			320			
	015			32			
510E	011			126			
	014			320			
	015			32			
510F	011			126			
	014			320			
	015			32			
510G	011			41			
	014			180			
	015			26			
510H	011			41			
	014			180			
	015			26			
510J	011			41			
	014			180			
	015			26			
510K	011			126			
	014			320			
	015			32			
510L	011			126			
				320			
				32			
510M	011			126			
	014			320			
	015			32			

Notes: _____

North Carolina State University Asbestos Assessment Survey
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FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: DOE HALL
Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: _____

S10 - OPEN TO LOWER DECK

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
502 H	011			41	G	L	
	014			200			
	015			24			
502 J	014			244	G	L	
	015			40			
	011	FT under CA		124			
502 K	014			245	G	L	
	015			41			
	011	FT below Ca		124			
502 L	014			210	G	L	
	011	FT under CA		247			
	015	blk baseboard		62			
		ALL 502 OPEN DUCT					
508	NC	Concrete + Deck + block wall + con. wall, electrical chase					+ tile
509	43	Tar paper wrap 2" O.D.	pipe around	73 LF			Messrs
510 A	011	FT under ca		907	G	L	
	014			1280 SF			
	015			145 LF			
510 B	011			68 SF	G	L	
	014			160 SF			
	015			17			
510 C	011			128	G	L	
	014			320			
	015			32			
506	098	Tar Coat Pipe Ins	Above Ceiling	70 LF	G	L	Hallway
	100	Black Duct Mastic	↓	90 LF			

Notes: _____

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th Floor

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
526					G	L	
528	014						+ 95 by BASEBOARD
	02						
	11 (015)						
528A	011	FT under carpet					
	014						
	02						
528B	014			196 SF			
	011	under Carpet					
	02	2x2 CP					
528E	014			196			
	011	FT below Ca					
	018	2x2 CP linear					
528G	014			196			
	011						
	018						
528H	014			196			
	011						
	018						
528J	014			2340			
	011			41			
	018			41			
528F	014			230			
	011			86			
	018			86			
	015			36			✓
528D	05			35			
	014			240			
	011			86			
537	015			88 LF			
	014		310 →	813			
	011	FT under Ca		813			
	02			813			

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FL.

Inspector(s): Doug Moore
John S. Iveski
 Date of Inspection: 3/10-1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
510 N	011			120			
	015			38LF	G	L	
	04			320SF			
5001		Concrete Fire Doors					
5002	1	Concrete Fire door					
515	011			94			
	014			310SF			
	017			3SF			
516	011			94			
	014			310SF			
	017			3SF			
518	011	Fire door - Con		93			
	014			310			
	017			3SF			
522	011			465			
	014			1020			
522A	011			94			lab
	014			300			
522B	011			94			
	014			94			
522C	011			144			
	014			410			

Notes: _____

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th Floor

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
522D	011	FF below Ceiling	100	100	G	L	
	014			260			
522E	011		57	57			
	014			260			
522F	011		57	57			
	014			295			
522G	011			94			
	014						
522H	011			28			
	014			110SF			
522J	011			28			
	014			110SF			
523	011	FF below CA		185			
	014			840 SF			
	NS	metal grid FF ceiling		185			
	017	Threshold		5 SF			
529	011	FF below CA		557			
	014			875			
	017			5 SF			
530	011			23233			
	014						
	017						
	017						
504	011			184			
	014			310			
	017 01			11			
	010			2 SF			

Notes:

North Carolina State University Asbestos Assessment Survey
 PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10-13/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
504 G	011			380	G	L	
	01			34			
	014			780			
	10	duct black mastic		6 SF			
505	011	Fiberline CA		195			
	014			420			
506	011	Fiberline CA		128			
	014			390			
0511	011	Fiberline CA		700 SF			
		WALLS covered w Fiberline panels, open deck (concrete)					
512	011			668			
	014			920 SF			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: POE Hall
Specific Area: Sixth Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
600	11			4031 #	G	L	Hallway observation
600	11			190 #			
	14			620 #			
	47	Acoustical Block		70 #	G		*BD stored, occ
604	48	2x3 Acoustical panel		102 #	G		
	11	9x9 F.T.		622 #			
	14			910 #			
604B	4			28 #			
C, D, E, F, G	44			150 #			
605	11			263			
	14			650 #			
	15			68 LF			
605A	11			558			
	14			960 #			
606		None					
602	14			1286 #			
	15			110 LF			
602B	11			68 #			
	14			175 #			
602C	14			210 #			
	15			28 LF			
602 D, F, H	14			350 #			
K, L, N	15			42 LF			
602M	14			340 #			
	15			36 LF			
602 E, G, J	14			280 #			
	15			45 LF			
607	35	Tar coated pipe	Chaseway	18 LF			
600	15	Baseboard:	by 3607	8 LF			Hallway
608	14			1575 #			
	15			156 LF			
608A	11	9x9 F.T.		68 #			
	14			130 #			
608D	11	9x9		128 #			
	14			210 #			

Notes:

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

2/4

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: Sixth Floor

Inspector(s): J. Silvestri
 Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
608E, H,	11			1260	G	L	
J, M, N,	14			330			
608P	14			310			
	15			55 LF			
608 F, G, K,	11			96			
L	14			340			
612	12	2x2 C.T. (warm)		131			
	14			390			
	15			35 LF			
612B	12	2x2 CT (warm)		131			
	14			390			
	15			35 LF			
612C	12			532			
	14			2050			
	15			115 LF			
612D	12			533			
	14			1410			
	15			130 LF			
614	11	9x9 F.T.		40			
	14			140			
615	11	9x9 F.T.		41			
	14			180			
613	35	Tar coated pipe	Above ceiling	12 LF			
616	11			255			
	14			140			
617	11			97			
	14			350			
618	11			97			
	14			350			
622	11			97			
	14			350			
624	11			97			
	14			350			
620	11			124			
	14			420			
621	11			124			
	14			420			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

3/4

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: Sixth Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
625	11			124 #			
	14			420 #			
626	11			124 #			
	14			420 #			
628	14	Sheetrock		275 #			
	15	baseboard		42 LF			
628A	14			420 #			
	15			48 LF			
628B	14			280 #			
	15			48 LF			
629		NONE					
631	11			41 #			
	14			270 #			
632	11			40 #			
	14			270 # 170 #			
630		NONE					women
634	12	2x2 C.T. (worm)		671 #			
	14	Sheetrock		1170 #			
	15	baseboard		117 LF			
634B	11	9x9 F.T.		92 #			
	14			440 #			
635	11			554			
	14			1170 #			
	53	2x2 Acoustical panel		96 #		4	
636	11	9x9 F.T.		548 #			
	14	Sheetrock		960 #			
	02	2x2 chicken track C.T.		548 #			
637 637	#	9x9 F.T.		200 #			
	14			645 #			
	15	Baseboard		72 LF			
638 638	#	9x9 F.T.		140 #			
	14			645 #			
	15			72 LF			
639 639	#	9x9 F.T.		140 #			
	14			645 #			
	15			72 LF			

Notes:

Sheetrock = Drywall

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Boe Hall
 Specific Area: Sixth Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
640	14			970#	C	L	
	15			52 LF			
640A	11	9x9 F.T.		68#			
	14			170#			
640B	14			270#			
	15			0			
640 C, D, E	11			124#			
	14			270#			
600	17	Threshold		80#			hall way
	10	Black Trid Mastic	Above Ceiling	90#			
	98	Tar wrapped Pipe Ins		55 LF			
	38	2" Canuco wrap Pipe Ins		10 LF			
	39	2" Assoc. MJP		4 Ea			
			By EM 626				

Notes: _____

North Carolina State University Asbestos Assessment Survey
 PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
707	011			101	G	L	
	014			240			
	017			2			
709A	011			100			
	014			220			
	017			2			
711	011			101			
	014			220			
	017			2			
717	011			44			
	014			120			
	017			2			
718	011			122			
	014			260			
	17			2			
720	NS	STOP - Concrete + block					
720B		Concrete metal G.I.O.C.P					
716	011	helo		41			
	014			120			
	017			2			
720C	011	Ft below CA		100 700			
	17			100 38			
	02			100 200			
	014			380			
720E	011			93			
	17			36			
	02			93			
	014			200			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: FOOTBALL
Specific Area: 7th FL

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
0000	NS	METAL GRID CP	HALL	363762	G	L	
	011			3762	G		
	014						
734	018			59 SF			
736A	011			549 SF			
	014			430 SF			
739	011			264 SF			open deck
	014			380 SF			
740	011			539 SF			open deck
	014			640 SF			
742	011			810			
	014			280			
	017			24 LF			OPEN DECK
738F	014			180			
738	014			660 SF			open deck
738A	014	Conc. Floors		200			
738C	014			240			
738B	014			240			
738D	014			240			
738E	014			240			
743	NS	Concrete 10" O.D. FG pipe ins.		10'	TO G		
744							Women's RA
749	011			127	G	L	
	014			220	G		

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

ing No.: 024
Name: POE HALL
ic Area: 7FL

Inspector(s): Doug Moore
John S. Vestri
Date of Inspection: 3/10-1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
50	011			124	G	L	Open mark
	014			410	G		
	017			2 SF			
54	011			124	G		
	014			380			
	017			2			
755	011			124			
	014			380			
	017			2			
760	011			124			
	014			380			
	017			2			
761	011			124			
	014			380			
	017			2			
762	011			273			
	014			280			
762A	011			130			
	014			240			
762B	011			110			
	014			200			
703	011			126			
	014			380			
	017			2			
704	011			124			
	014			380			
	017			2			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th Floor

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
708	011		1	124	6	6	OPEN Deck
	014			380			
	017			2	2		
710	011			124			
	014			380			
	017			2 Ea			
712	011			124			
	014			380			
	017			2			
713	011			124			
	014			380			
	017			2			
714	011			273			
	014			380 120			
	017			2			
714A	011			130			
	014			140			
	017			2			
714B	011			111			
	014			340			
715	NS	Concrete + block construction					
719	43		Pipe Chase	73LF			

Notes: _____

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th Floor

Inspector(s): Doug Moore
John S. Westra
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
724	011			259	G	L	
	014			260	↓		
	017			2	↓		
	02			259	G		
725	011			126			
	014			340			
	017			2			
726	011			126			
	014			340			
	017			2			
728	011			126			
	014			340			
	017			2			
730	011			126			
	014			340			
	017			2			
732	011			271			
	014			60			
	017			2			
732A	011			126			
	014			240			
	017						
732B	011			120			
	014			240			
	017						
700	08	Tar Coated Pipe Ins	Above Ceiling	40 LB			
	10	Black Duct Ins	↓	30 LB			
	08	Red Duct Mastic	↓	20 LB			
	09	Tan Duct Mastic	↓	0 LB			
	11						

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: 7th Floor

Inspector(s): Don Moore
John Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
0751	011			101	G	L	
	014			230			
752	011			103			
	014			230			
753	011			103			
	014			230			
756	011			103			
	014			230			
758	011			90			
	014			210			
700	011						
	014						
700A	011	- Concrete floors					
	014	Open Decks					
		wood walls					
700B	011						
	014						
700C	011						
	014						
700D	011						
	014						
705	011						
	014						
706	011			101			
	014			230			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th FL.

Inspector(s): Dan Moore
John Silvestri
 Date of Inspection: 3/10 / 97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
733	014	Concrete Floor		410 SF	G	L	
746	014		945				
746A	014		451				
746B	014		453				
746B	014		453				
746C	014		464				
746D	014		464				
746E	014		464				
746F	014		464				
747	014			120			
	011/17			46			
	10	Black Marble		4 SF			
748	014			120			
	011			41			
	017			2			

Notes:

North Carolina State University Asbestos Assessment Survey
 PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: PENTHOUSE / ROOF

Inspector(s): J. Silvestri

Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
P1000	20	Muddled joint packing	stairwell	2 Ea	G	L	
P1000A	20	Muddled joint pack		2 Ea			Switch Room
P1001				1 Ea			stairwell
P1001A				2 Ea			Switch rm
P1002							
P1004	19	Black VJC		24 #			MER
	21	Foam panel Adhesive	w. wall	325 #			
	36	White F.G. Duct Ins		210 #			
	04 04	MJP - 8"		41 Ea			
	06 06	MJP - 4"		16 Ea			
	03	canvas pipe Ins - 8"		350 LF			
	05	canvas pipe Ins - 4"		66 LF			
	09	Yellow/Tan Duct Mastix		60 #			
P1003	19	Black VJC		24 #			MER
	21	Foam panel Adhesive		325 #			
	36	White F.G. Duct Ins		175 #			
	04	MJP - 8"		38 Ea			
	06	MJP - 4"		16 Ea			
	03	Canvas pipe Ins - 8"		350 LF			
	05	Canvas pipe Ins - 4"		66 LF			
	09	Yellow/Tan Duct Mastix		60 #			

Notes:

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ASBESTOS SURVEY REPORTS

**POE HALL BUILDING
FACILITY NO. 024**

PREPARED FOR:

**NORTH CAROLINA STATE
UNIVERSITY**

Prepared By:

**PROFESSIONAL SERVICE INDUSTRIES, INC.
5035-A WEST W.T. HARRIS BOULEVARD
CHARLOTTE, NORTH CAROLINA 28269**

PSI PROJECT No. 511-7A008

June 2, 1997



ASBESTOS SURVEY REPORTS



**POE HALL BUILDING
FACILITY NO. 024**

PREPARED FOR:

**NORTH CAROLINA STATE
UNIVERSITY**

Prepared By:

**PROFESSIONAL SERVICE INDUSTRIES, INC.
5035-A WEST W.T. HARRIS BOULEVARD
CHARLOTTE, NORTH CAROLINA 28269**

PSI PROJECT No. 511-7A008

June 2, 1997

Information To Build On

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APPENDICES

- Appendix A. Figures
- Appendix B. DEHNR Form 3535
- Appendix C. DEHNR Form 3540
- Appendix D. DEHNR Form 3542
- Appendix E. Analytical Reports
- Appendix F. Field Assessment Sheets

Professional Service Industries, Inc. (PSI) has conducted an Asbestos Survey and Assessment of Poe Hall at the North Carolina State University (NCSU) in Raleigh, North Carolina. The survey was conducted by PSI from March 10, 1997 through March 17, 1997.

The visual inspection and sampling survey was conducted in general accordance with EPA/AHERA guidelines to determine the presence of suspect asbestos-containing materials (ACM) which were accessible and/or exposed in the buildings. Sampling locations were chosen to be representative of the homogeneous sampling area. Bulk samples obtained from the facility were analyzed in the laboratory using Polarized Light Microscopy (PLM) with dispersion staining by a laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

A material is considered by the EPA and OSHA to be asbestos containing if at least one sample collected from the area has asbestos present in a quantity greater than one percent (1%).

The following lists the suspect materials observed and analyzed for asbestos content:

Suspect Material Description

- Wallboard and joint compound
- Plaster
- Floor tile and associated mastic
- Baseboard and associated mastic
- 2' x 2' lay-in Ceiling tile
- 2' x 4' lay-in Ceiling tile
- Duct mastic
- Pipe insulation
- Pipe fitting insulation
- Vibration damper
- Lab countertops
- Fume hood lining
- Duct insulation
- Tank insulation
- Welding blocks
- Furnace block lining
- Partition panels
- Foam panel adhesive
- 2' x 3' Acoustical panel
- Laboratory sink

1.0 EXECUTIVE SUMMARY

Asbestos-containing materials were identified throughout the building at a variety of locations. The following materials were identified as asbestos-containing (per EPA and OSHA definitions):

<u>Samples*</u>	<u>Homogeneous Material</u>	<u>Location</u>	<u>Condition</u>	<u>Quantity</u>
024-001 024-002 024-003	12" x 12" White with black streaks floor tile and associated mastic (both tile and mastic are asbestos-containing)	Rooms 108,504	Good	278 SF
024-019 024-020 024-021	Gasket type 1" rope	Rooms 116, and 212	Good	5 LF
024-022 024-023 024-024	Red duct mastic	Throughout the building on ductwork	Good	Unknown
024-028 024-029 024-030	Black duct mastic	Throughout the building on ductwork	Good	Unknown
024-031 024-032 024-033 024-034 024-035	9" x 9" White with black streaks floor tile and associated mastic (both tile and mastic are asbestos-containing)	Located in halls floors 2 through 7, and in a number of classrooms and offices	Good	59,533 SF
024-080 024-081 024-082	Lab countertop	Rooms 102D, 312, 317	Good	415 SF
024-083 024-084 024-085	Fume hood lining	Rooms 102D and 317	Good	64 SF
024-086 024-087 024-088	Pipe insulation (E-tar)	Room 102C	Good	12 LF
024-098 024-099 024-100	Tar coated pipe insulation	Throughout building in halls and classrooms above ceilings	Good	765 LF
024-113 024-114 024-115	Generator exhaust insulation	Room 130	Good	18 LF
024-116 024-117 024-118	Vibration joint cloth (vibration damper)	Room 130	Good	2 SF
024-122 024-123 024-124	Pipe insulation, tar paper Only sample 024-123 of the set tested positive for asbestos	Pipe chases, Rooms 212, 308, 312, 324, 509, 525, 500	Good	476 LF
024-140 024-141	12" x 12" Tan with brown streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-142 024-143	12" x 12" Brown with tan streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-144 024-145	12" x 12" Green floor tile and associated adhesive	Room 114	Good	5 SF
024-146 024-147	12" x 12" Gray floor tile and associated adhesive	Room 114	Good	5 SF

Refer to Appendix A for figures illustrating floor plans, asbestos bulk sample locations, and locations of the asbestos containing materials. Refer to Appendix C for further information on the homogeneous sampling areas.

* Sample numbers are assigned in the field during survey activities using the facility number as a prefix. These are the sample numbers reported. The laboratory assigned each sample a unique sample identification number using the sampled material homogeneous area as a prefix. Although the field identification number and the laboratory identification number have different prefixes, they both have the same root number and reference the same sample; e.g., field number 003 (building prefix)-014 (root number) references the same sample as the laboratory number 004 (homogeneous material number)-014 (root number).

1.1 Recommendations

1. PSI recommends that the asbestos-containing materials identified be placed under an operations and maintenance plan that conforms to the communication portion of OSHA CFR 1910.1001 (j) and 29 CFR 1926.1101 (k).). Removal of thermal system insulation is regulated by OSHA as a Class I removal operations (29 CFR 1926.1101). Removal of floor tile/mastic is regulated by OSHA as Class II removal operations (29 CFR 1926.1101

2. PSI recommends that when it becomes necessary to disturb the roofing materials that they be sampled to confirm the presence or absence of asbestos. If roofing materials are not sampled they should be assumed to be asbestos-containing and appropriate work practices followed.

This report presents the findings of the Asbestos Survey and Assessment conducted at the Poe Hall Building at the North Carolina State University campus located in Raleigh, North Carolina. The Poe Hall Building is constructed of masonry and steel and consists of 165,888 gross square feet. The building is used as laboratory, office, and classroom space.

2.1 Authorization

Authorization to perform this assessment was given by the client in the form of a North Carolina State University purchase order No. P0064610, dated February 6, 1997.

2.2 Purpose

The purpose of the asbestos survey was to identify those building materials which contain asbestos or which can be assumed to contain asbestos, to determine the condition and relative risk of potential disturbance.

2.3 Scope

The visual inspection and sampling survey was conducted in general accordance with EPA/AHERA guidelines and the provided Asbestos Bulk Survey Scope of Work to determine the presence of suspect asbestos containing materials (ACM) which were accessible and/or exposed within the building interior. A room by room inventory was conducted in which suspect materials were assessed, sampled, and quantified.

Bulk survey samples obtained from the facility were analyzed in the PSI Lawrence, Kansas, NVLAP accredited laboratory using Polarized Light Microscopy (PLM) with dispersion staining. A detailed listing of the analyses is included in Appendix E - Laboratory Analysis Data Sheets.

2.4 Limitations and Exclusions

Roofing materials were not within the scope of this survey and therefore, were not sampled. Roofing materials should be assumed to be asbestos-containing, unless sampling results indicate otherwise.

Destructive sampling was not performed, only accessible materials were included in this survey. Electrical wiring may be considered a suspect asbestos-containing material but was not assessed, sampled, or quantified by the inspection teams due to the risk of electrocution. NCSU should consider electrical wiring insulation to be a suspect asbestos-containing material and handle it with the appropriate protective measures.

In most cases material under carpeting was assessed, sampled, and quantified. Conditions may have existed, or do exist, that limit the inspectors ability to accurately identify and assess the underlying materials. Floor tile, floor tile mastic, and other suspect materials encountered underlying carpet should be assumed to be asbestos-containing material unless subsequent sampling indicates otherwise.

Quantities are estimates and should be confirmed by an engineering survey if renovation or demolition activities are contemplated.

This section includes the description of the methodologies used to perform the asbestos survey and assessment. These methodologies include document review, personnel interviews, visual inspection, quantification, sample collection, sample analysis, assessment, classification, and drawing development.

3.1 Document Review

a. Construction Documents

Construction documents provided by NCSU were used in part to determine quantities of materials, potential for hidden materials, and to develop material and sample location drawings.

b. Past Reports

Previous asbestos survey reports provided by NCSU were reviewed to provide additional background information about the building. The previous reports were not relied upon to develop a sampling strategy.

3.2 Personnel Interviews

When possible, interviews are conducted with personnel familiar with the building for their knowledge of the use of ACM in their buildings. Interviews are also conducted to determine the extent of renovation activities or past ACM removal activities.

3.3 Visual Inspection

The asbestos survey was performed by a North Carolina accredited inspector. An initial walk-through was conducted to determine the presence of suspect materials which were accessible and/or exposed in the facility. Suspect materials were also quantified during the walk-through.

Materials which were visually similar in color, texture, general appearance, and appear to have been installed at the same time were grouped into homogeneous sampling areas. A homogeneous sampling material is an area of surfacing, thermal system insulation, or miscellaneous material that is uniform in color and texture. Further definition includes material within a structure with the same installation date. When feasible, homogeneous sampling areas included multiple floors within a building.

Following the walk-through, the inspector collected samples of selected materials identified as suspect ACM. Sampling was limited to those materials which were accessible with minimum amount of damage to walls or ceilings, and did not involve destruction of physical barriers or the structural integrity of the item being tested.

The materials sampled are a good representation of the conditions in each building.

EPA guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous sampling area. While an effort was made to collect samples randomly, samples were taken preferentially from previously damaged areas or areas which were the least visible to minimize noticeable damage to the material. After each sample was extracted, a spray encapsulant or sealant was applied to the sampled area to prevent potential fiber release. Thermal system installation sample locations were labeled with tags and patched with non-asbestos heat resistant sealant. Repair of visible previously undamaged sample areas was performed after sample collection.

3.4 Sampling Materials

Sampling Procedure

Following the walk-through, the inspector collected selected samples of exposed and accessible materials identified as suspect ACM. Sampling was limited to those accessible materials not involving the destruction of walls, other building elements, physical barriers, or the structural integrity of the item being tested.

EPA guidelines were used to determine the sampling protocol. Sampling locations were chosen to be representative of the homogeneous material.

Samples of surfacing material were collected in general accordance with the EPA random sampling protocol outlined in the EPA publication, "Asbestos in Buildings: Simplified Sampling Scheme for Friable Surfacing Materials" (EPA 560/5-85-030a, October, 1985). Samples of thermal system insulation (TSI) and miscellaneous materials were taken as randomly as possible while preferentially sampling previously damaged areas so as to minimize disturbance of the suspect materials.

Safety Precautions

Asbestos is a known carcinogen. Special care was taken when sampling. A properly selected and fit-tested respirator was worn during sampling activities. Samples were taken in such a manner as to minimize dust generation. Samples were collected following these general guidelines:

- (a) Do not create unnecessary dust (spray with amended water).
- (b) Collect only a small amount (size of a sugar cube).
- (c) Tightly close the sample container.
- (d) Repair the sample collection location.

Shipment

Samples are shipped by overnight express under chain-of-custody documentation to our PSI Lawrence, Kansas NVLAP accredited laboratory. Custody documentation procedures must be followed whenever samples are received, transferred, stored analyzed, or destroyed. Samples are held at the laboratory for 90 days.

3.5 Laboratory Analysis

Analysis was performed by using the bulk sample for visual observation and slide preparations for microscopic examination and identification. The samples were mounted on slides and analyzed for asbestos (chrysotile, amosite, crocidolite, anthophyllite, and actinolite/tremolite), fibrous non-asbestos constituents (mineral wool, paper, etc.) and non-fibrous constituents. Asbestos is identified by Polarized Light Microscopy. The same method is used to identify the non-asbestos constituents.

The microscopist visually estimated relative amounts of each constituent in proportion to the total volume of the sample, using a stereoscope. The Interim Method for the Determination of Asbestos in Bulk Insulation Samples, (40 CFR Ch 1 Pt. 763, App. A to Subpt. F. July 1, 1987) was used to analyze all bulk samples.

Laboratory Quality Control Program

PSI laboratories maintain an in-house quality control program. This program involves the re-analysis of a minimum of ten percent of all samples, precision and accuracy controls, use of standard bulk reference materials, maintenance of state and national accreditation, participation in external and internal proficiency testing programs, and confirmation of analyst experience and qualifications in compliance with specific internal training and competency requirements. Additionally, all quality assurance/quality control program and operational procedures are documented in manual form and retained on site as reference materials for all analytical staff.

3.6 Quantification of Materials

Quantities of accessible and exposed suspect building materials were estimated. The estimation was performed by taking approximate measurements in the field or estimating quantities based on the provided scale drawings. Materials such as pipe insulation and associated mudded joint packing (MJP) were categorized according to the outside diameter of the insulation, in 2 inch increments. Pipe lagging was quantified by linear footage while the actual number of accessible and exposed MJPs were counted. Insulation on mechanical equipment was

quantified by the square footage of the surface area of suspect insulation. Similarly, fireproofing, plasters, ceiling and floor tiles, and transite panels were measured in square feet of surface area.

3.7 Drawings

Scale drawings were provided by NCSU and modified for this report. ACM materials are identified by symbols for materials, utilizing a CAD menu provided by NCSU, such as floor tiles and ceiling tiles. Location of piping and other mechanical systems are designated by symbols. Symbols do not represent actual pipes but merely that piping is located in or runs through the area. The tag on the sample location drawing provides the sample number, homogeneous sample group code, bulk sample code, and whether the material is positive or negative for asbestos content.

3.8 Assessment of Materials

The condition of a suspect material is an indication of the likelihood that it may release asbestos fibers into the environment. The combination of its current condition coupled with the potential for damage coupled with the potential for future disturbance determines which EPA response priority is appropriate for that material.

The condition of each homogeneous suspect material within a room was assessed using the EPA decision tree approach. The friability of each material was determined and then its condition and potential for future damage were assessed using the following criteria:

- 1.) Source and type of damage
 - Physical contact
 - Water or air erosion
 - Deterioration or material delamination
 - Abrasions, punctures, tears, blistering, crumpling, etc.
- 2.) Extent of damage
 - Good; No damage or little damage
 - Damaged: less than 10% damage, evenly distributed OR less than 25% damage confined to a localized area
 - Significantly Damaged: 10% or more damage distributed OR 25% within a localized area
- 3.) Potential for future damage:
 - Frequency of access to material
 - Height of material
 - Location of material in plenum
 - Exposure of material
 - Accessibility
 - Presence in an area of air movement, vibrations, or loud noises

3.9 Report Format

This report has been organized in a manner that presents the data in several forms to best suit the needs of NCSU. The "Executive Summary" provides a description of the materials found to contain asbestos and the approximate quantity of each material. The "Findings" describe the materials found and provide recommendations for managing them. Appendix A contains Figures and illustrates asbestos-containing material and sample locations. Appendix B contains the Department of Environment, Health, and Natural Resources (DEHNR) form 3535, "Determination of Sampling Locations". The DEHNR form 3540 "Description of Sample Area" is presented in Appendix B. Appendix C contains DEHNR form 3542 "Assessment of Materials", which assesses the condition of asbestos-containing materials. Appendix E "Analytical Reports" contains the laboratory report of sample analysis and includes bulk sample collection field forms and an explanation of bulk sample codes. Appendix F contains the Field Assessment Sheet as it was completed in the field during the survey.

4.0 FINDINGS AND RECOMMENDATIONS

4.1 General Summary

Asbestos-containing materials were identified in the Poe Hall Building. The quantities and locations of these materials are presented below and in Appendix A.

Suspect materials found within the building were:

- Wallboard and joint compound
- Plaster
- Floor tile and associated mastic
- Baseboard and associated mastic
- 2' x 2' lay-in Ceiling tile
- 2' x 4' lay-in Ceiling tile
- Duct mastic
- Pipe insulation
- Pipe fitting insulation
- Vibration damper
- Lab countertops
- Fume hood lining
- Duct insulation
- Tank insulation
- Welding blocks
- Furnace block lining
- Partition panels
- Foam panel adhesive
- 2' x 3' Acoustical panel
- Laboratory sink

Asbestos-containing materials were identified throughout the building at a variety of locations. The following materials were identified as asbestos-containing (per EPA and OSHA definitions):

<u>Samples*</u>	<u>Homogeneous Material</u>	<u>Location</u>	<u>Condition</u>	<u>Quantity</u>
024-001 024-002 024-003	12" x 12" White with black streaks floor tile and associated mastic	Rooms 108,504	Good	278 SF
024-019 024-020 024-021	Gasket type 1" rope	Rooms 116, and 212	Good	5 LF
024-022 024-023 024-024	Red duct mastic	Throughout the building on ductwork	Good	Unknown

4.0 FINDINGS AND RECOMMENDATIONS

<u>Samples*</u>	<u>Homogeneous Material</u>	<u>Location</u>	<u>Condition</u>	<u>Quantity</u>
024-028 024-029 024-030	Black duct mastic	Throughout the building on ductwork	Good	Unknown
024-031 024-032 024-033 024-034 024-035	9" x 9" White with black streaks floor tile and associated mastic	Located in halls floors 2 through 7, and in a number of classrooms and offices	Good	59,533 SF
024-080 024-081 024-082	Lab countertop	Rooms 102D, 312, 317	Good	415 SF
024-083 024-084 024-085	Fume hood lining	Rooms 102D and 317	Good	64 SF
024-086 024-087 024-088	Pipe insulation (E-tar)	Room 102C	Good	12 LF
024-098 024-099 024-100	Tar coated pipe insulation	Throughout building in halls and classrooms	Good	765 LF
024-113 024-114 024-115	Generator exhaust insulation	Room 130	Good	18 LF
024-116 024-117 024-118	Vibration joint cloth (vibration damper)	Room 130	Good	2 SF
024-122 024-123 024-124	Pipe insulation, tar paper Only sample 024-123 of the set tested positive for asbestos	Pipe chases, Rooms 212, 308, 312, 324, 509, 525, 500	Good	476 LF
024-140 024-141	12" x 12" Tan with brown streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-142 024-143	12" x 12" Brown with tan streaks floor tile and associated adhesive	Room 114	Good	5 SF
024-144 024-145	12" x 12" Green floor tile and associated adhesive	Room 114	Good	5 SF
024-146 024-147	12" x 12" Gray floor tile and associated adhesive	Room 114	Good	5 SF

Refer to Appendix A for figures illustrating asbestos bulk sample locations and locations of the asbestos containing materials. Refer to Appendix C for further information on the homogeneous sampling areas.

* Sample numbers are assigned in the field during survey activities using the facility number as a prefix. These are the sample numbers reported. The laboratory assigned each sample a unique sample identification number using the sampled material homogeneous area as a prefix. Although the field identification number and the laboratory identification number have different prefixes, they both have the same root number and reference the same sample; e.g., field number 003 (building prefix)-014 (root number) references the same sample as the laboratory number 004 (homogeneous material number)-014 (root number).

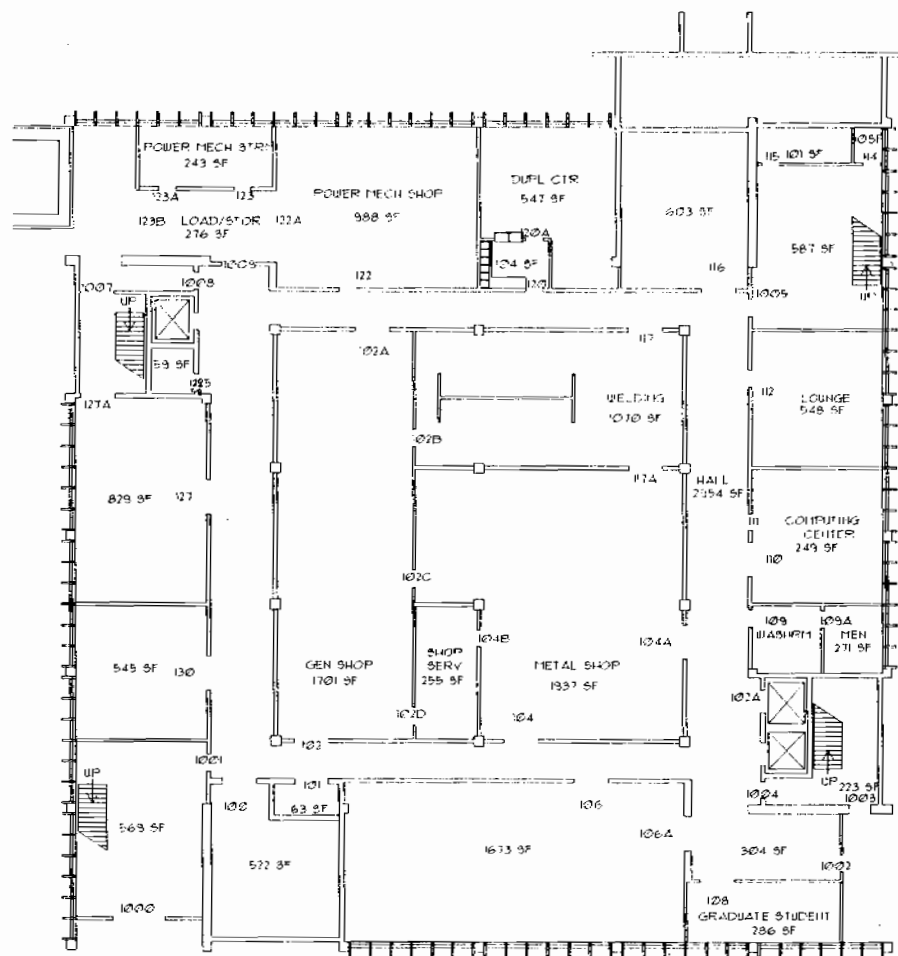
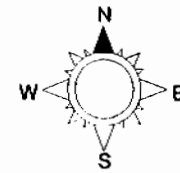
4.2 Recommendations

ACM identified in this survey was assessed as being in good condition. PSI recommends that the asbestos-containing materials identified be placed under an operations and maintenance plan that conforms to the communication portion of OSHA CFR 1910.1001 (j) and 29 CFR 1926.1101 (k).). If renovation or demolition of this facility results in the disturbance of asbestos-containing materials (ACM), Federal Regulations require specific control measures for the handling of ACM. Federal Regulations require that asbestos-containing materials, if impacted by renovation or demolition, be removed prior to disturbance by accredited personnel. Removal of thermal system insulation is regulated by OSHA as a Class I removal operations (29 CFR 1926.1101). Disturbance of asbestos-containing floor tile, floor tile mastic, and resilient floor coverings, until proven asbestos free, is regulated by OSHA regulation 29 CFR 1926.1101 as a Class II removal operation.

The field and laboratory results reported herein are considered sufficient in detail and scope to determine the presence of accessible and/or exposed suspect asbestos-containing building materials in the portion of the facility included in the project scope and which were made accessible to the PSI Survey Team. PSI warrants that the findings contained herein have been prepared in general accordance with accepted professional practices at the time of this preparation, as applied by similar professionals in the community.

No other warranties are implied or expressed.

APPENDIX A.



FIRST FLOOR

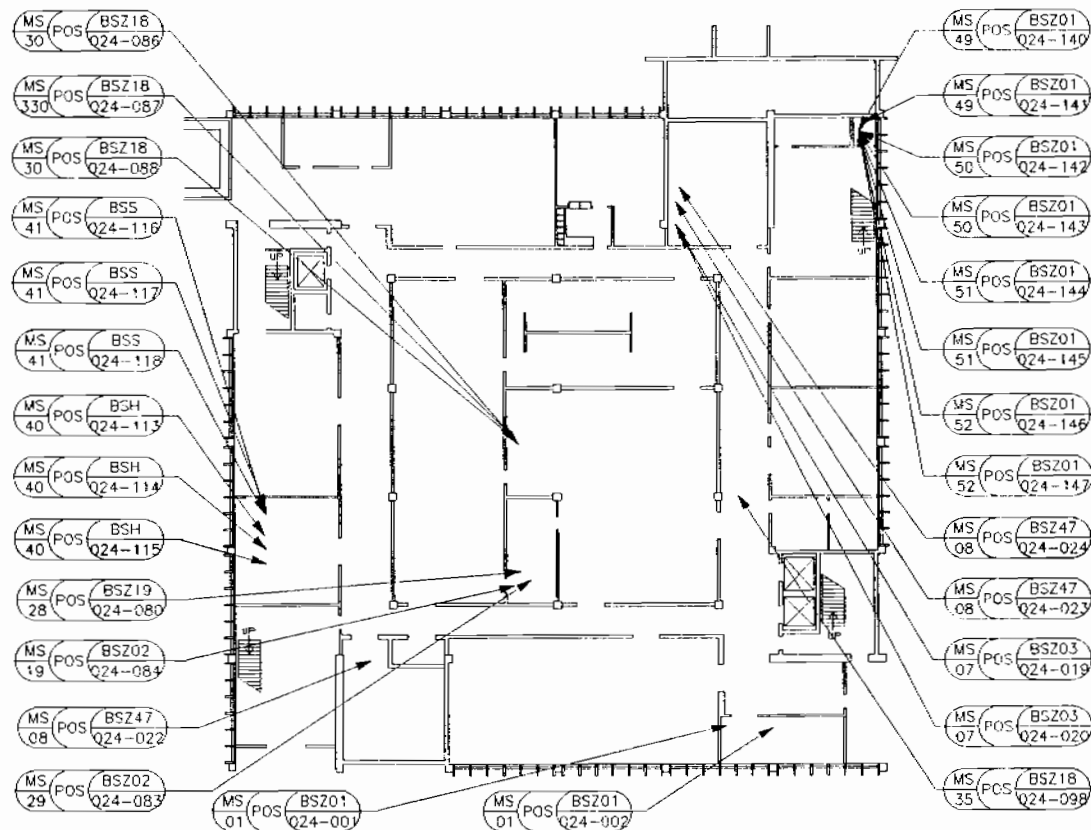
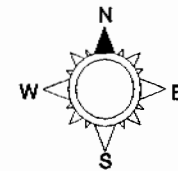
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PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

TITLE:
POE HALL

HAZMAT/DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 1
SCALE: NOT TO SCALE		PROJECT NUMBER: -7A008



BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIBL E ASBESTOS
	NF	MISC. NON-FRIBL E ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

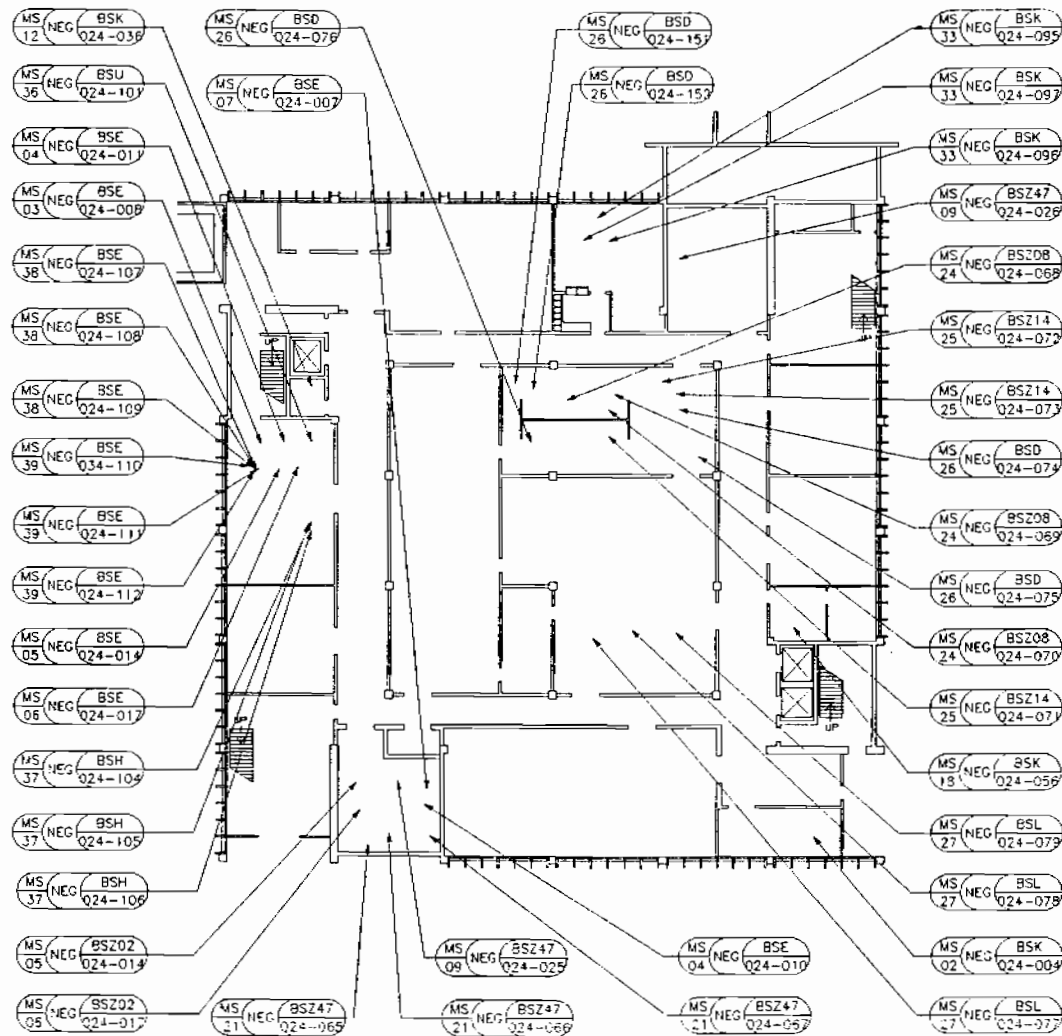
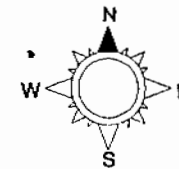
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P 024 1

TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS
POSITIVE RESULTS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z31	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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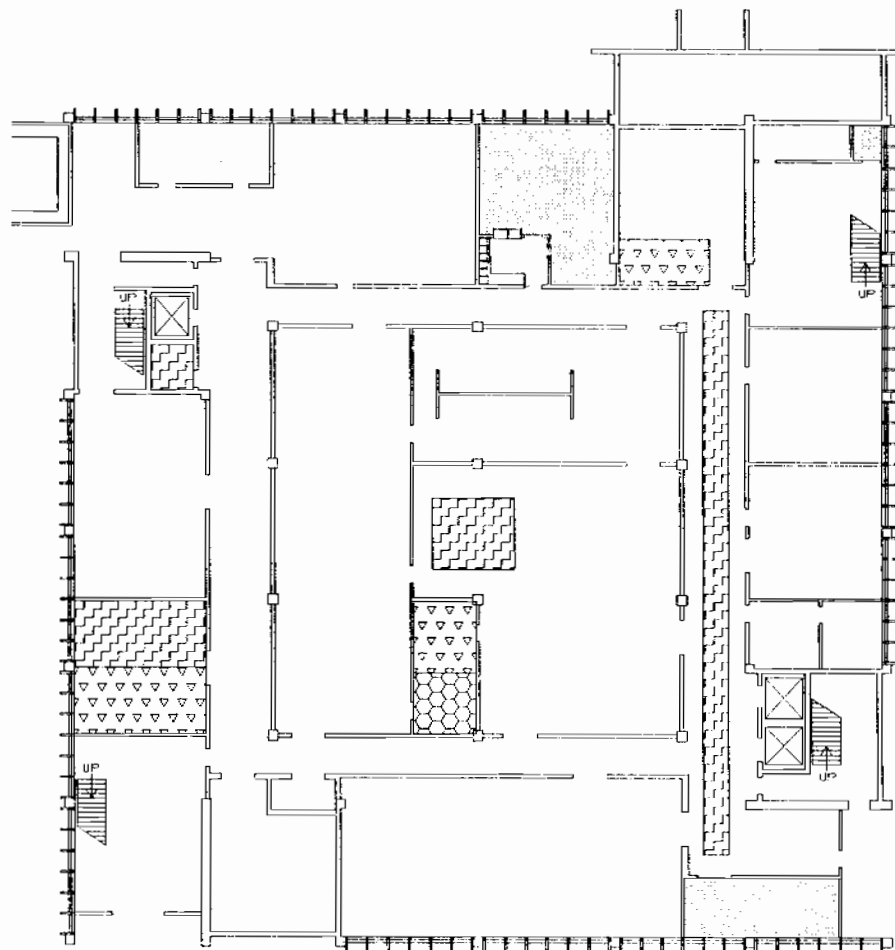
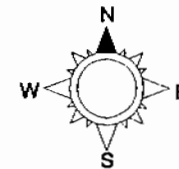
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TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS
NEGATIVE RESULTS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
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	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z61	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	WSC, NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

FIRST FLOOR

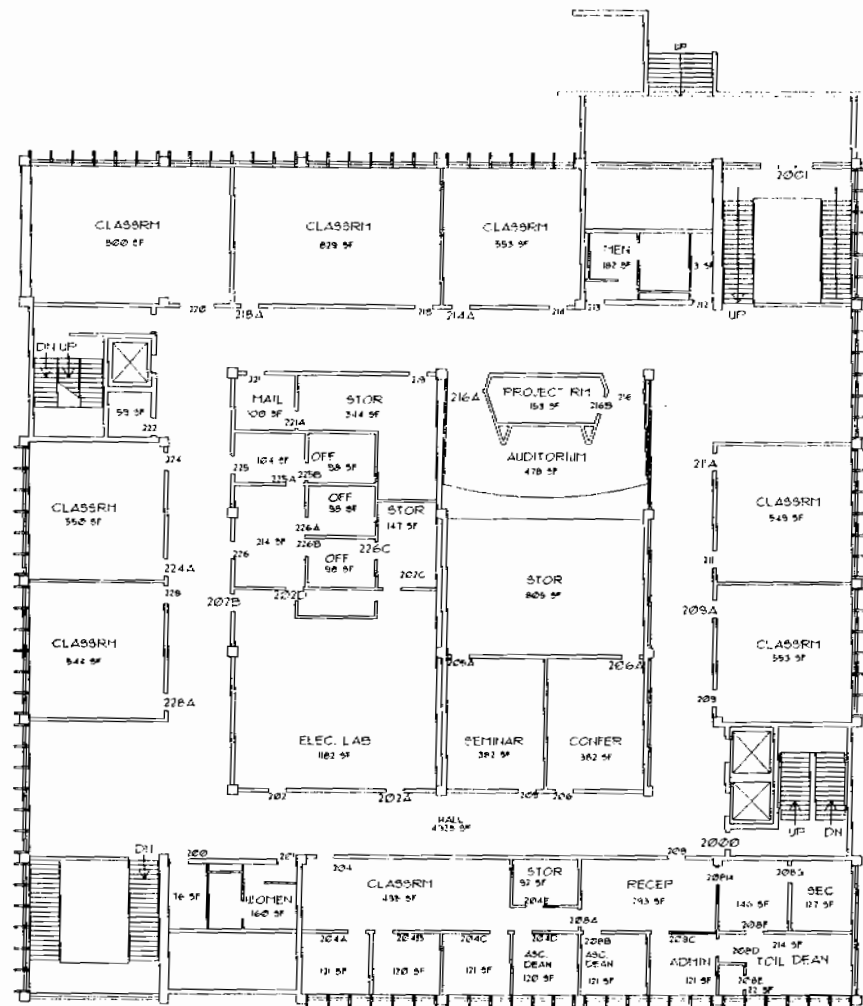
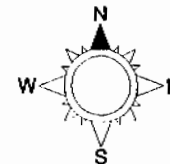
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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMATL DWN. BY: **A. ZDROBA**
 FLOORPLAN DWN. BY: **N.C.S.U.**
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DATE: **MAY 1997**
 DRAWING NO.: **P 024 1**
 PROJECT NUMBER: **7A008**



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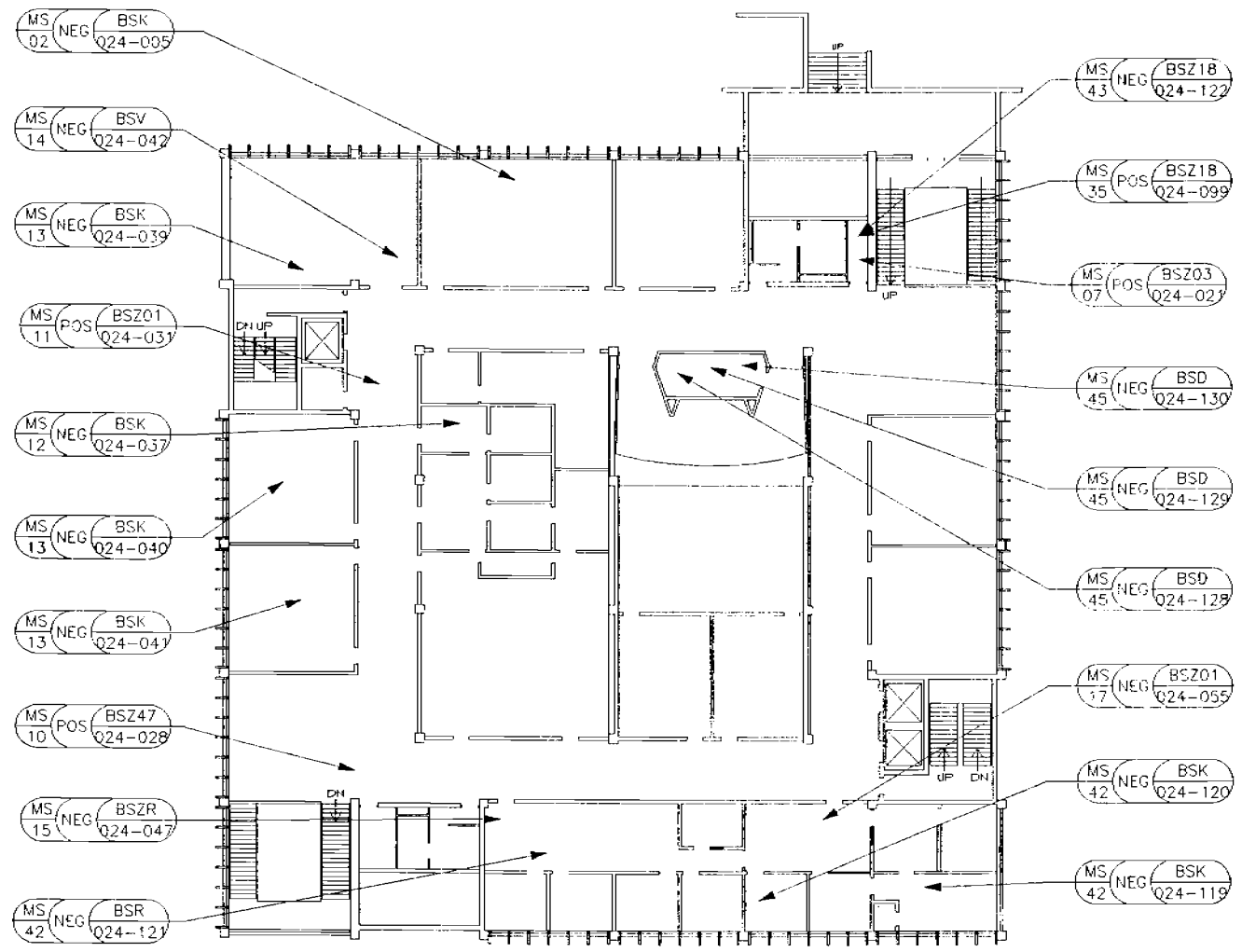
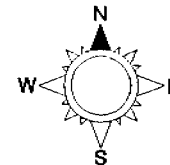
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PROJECT NUMBER:

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BULK SAMPLE CODE LEGEND

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	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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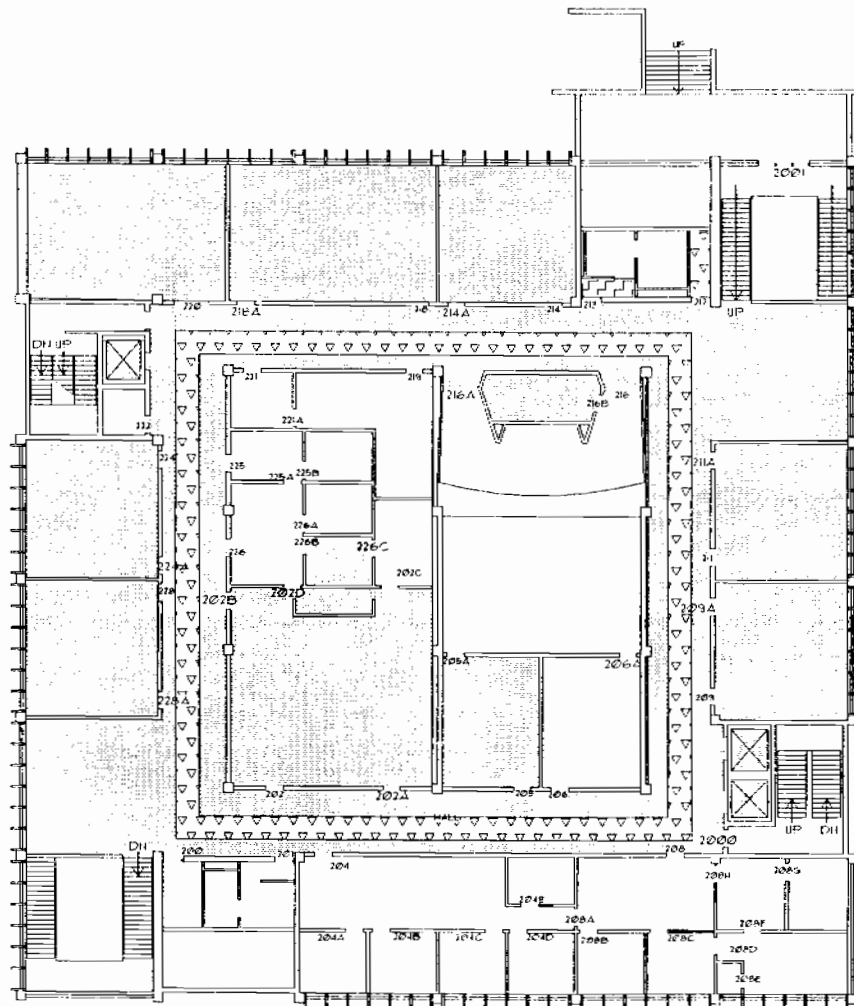
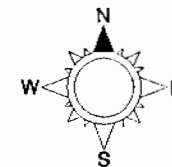
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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMATL DWN. BY: **A. ZDROBA**
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DATE: **MAY 1997**
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	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
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	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
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ASBESTOS-CONTAINING MATERIAL LOCATIONS**

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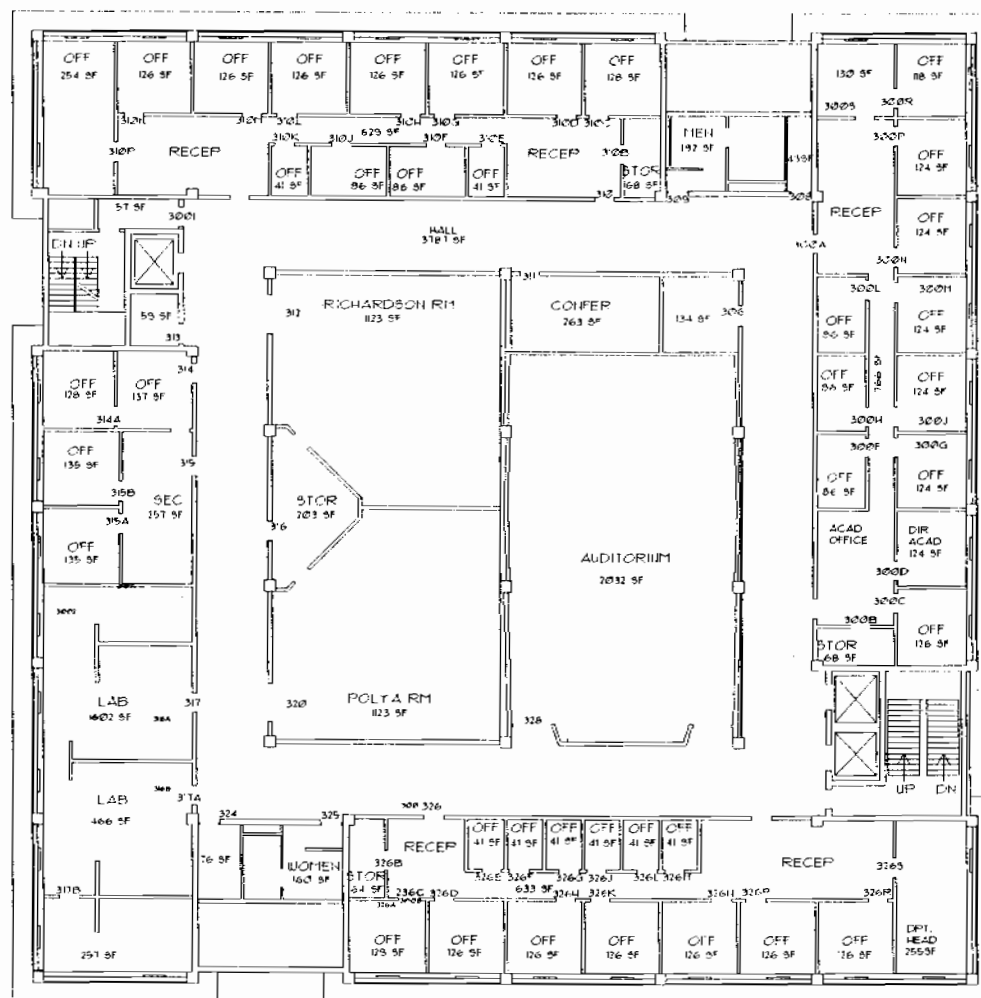
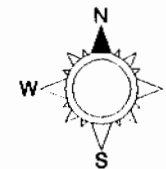
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POE HALL

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N.C.S.U.

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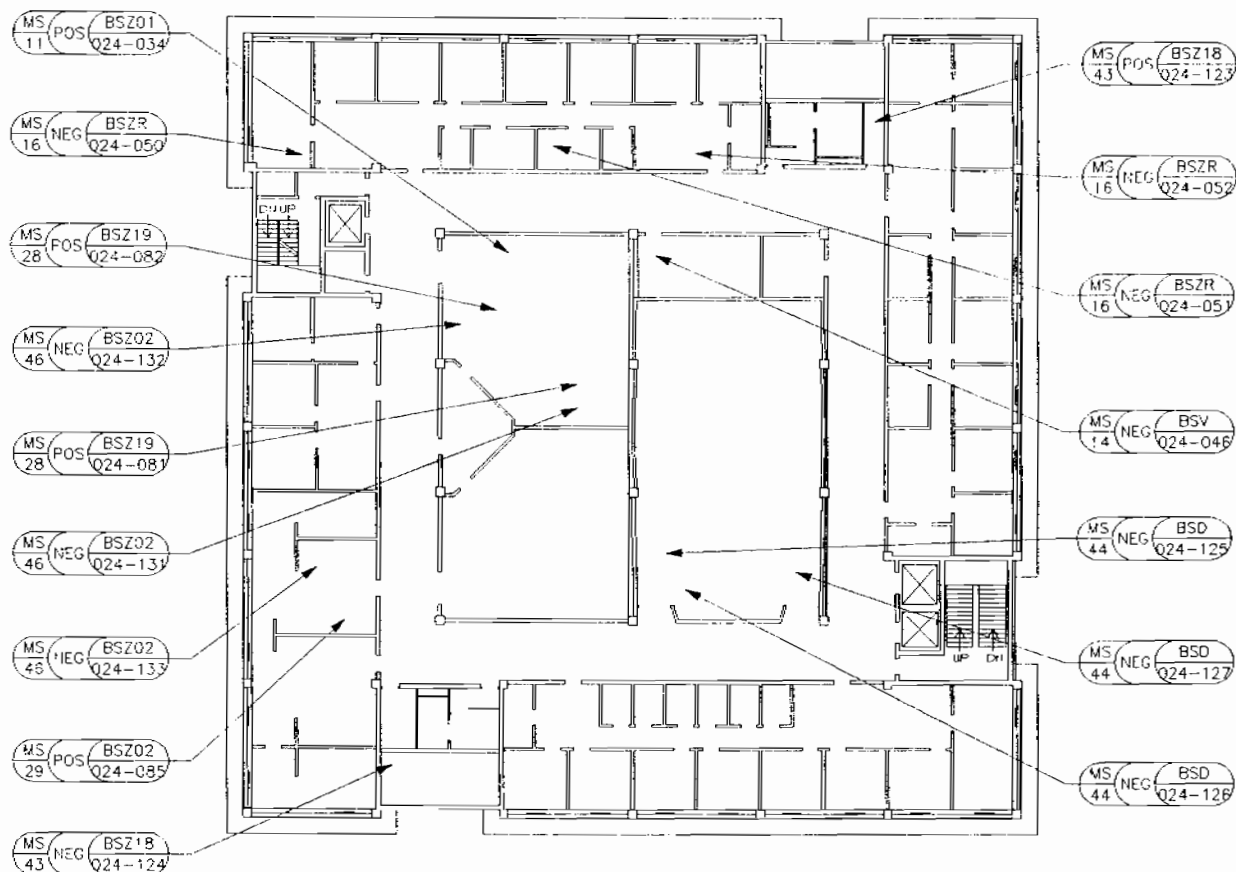
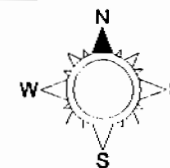
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NOT TO SCALE

PROJECT NUMBER:

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BULK SAMPLE CODE LEGEND		
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	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
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	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	MF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMATL. DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

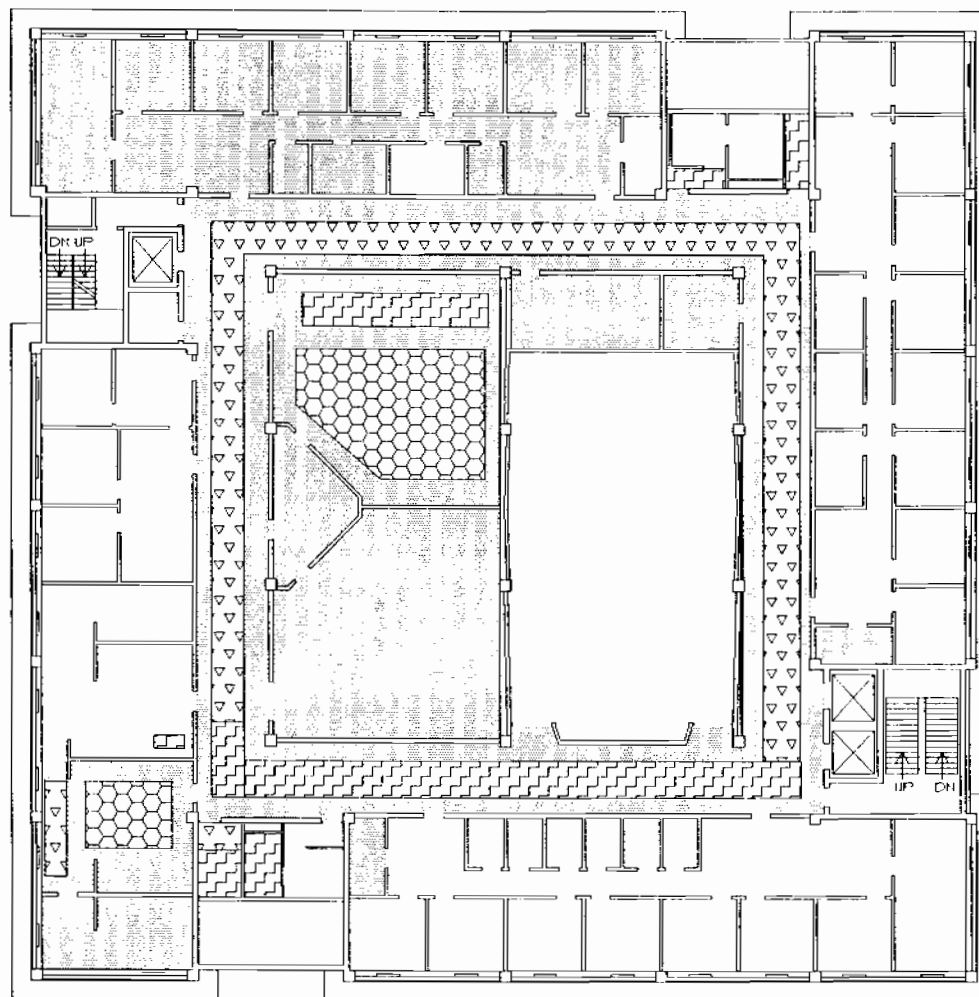
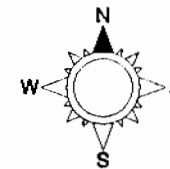
SCALE:
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DATE:
MAY 1997

PROJECT NUMBER:

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P 024 3

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THIRD FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
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PROJECT NAME:

**NCSU
ASBESTOS SURVEY**

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

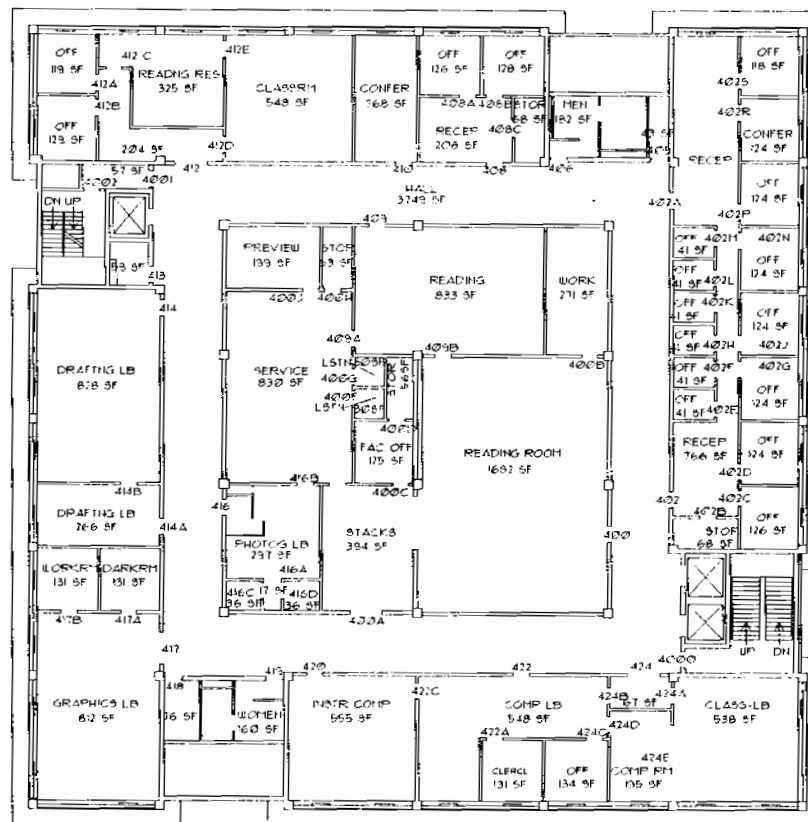
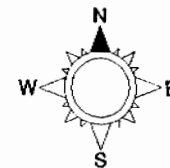
DRAWING NO.:
P 024 3

TITLE

**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



FOURTH FLOOR

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PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

HAZMAT/DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

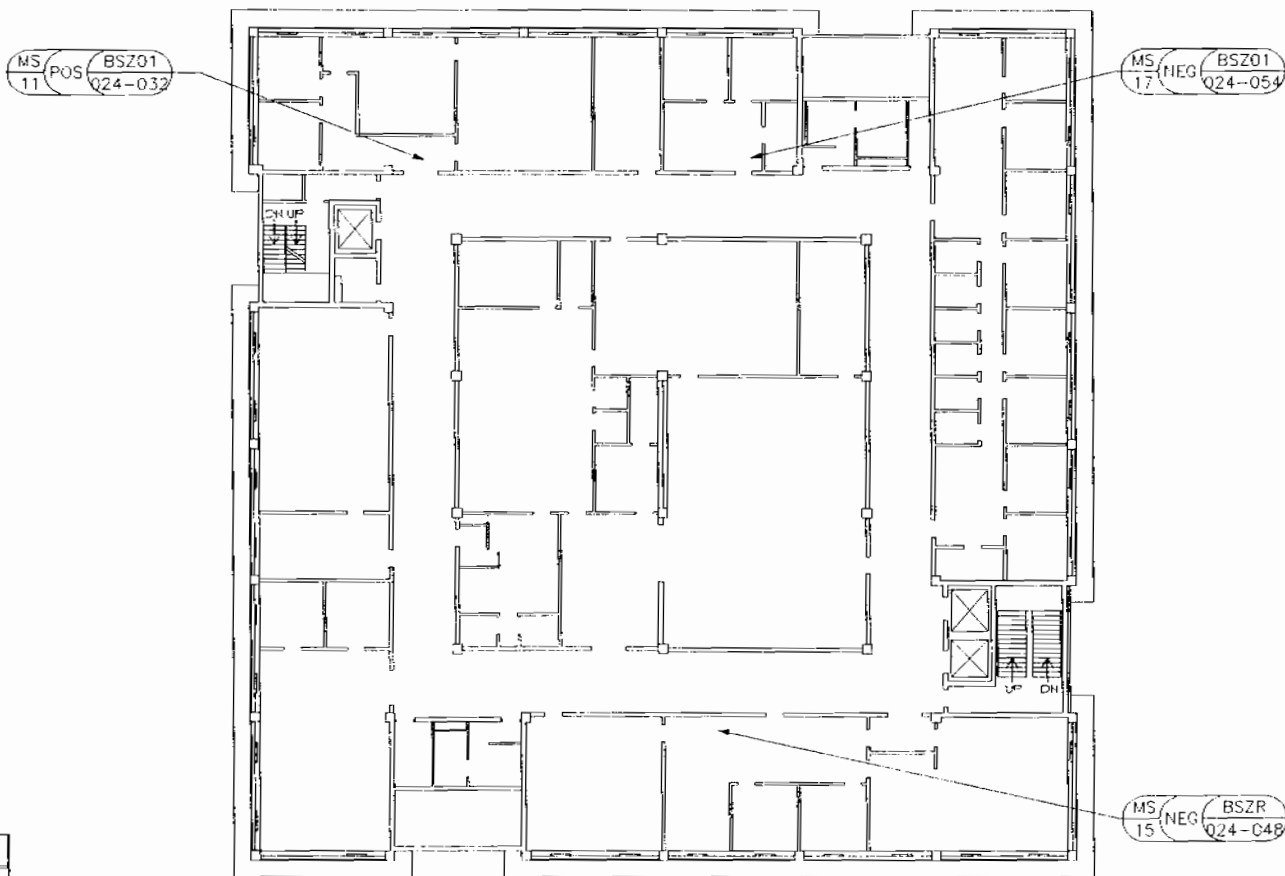
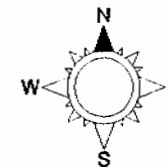
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MAY 1997

DRAWING NO.:
P 024 4

TITLE
POE HALL

SCALE:
NOT TO SCALE

PROJECT NUMBER:
611-7A008



FOURTH FLOOR

BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSW	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACoustICAL PLASTER
	BPD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z48	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

HAZMTRL DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

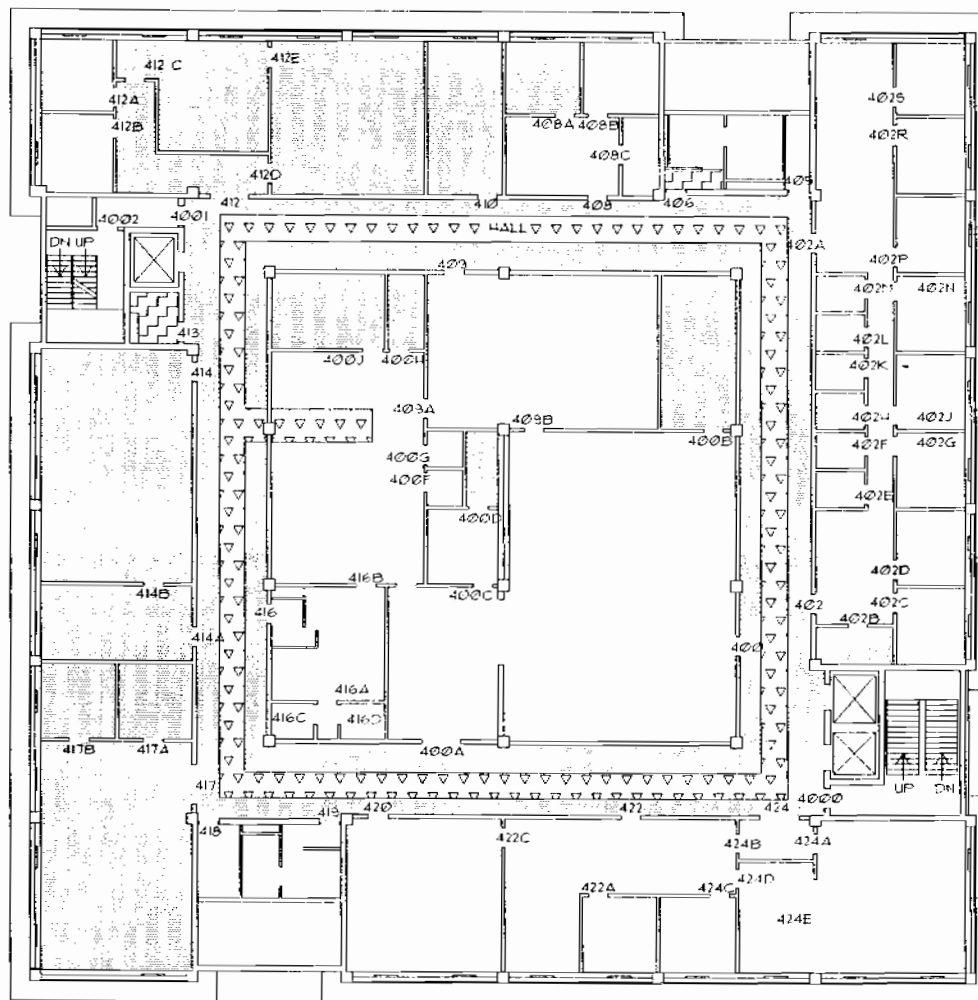
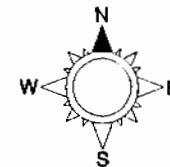
DATE:
MAY 1997

DRAWING NO.:
P 024 4

TITLE
**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



FOURTH FLOOR

BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	ZD1	FLOOR TILE
	ZD2	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRAGILE ASBESTOS
	NF	MISC. NON-FRAGILE ASBESTOS
	BSA	SPRAYED ACoustICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:

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ASBESTOS SURVEY**

TITLE

**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMATL. DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

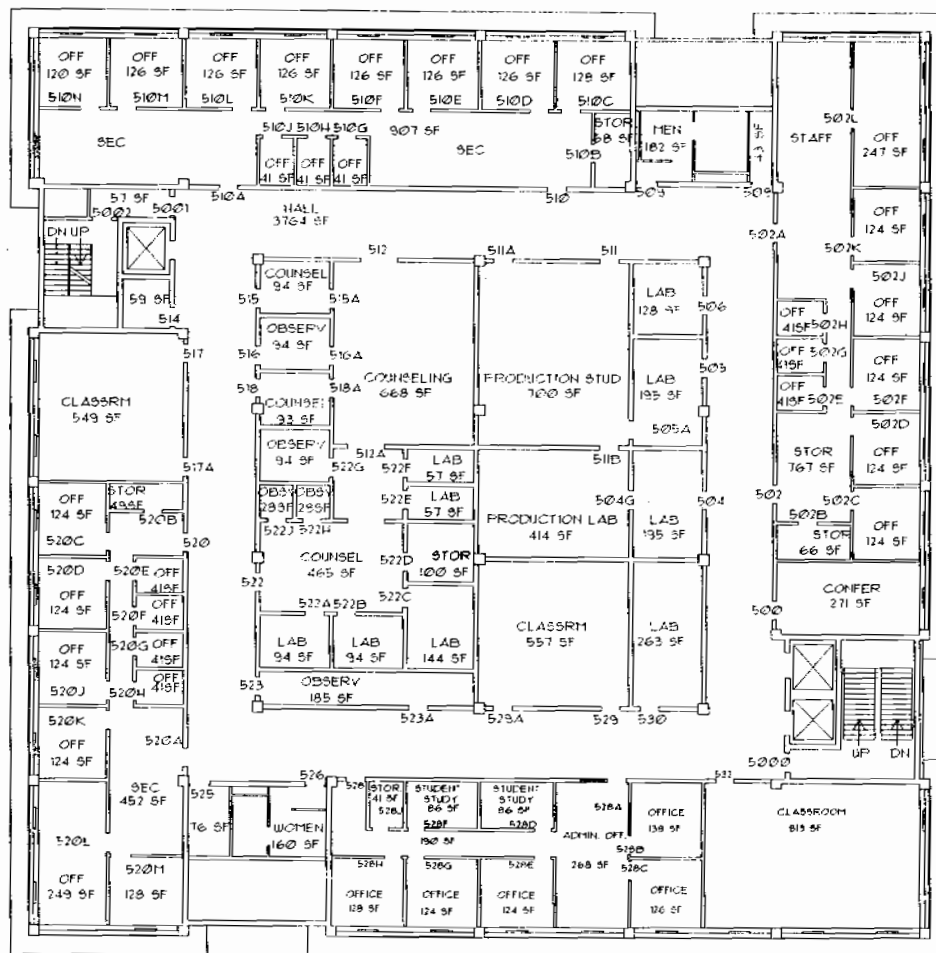
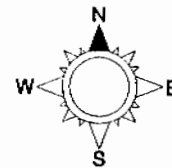
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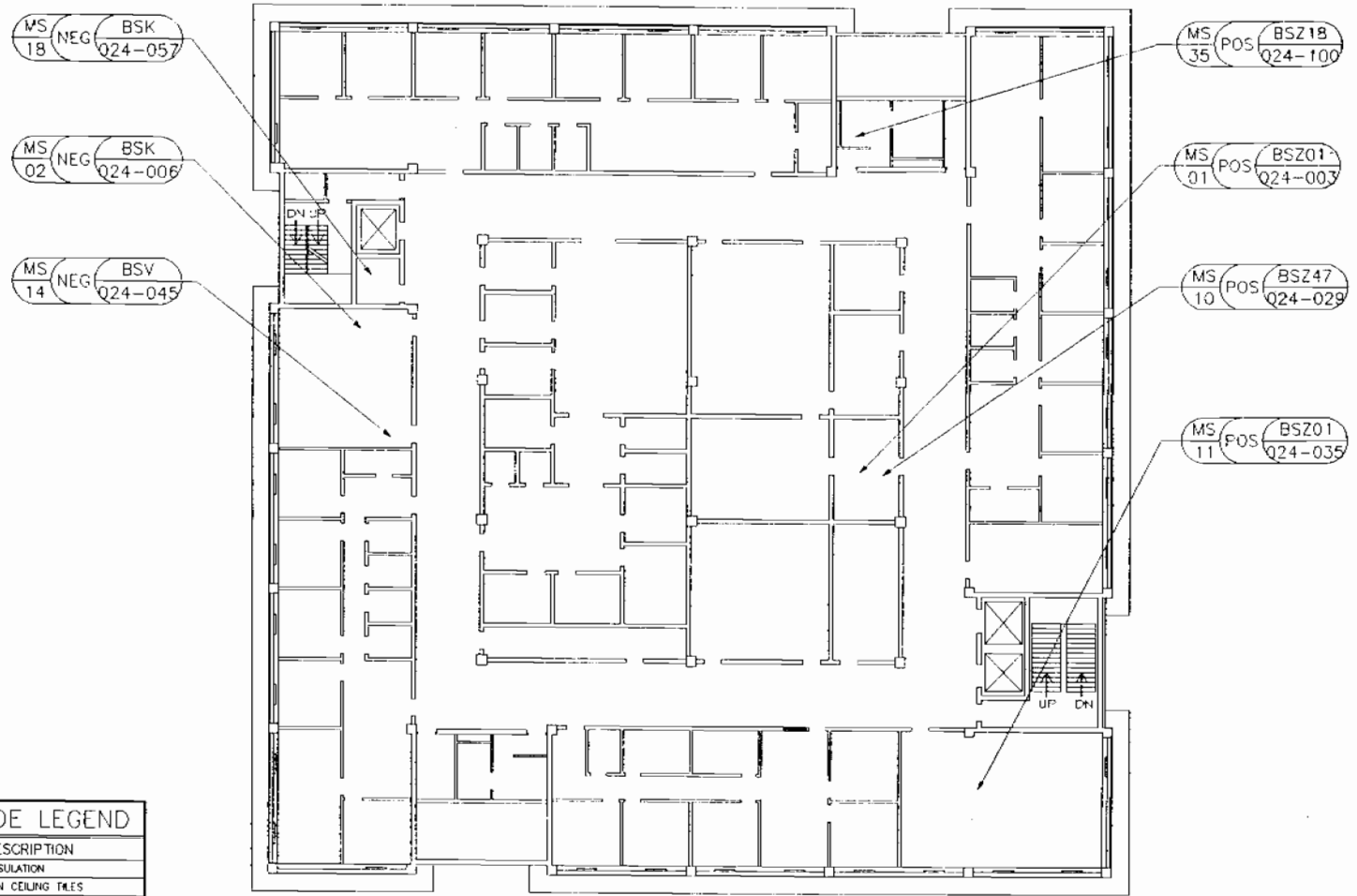
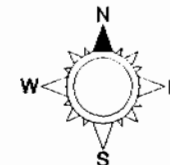
NOT TO SCALE

PROJECT NUMBER:

511-7A008



FIFTH FLOOR



BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

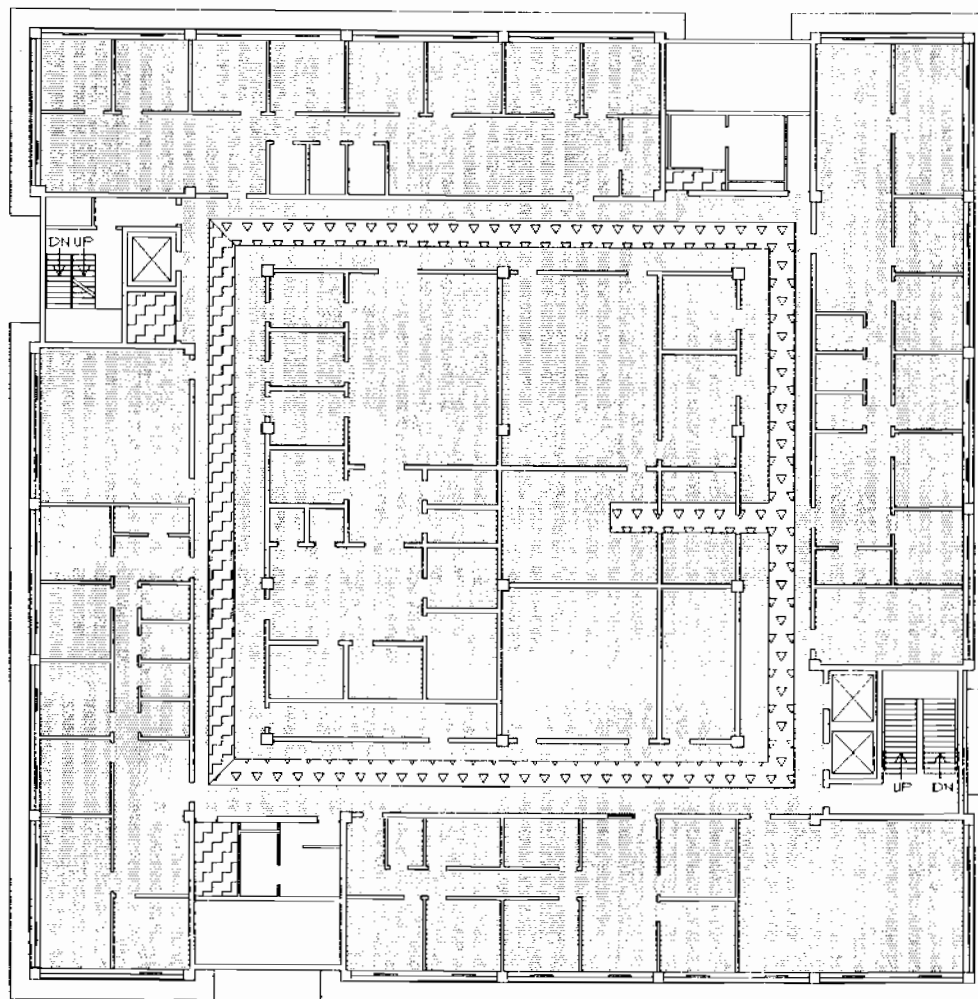
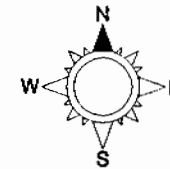
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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMATL DWN. BY: **A. ZDROBA**
 FLOORPLAN DWN. BY: **N.C.S.U.**
 SCALE: **NOT TO SCALE**
 DATE: **MAY 1997**
 DRAWING NO.: **P 024 5**
 PROJECT NUMBER: **7A008**



FIFTH FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSO	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

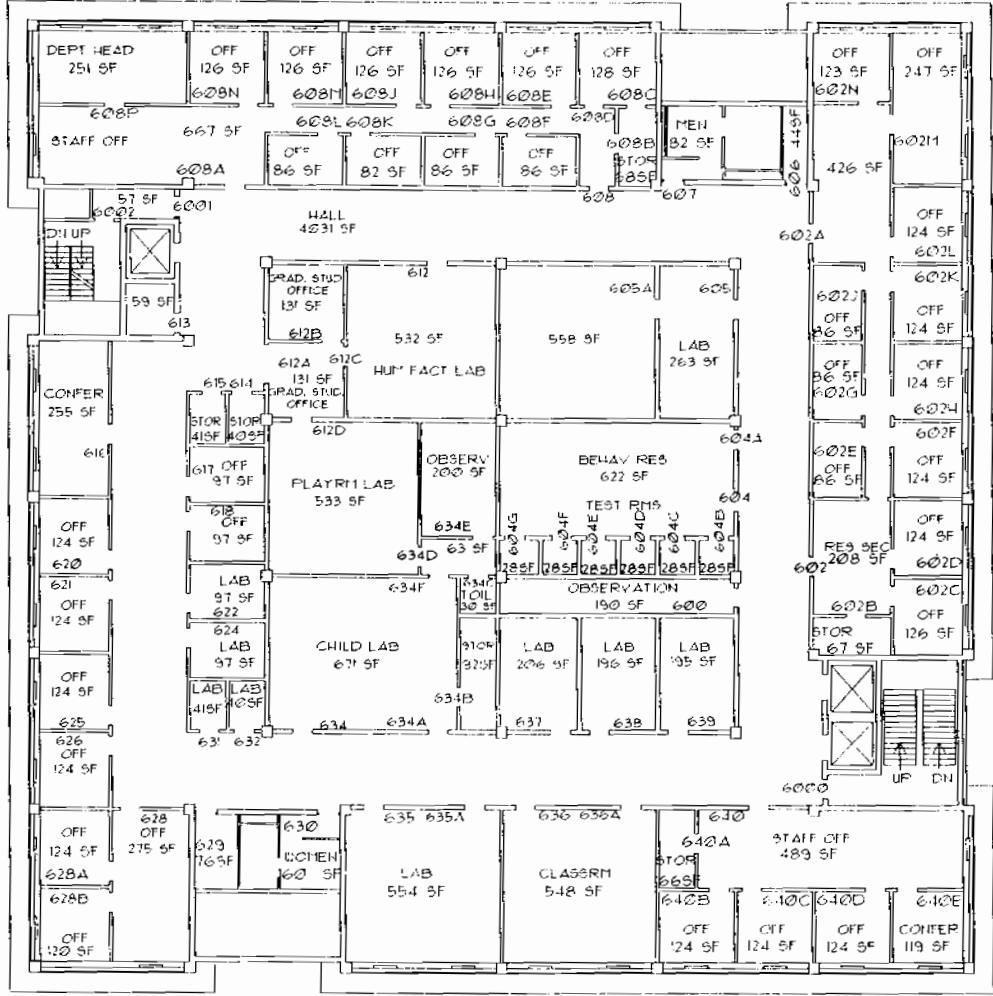
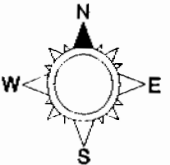
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PROJECT NAME:
**NCSU
ASBESTOS SURVEY**

TITLE
**POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMTRL DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 5
FLOORPLAN DWN. BY: N.C.S.U.	PROJECT NUMBER: 511-7A008	
SCALE: NOT TO SCALE		



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PROJECT NAME:
NCSU ASBESTOS SURVEY

HAZMATL DWN. BY:
A. ZDROBA
 FLOORPLAN DWN. BY:
N.C.S.U.

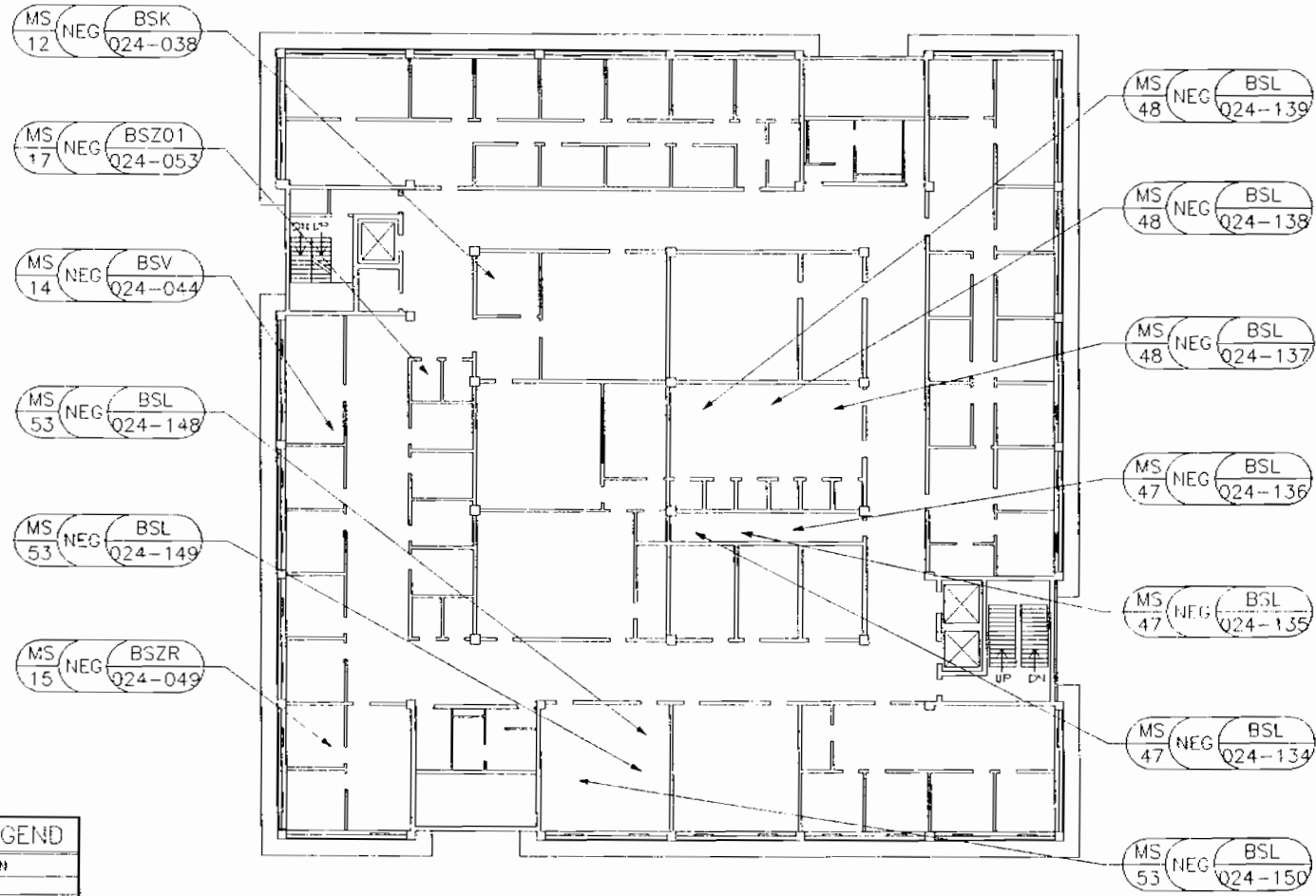
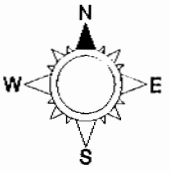
DATE:
MAY 1997

DRAWING NO.:
P 024 6

TITLE:
POE HALL

SCALE:
NOT TO SCALE

PROJECT NUMBER:
7A008



SIXTH FLOOR

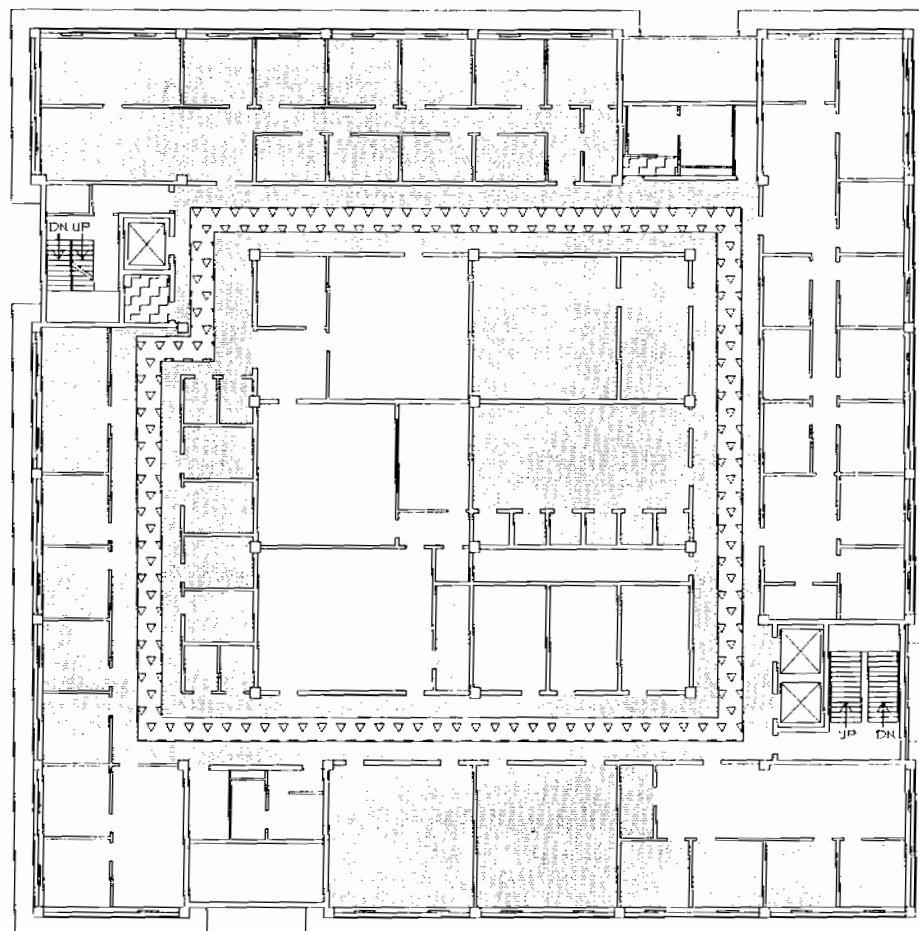
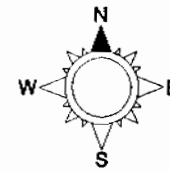
BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
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	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	201	FLOOR TILE
	202	CEMENTITIOUS PANELS
	251	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	219	LAB COUNTERTOPS
	241	COVERING UNDER TILE
	246	LINOLEUM
	247	MASTIC

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PROJECT NAME: **NCSU ASBESTOS SURVEY**
TITLE: **POE HALL SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

HAZMTRL DWN. BY: **A. ZDROBA**
FLOORPLAN DWN. BY: **N.C.S.U.**
SCALE: **NOT TO SCALE**
DATE: **MAY 1997**
DRAWING NO.: **P 024 6**
PROJECT NUMBER: **1-7A008**



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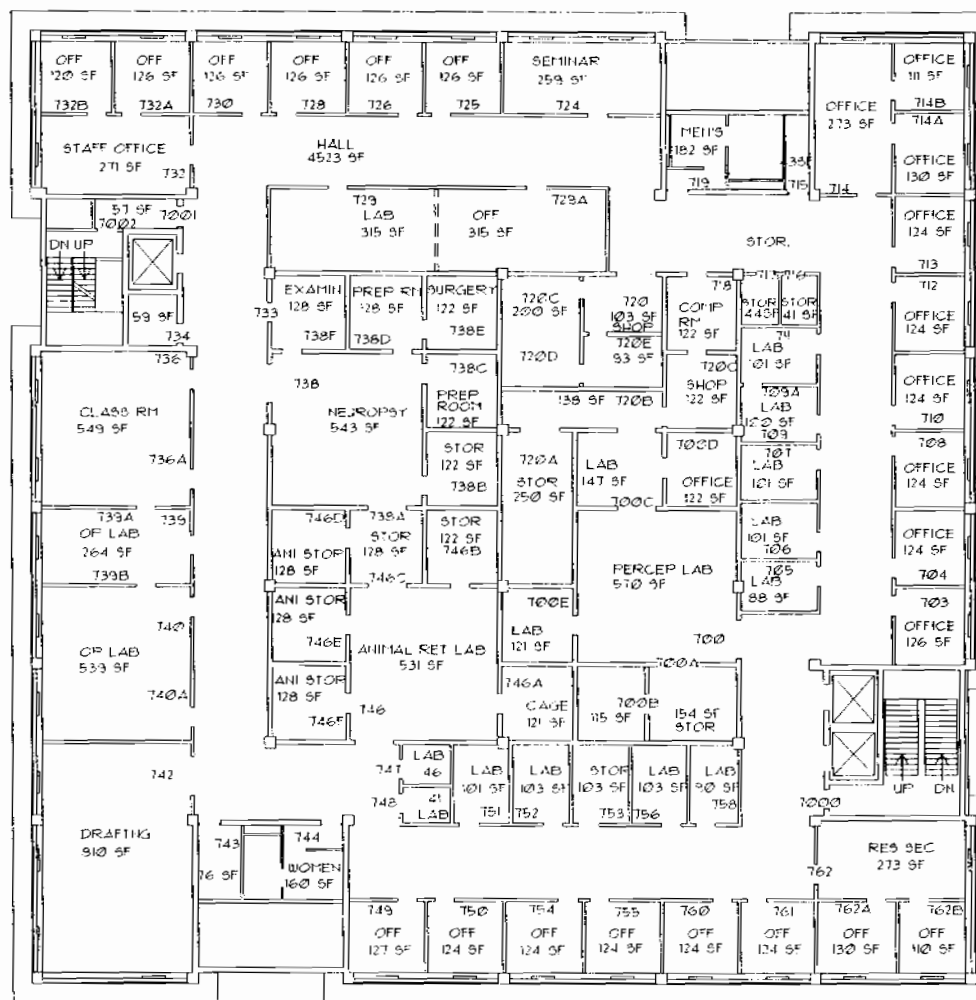
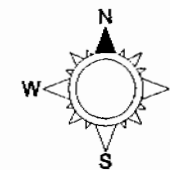
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SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIBLE ASBESTOS
	NF	MISC. NON-FRIBLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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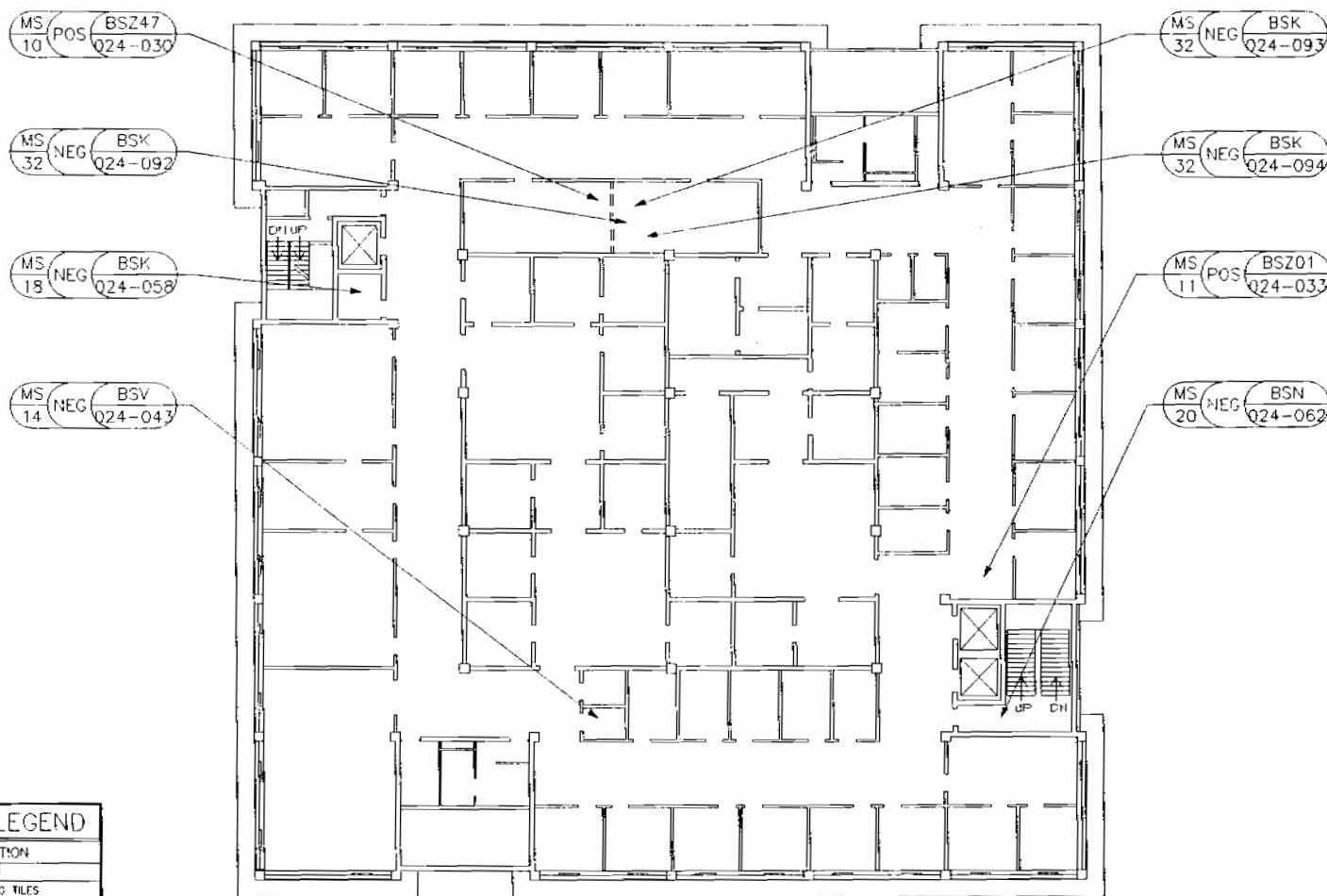
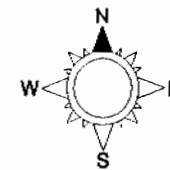
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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMTRL DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 6
FLOORPLAN DWN. BY: N.C.S.U.	PROJECT NUMBER: 511-7A008	
SCALE: NOT TO SCALE		



SEVENTH FLOOR



BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSK	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	MF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

SEVENTH FLOOR

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PROJECT NAME:

**NCSU
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HAZMTRL. DWN. BY:
A. ZDROBA
FLOORPLAN DWN. BY:
N.C.S.U.

DATE:
MAY 1997

DRAWING NO.:
P 024 7

TITLE

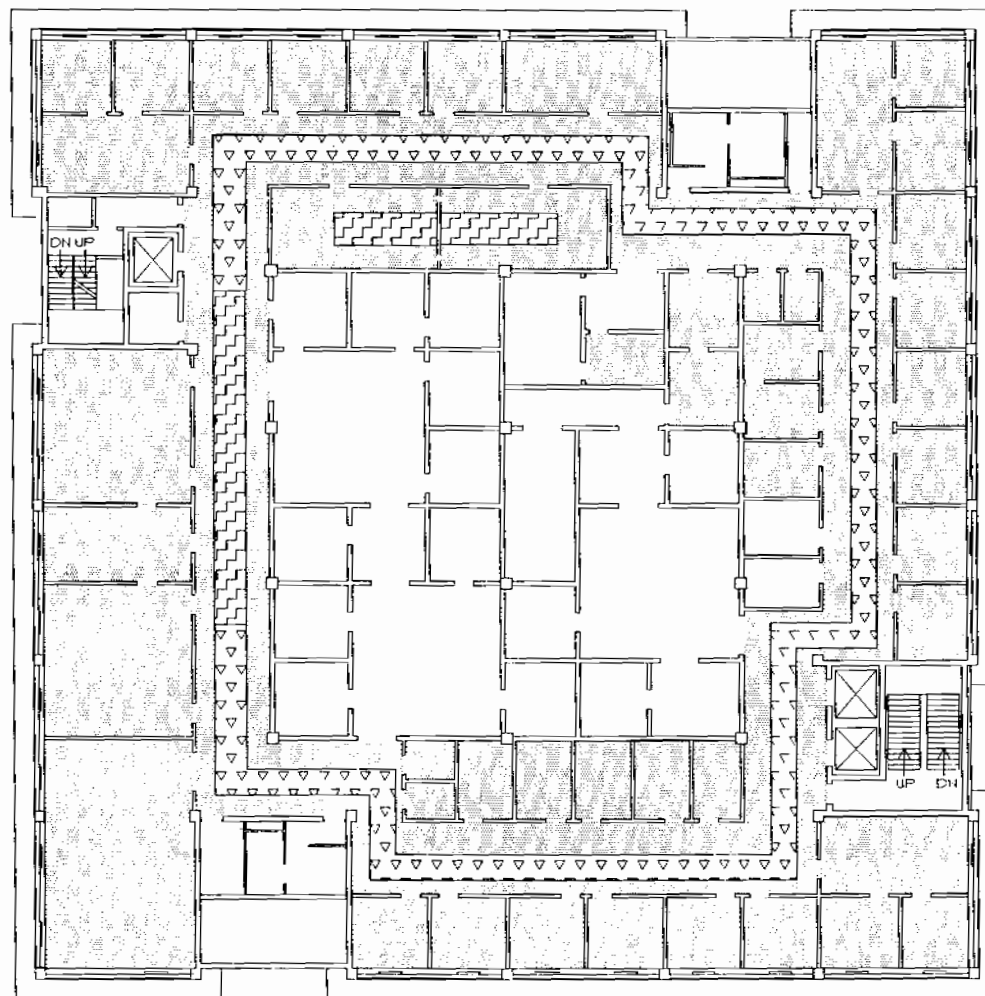
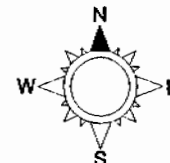
POE HALL

SCALE:
NOT TO SCALE

PROJECT NUMBER:

7A008

SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS



SEVENTH FLOOR

BULK SAMPLE CODE LEGEND		
SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACOUSTICAL PLASTER
	B50	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

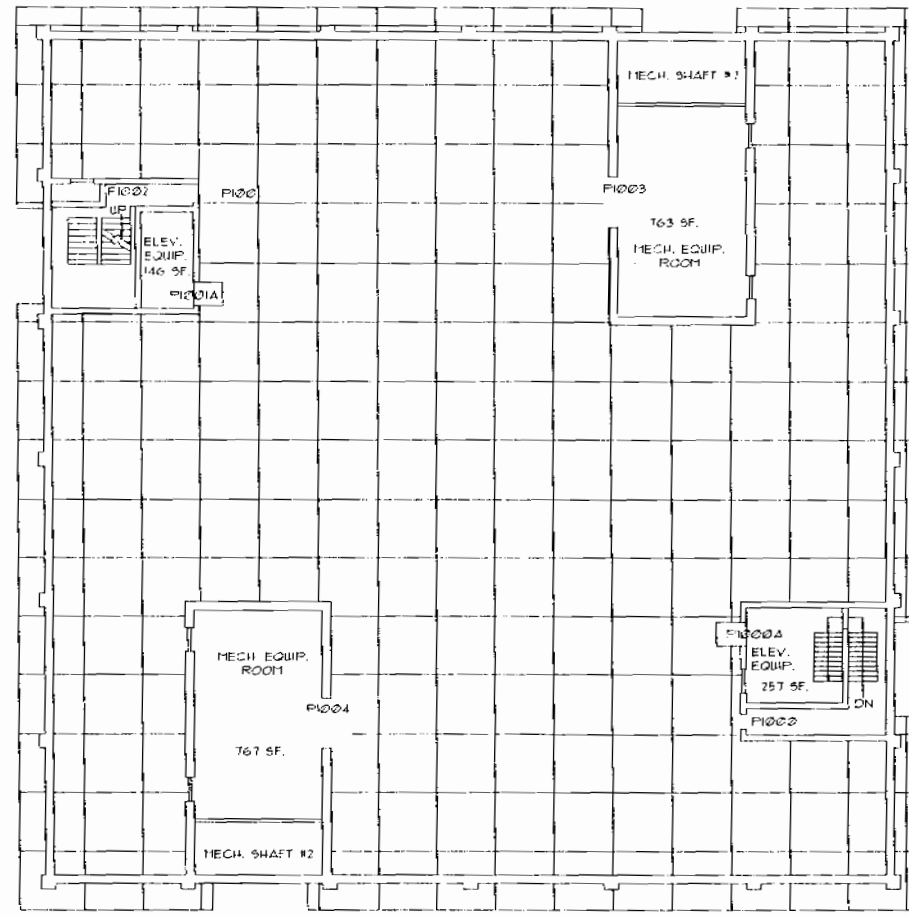
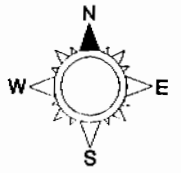
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PROJECT NAME: **NCSU
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TITLE: **POE HALL
ASBESTOS-CONTAINING MATERIAL LOCATIONS**

HAZMTRL DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 7
FLOORPLAN DWN. BY: N.C.S.U.	PROJECT NUMBER: 1-7A008	
SCALE: NOT TO SCALE		



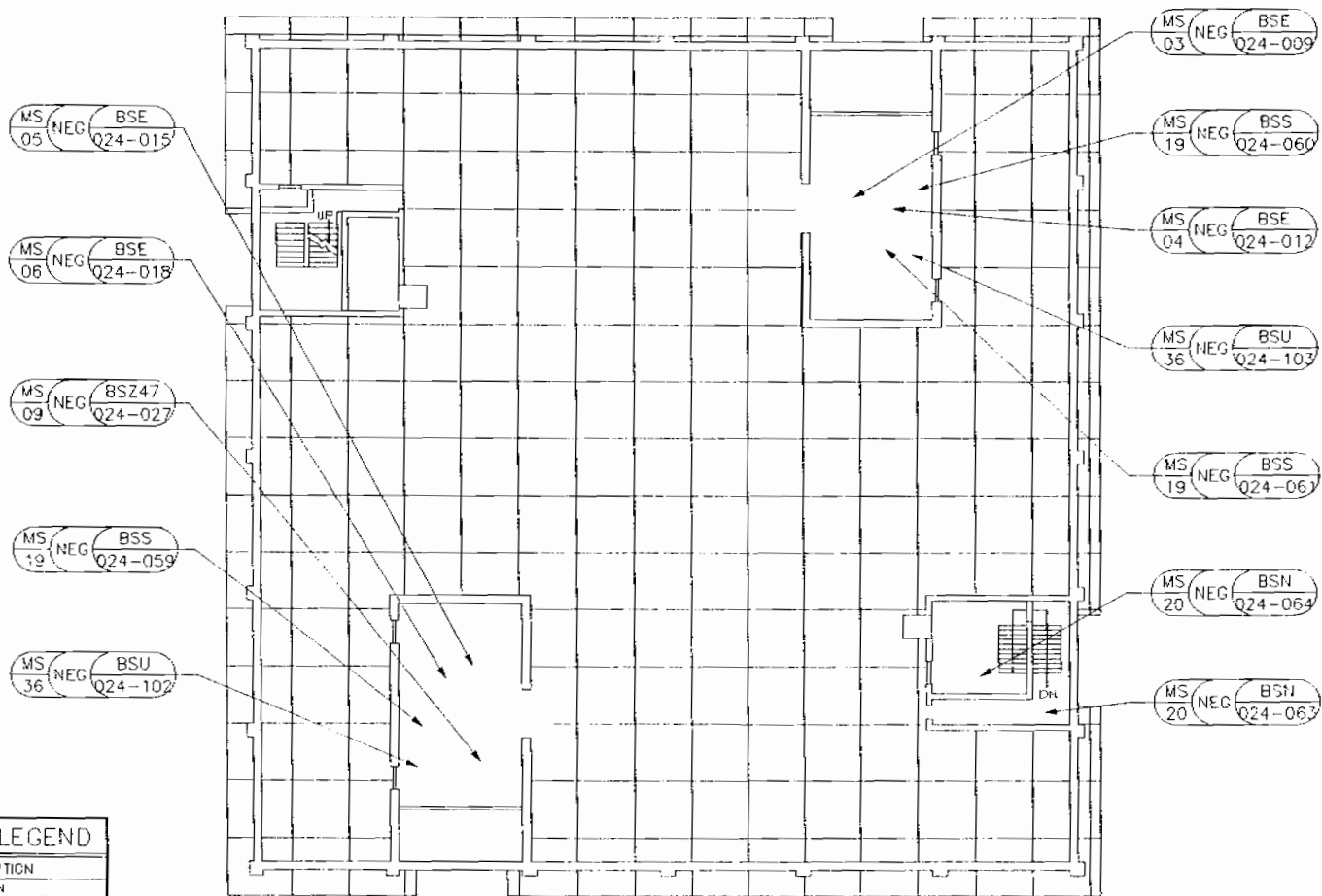
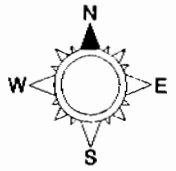
ROOF

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PROJECT NAME: **NCSU ASBESTOS SURVEY**
 TITLE: **POE HALL**

HAZMTRL DWN. BY: A. ZDROBA	DATE: MAY 1997	DRAWING NO.: P 024 R
FLOORPLAN DWN. BY: N.C.S.U.	PROJECT NUMBER: 11-7A008	
SCALE: NOT TO SCALE		



ROOF

BULK SAMPLE CODE LEGEND

SYMBOL	CODE	MATERIAL DESCRIPTION
	BSH	BOILER/TANK INSULATION
	BSK	DROP OR LAY-IN CEILING TILES
	BSV	WALLBOARD
	Z01	FLOOR TILE
	Z02	CEMENTITIOUS PANELS
	Z51	BROWN OR SCRATCH COATS
	BSE	MISCELLANEOUS PIPE COVERING
	FRI	FRIABLE ASBESTOS
	NF	MISC. NON-FRIABLE ASBESTOS
	BSA	SPRAYED ACoustICAL PLASTER
	BSD	HARD PLASTER
	BSR	FIREPROOFING
	Z19	LAB COUNTERTOPS
	Z41	COVERING UNDER TILE
	Z46	LINOLEUM
	Z47	MASTIC

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PROJECT NAME:

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FLOORPLAN DWN. BY:
N.C.S.U.

DATE:

MAY 1997

DRAWING NO.:

P 024 R

TITLE

**POE HALL
SUSPECT-ASBESTOS MATERIAL SAMPLE LOCATIONS**

SCALE:

NOT TO SCALE

PROJECT NUMBER:

11-7A008

APPENDIX B.

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-01) 12" x 12" WHITE WITH BLACK STREAKS FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2, 3 and 4

(HGA-02) 2 " x 2" "CHICKEN TRACK" PATTERN CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-03) 8" O.D. WHITE CANVAS WRAP PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-04) MJF- PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-05) 4" O.D. WHITE CANVAS WRAP PIPE INSULATION

Reason for selecting the homogeneous area: Code A, B & C

Reason for selecting the sample location: Code 2 and 3

(HGA-06) MJP, PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-07) 1" O.D. GASKET TYPE ROPE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 & 3

(HGA-08) RED DUCT MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-09) YELLOW/TAN DUCT MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

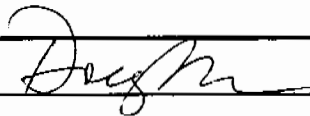
4. Previously damaged

5. Other

Inspector

Typed Name: G. Douglas Moore

Signature:



Date:

5/19/97

Accreditation Number:
10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-010) BLACK DUCT MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-011) 9" x 9" WHITE WITH BLACK STREAK FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-012) 2" x 2" "WORM TRACK" CEILING PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-013) 2" x 4" "CHICKEN TRACK" CEILING PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 1,2, and 3

(HGA-014) WALLBOARD AND JOINT COMPOUND

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2, 3 and 4

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

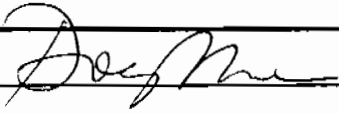
D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-015) BLACK BASEBOARD AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-016) GRAY BASEBOARD AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-017) BLACK THRESHOLD DOORWAY ACCENT STRIP

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2, 3 and 4

(HGA-018) 2" x 2" CEILING TILE WITH LINEAR FISSURE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-019) BLACK VIBRATION JOINT CLOTH

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-020) MJP - PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-021) FOAM PANEL ADHESIVE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-024) (THERE IS NO HGA-22 or HGA-023) WELDING BLOCKS

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-025) FURNACE BLOCK LINING

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-026) CEILING PLASTER

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: *Doug Moore*

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-027) PARTITION PANELING

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-028) LAB COUNTER TOP

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2, 3, and 4

(HGA-029) FUME HOOD LINING

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-030) PIPE INSULATION (E-TAR TYPE)

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-031) PIPE FITTING INSULATION (ASSOCIATED WITH E-TAR TYPE)

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

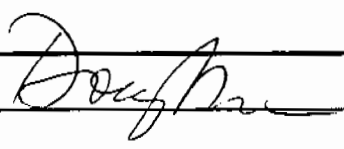
D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
PSI

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-032) 2" x 4" "WORM TRACK" PATTERN CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-033) 2" X 2" PINHOLE PATTERN CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-035) (THERE IS NO HGA-034) TAR COATED PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-036) WHITE PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-037) TANK INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: *J. Silvestri*

Date: 5-19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-038) 2" O.D. CANVAS WRAP PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2 and 3

(HGA-039) MJP - PIPE FITTING INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

(HGA-040) GENERATOR EXHAUST PIPE INSULATION

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-041) GRAY VIBRATION JOINT CLOTH

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

(HGA-042) 2" x 2" WHITE QUAD TYPE CEILING TILE

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2 and 3

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

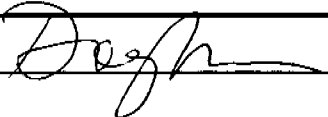
D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature: 

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-043) PIPE INSULATION, TAR PAPER WRAP
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 2

(HGA-044) CEILING PLASTER PARTITION PANELS
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2 and 3

(HGA-045) WALL PLASTER
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 1,2 and 3

(HGA-046) LABORATORY SINK BOARD
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

(HGA-047) 1" x 1" ACOUSTICAL BLOCK AND ASSOCIATED MASTIC
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

1. Statistically random

B. Similar size

2. Accessible

C. Similar date of installation

3. Minimize visual impact

D. Other

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

Accreditation Number: 11605/10763

Agency:
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DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-048) 2" x 3" ACOUSTICAL PANEL
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 2 and 3

(HGA-049) 12" x 12" TAN AND BROWN FLOOR TILE AND ASSOCIATED MASTIC
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code 2

(HGA-050) 12" x 12" BROWN AND TAN STREAKS FLOOR TILE AND ASSOCIATED MASTIC
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample location: Code 2

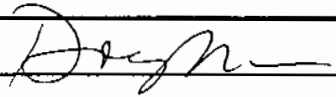
(HGA-051) 12" x 12" GREEN FLOOR TILE AND ASSOCIATED MASTIC
Reason for selecting the homogeneous area: Code A & B
Reason for selecting the sample locations: Code

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

- | | |
|---------------------------------|---------------------------|
| A. Similar color & texture | 1. Statistically random |
| B. Similar size | 2. Accessible |
| C. Similar date of installation | 3. Minimize visual impact |
| D. Other | 4. Previously damaged |
| | 5. Other |

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore	Signature: 	Date: 5/19/97
Accreditation Number: 11605/10763	Agency: PSI	

DETERMINATION OF SAMPLING LOCATIONS

DISCUSSION OF EACH SAMPLE AREA:

(HGA-052) 12" x 12" GRAY FLOOR TILE AND ASSOCIATED MASTIC

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample location: Code 2

(HGA-053) 2" x 2" ACOUSTICAL WALL PANEL

Reason for selecting the homogeneous area: Code A & B

Reason for selecting the sample locations: Code 2

CODE: SELECTION OF
HOMOGENEOUS AREA

CODE: SELECTION OF SAMPLE LOCATION

A. Similar color & texture

B. Similar size

C. Similar date of installation

D. Other

1. Statistically random

2. Accessible

3. Minimize visual impact

4. Previously damaged

5. Other

Inspector

Typed Name: J. Silvestri/ G. Douglas Moore

Signature:

Date: 5/19/97

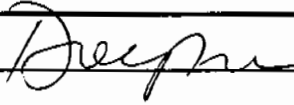
Accreditation Number: 11605/10763

Agency:
PSI

APPENDIX C.

DESCRIPTION OF SAMPLE AREA

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97 through	HGA-01; "12x12" White with black streaks floor tile and associated	Miscellaneous material identified as an ACM. Both the floor tile and associated mastic have been identified as asbestos-containing. This material is located in Rooms 108, 504G, 120A and 114.
3/14/97	024-001 Room 108	
	024-002 Room 108	
	024-003 Room 104	
3/10/97 through	HGA-02; "2x2" "chicken-track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Located throughout the building.
3/14/97	024-004 Room 108	
	024-005 Room 218	
	024-006 Room 517	
3/10/97 through	HGA-03; 8" O.D. White canvas wrap pipe insulation	TSI identified as Non-ACM. Located primarily above ceiling, in Mech. Rooms, and chaseways..
3/14/97	024-007 Room 100	
	024-008 Room 127	
	024-009 Room P1003	
3/10/97 through	HGA-04; MJP-Pipe Fitting Insulation	TSI identified as Non-ACM. Found in ground floor Mech. Rooms up to Penthouse, located in Pipe chases Mech. Rooms, and above some ceilings.
3/14/97	024-010 Room 100	
	024-011 Room 127	
	024-012 Room P100	

Inspector		
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Accreditation Number: 11605/10763	Agency: PSI	

**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-05; 4" White canvas wrap pipe insulation	TSI identified as Non-ACM. Located primarily in Mech. Rooms, pipe chaseways and above some ceilings.
through		
3/14/97	024-013 Room 100	
	024-014 Room 127	
	024-015 Room P1004	
3/10/97	HGA-06; MJP-Pipe Fitting Insulation	TSI identified as Non-ACM. Pipe fitting insulation located primarily in Mech. Rooms, pipe chaseways, and above some ceilings.
through		
3/14/97	024-016 Room 100	
	024-017 Room 127	
	024-018 Room P1004	
3/10/97	HGA-07; 1" Gasket type rope	TSI identified as ACM. This asbestos-containing rope was located in Rooms 116 and 212..
through	024-019 Room 116	
3/14/97	024-020 Room 116	
	024-021 Room 212	
3/10/97	HGA-08; Red Duct Mastic	Miscellaneous material identified as ACM. Located throughout the building on ductwork.
through	024-022 Room 100	
3/14/97	024-023 Room 116	
	024-024 Room 116	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: <i>Doeg Moore</i>	Date: 5/20/97
Identification Number: 11605/10763	Agency: PSI	

**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97 through	HGA-09; Yellow/Tan duct mastic	Miscellaneous material identified as Non-ACM. Located throughout the building on duct work.
3/14/97	024-025 Room 100	
	024-026 Room 116	
	024-027 Room P1004	
3/10/97 through	HGA-10; Black duct mastic	Miscellaneous material identified as ACM. Located throughout the building on duct work. This ACM is Non-friable and is in good condition.
3/14/97	024-028 Room 200	
	024-029 Room 504	
	024-030 Room 729	
3/10/97 through	HGA-011; 9" x 9" White with Black streaks floor tile and associated mastic.	Miscellaneous material identifies as ACM. Both the floor tile and mastic were identified as asbestos-containing. This ACM is found in hall (floors 2-7) and in a variety of rooms throughout the building.
3/14/97	024-031 Room 200	
	024-032 Room 412	
	024-033 Room 700	
	024-034 Room 312	
	024-035 Room 532	
3/10/97 through	HGA-012; 2" x 2" "Worm track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Located sporadically throughout building.
3/14/97	024-036 Room 125	
	024-037 Room 225	
	024-038 Room 612B	

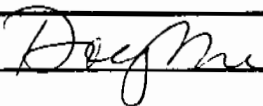
Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: <i>David Moore</i>	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

DESCRIPTION OF SAMPLE AREA

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-013; 2" x 4" "Chicken track" pattern ceiling tile	Miscellaneous material identified as Non-ACM. Located sporadically throughout the building.
through		
3/14/97	024-039 Room 200	
	024-040 Room 224	
	024-041 Room 228	
3/10/97	HGA-014; Wallboard and joint compound	Miscellaneous material identified as Non-ACM. Located throughout the building.
through		
3/14/97	024-042 Room 220	
	024-043 Room 748	
	024-044 Room 616	
	024-045 Room 517	
	024-046 Room 311	
3/10/97	HGA-015; Black baseboard and associated adhesive	Miscellaneous material identifies as Non-ACM located throughout the building
through		
3/14/97	024-047 Room 204	
	024-048 Room 422	
	024-049 Room 628A	
3/10/97	HGA-016; Gray baseboard and associated adhesive	Miscellaneous material identified as Non-ACM found in 310 offices.
through		
	024-050 Room 310P	
3/14/97	024-051 Room 310F	
	024-052 Room 310	

Inspector

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Signature: 

Date: 5/20/97

Accreditation Number: 11605/10763

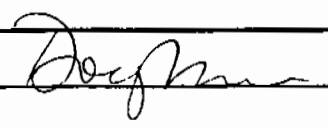
Agency: PSI
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**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-017; Black threshold door way accent strip	Miscellaneous material identified as Non-ACM. Found in classroom doorways throughout building, except the first floor.
through		
3/14/97	024-053 Room 615	
	024-054 Room 408	
	024-055 Room 208	
3/10/97	HGA-018; 2" x 2" Ceiling tile with linear fissures and random pinholes	Miscellaneous material identified as Non-ACM. Located throughout the building.
through		
3/14/97	024-056 Room 107	
	024-057 Room 514	
	024-058 Room 734	
3/10/97	HGA-019; Black vibration joint cloth	Miscellaneous material identifies as Non-ACM located at same penthouse air handlers.
through		
3/14/97	024-059 Room P1004	
	024-060 Room P1003	
	024-061 Room P1003	
3/10/97	HGA-020; MJP-Pipe fitting insulation	TSI identified as Non-ACM on drain bowls in chaseways and penthouse.
through		
3/14/97	024-062 Room 7000 (Stairs)	
3/14/97	024-063 Room P1000	
	024-064 Room P1000A	

Inspector

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Signature: 

Date: 5/20/97

Accreditation Number: 11605/10763

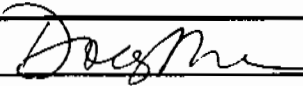
Agency: PSI
 PSI

DESCRIPTION OF

SAMPLE AREA

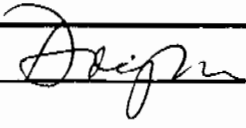
Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-021; Foam panel adhesive	Miscellaneous material identified as Non-ACM. Located in mechanical Room 100.
through		
3/14/97	024-065 Room 100	
	024-066 Room 100	
	024-067 Room 100	
3/10/97	HGA-024; (There is no HGA-22 or HGA-23) Welding Blocks	Miscellaneous material identified as Non-ACM. Located in Room 102B.
through		
3/14/97	024-068 Room 102B	
	024-069 Room 102B	
	024-070 Room 102B	
3/10/97	HGA-025; Furnace black lining	Miscellaneous material identified as Non-ACM. Located in Room 102B.
through		
3/14/97	024-071 Room 102B	
	024-072 Room 102B	
	024-073 Room 102B	
3/10/97	HGA-026; Ceiling Plaster (rough coat)	Surfacing identified as Non-ACM. Located in Room 102B
through		
3/14/97	024-074 Room 102B	
3/14/97	024-075 Room 102B	
	024-076 Room 102B	
	024-151 Room 102B	
	024-152 Room 102B	

Inspector

Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

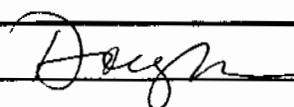
**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-027; Partition Paneling	Miscellaneous material identified as Non-ACM. Located in Room 102C.
through		
3/14/97	024-077 Room 102C	
	024-078 Room 102C	
	024-079 Room 102C	
3/10/97	HGA-028; Lab Counter tops	Miscellaneous material identified as ACM. Located in Room 102D, 312, and 317.
through		
3/14/97	024-080 Room 102D	
	024-081 Room 312	
	024-082 Room 312	
3/10/97	HGA-029; Fume hood lining	Miscellaneous material identified as ACM. Located in Room 102D and 317.
through		
3/14/97	024-083 Room 102D	
	024-084 Room 102D	
	024-085 Room 317	
3/10/97	HGA-030; Pipe insulation (E-Tar)	TSI identified as ACM. Found in Room 102C
through		
3/14/97	024-086 Room 102C	
3/14/97	024-087 Room 102C	
	024-088 Room 102C	
	There is no HGA-031	

Inspector		
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Accreditation Number: 11605/10763	Agency: PSI	

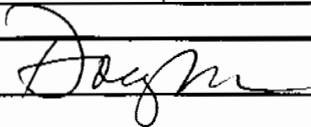
**DESCRIPTION OF
SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-040; Generator exhaust insulation	TSI identified as ACM. Located in Mechanical Room 130.
through		
3/14/97	024-113 Room 127	
	024-114 Room 127	
	024-115 Room 127	
3/10/97	HGA-041; Gray vibration joint cloth	Miscellaneous material identified as ACM. Located in Room 130.
through		
3/14/97	024-116 Room 130	
	024-117 Room 130	
	024-118 Room 130	
3/10/97	HGA-042; 2"x 2" Ceiling tile, white quad type	Miscellaneous material identified as Non-ACM, located in same 208 office and 204 office.
through		
3/14/97	024-119 Room 208D	
	024-120 Room 208B	
	024-121 Room 204	
3/10/97	HGA-043; Pipe insulation, tar paper	TSI identified as ACM. Mixed analyzed results. Located in pipe chases, rooms 212, 312, 308, 324, 525, 509, and 500.
through	024-122 Room 212	
3/14/97	024-123 Room 312	
	024-124 Room 324	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

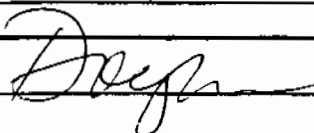
**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-044; Plaster ceiling panels	Surfacing identified as Non-ACM. Located in Room 216 Auditorium.
through		
3/14/97	024-125 Room 216	
	024-126 Room 216	
	024-127 Room 216	
3/10/97	HGA-045; Wall Plaster	Surfacing identified as Non-ACM. Located in Room 216B, Auditorium Projection room.
through		
3/14/97	024-128 Room 216B	
	024-129 Room 216B	
	024-130 Room 216B	
3/10/97	HGA-046; Laboratory sink board	Miscellaneous material identified as Non-ACM. Located in Rooms 312 and 317.
through		
3/14/97	024-131 Room 114	
	024-132 Room 114	
3/10/97	024-133 Room 317	
3/10/97	HGA-047; 1" x 1" Acoustical block and associated mastic	Miscellaneous material identified as Non-ACM. Found in Room 600.
through		
3/14/97	024-134 Room 600	
	024-135 Room 600	
	024-136 Room 600	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Asbestos Identification Number: 11605/10763	Agency: PSI	

**DESCRIPTION OF
 SAMPLE AREA**

Each Sample		Discussion
Date	Sample #/ Location	
3/10/97	HGA-048; 2" x 3" Acoustical Panel	Miscellaneous material identified as Non-ACM. Located in Room 604.
through		
3/14/97	024-137 Room 604	
	024-138 Room 604	
	024-139 Room 604	
3/10/97	HGA-049; 12" x 12" Tan and brown floor tile and associated mastic	Both floor tile and mastic are asbestos-containing. Located in Room 114.
through		
3/14/97	024-140 Room 114	
	024-141 Room 114	
3/10/97	HGA-050; 12" x 12" Brown with tan streaks floor tile and associated mastic	Both floor tile and mastic are asbestos-containing. Located in Room 114.
through		
3/14/97	024-142 Room 114	
3/10/97	024-143 Room 114	
3/10/97	HGA-051; 12" x 12" Green floor tile and associated mastic	
through		
3/14/97	024-144 Room 114	
3/10/97	024-145 Room 114	

Inspector		
Typed Name: J. Silvestri/G. Douglas Moore	Signature: 	Date: 5/20/97
Accreditation Number: 11605/10763	Agency: PSI	

APPENDIX D.

APPENDIX E.

BULK SAMPLE CODES

BSA	sprayed acoustical plaster (square feet)	BSZ18	roofing tar paper/felt (square feet)
BSB	trowelled acoustical plaster (square feet)	BSZ19	lab countertops (square feet)
BSC	acoustical/thermal insulation (square feet)	BSZ21	fire hose (linear feet)
BSD	hard wall/ceiling plaster (square feet)	BSZ22	fire cabinet (square feet)
BSE	pipe covering (linear feet) ___ inches O.D.	BSZ23	tongs (pair)
BSF	corrugated pipe covering (linear feet)	BSZ24	poured-in insulation (cubic feet)
BSG	wrapped cardboard/paper pipe covering (linear feet)	BSZ25	burner screen (each)
BSH	boiler/tank insulation (square feet)	BSZ26	concrete block wall (square feet)
BSI	breaching insulation (square feet)	BSZ27	contaminated soil (square feet)
BSJ	woven paper/tape (square feet)	BSZ28	fire blanket (square feet)
BSK	drop or lay-in ceiling panel (square feet)	BSZ29	metal-wrapped pipe insulation, 4 inch O.D. (linear feet)
BSL	acoustical tile (square feet)	BSZ30	metal-wrapped pipe insulation, 6 inch O.D. (linear feet)
BSM	batt-type insulation (square feet)	BSZ31	radiator blanket (square feet)
BSN	MJP on nonsuspect pipe cover (each) ___ inches O.D.	BSZ32	asbestos cloth (square feet)
BSO	MJP on pipe covering (BSE) (each) ___ inches O.D.	BSZ33	weatherproofing (square feet)
BSP	MJP on corrugated pipe covering (BSF) (each) ___ inches O.D.	BSZ34	clamp (each)
BSQ	MJP on wrapped cardboard/paper pipe covering (BSG) (each) ___ inches O.D.	BSZ35	material on meter (square feet)
BSR	fireproofing (square feet)	BSZ36	packing compound (square feet)
BSS	vibration joint cloth (square feet)	BSZ37	stored gasket (square feet)
BST	interior duct insulation (square feet)	BSZ38	stored vinyl floor tiles (square feet)
BSU	exterior duct insulation (square feet)	BSZ39	stored drop or lay-in ceiling panels (square feet)
BSV	wall/ceiling board (square feet)	BSZ40	stored rope (linear feet)
BSW	blown-in insulation (square feet)	BSZ41	covering under tile (square feet)
BSX	debris (square feet)	BSZ42	metal-wrapped pipe insulation, 8 inch O.D. (linear feet)
BSY	stored insulations/materials (cubic feet)	BSZ43	metal-wrapped pipe insulation, 10 inch O.D. (linear feet)
BSZ01	vinyl floor tiles (square feet)	BSZ44	metal-wrapped pipe insulation, 12 inch O.D. (linear feet)
BSZ02	cementitious panels (square feet)	BSZ45	honeycombed cementitious material (square feet)
BSZ03	asbestos rope (linear feet)	BSZ46	linoleum (square feet)
BSZ04	fire suit (each)	BSZ47	mastic (square feet)
BSZ05	gasket (square feet)	BSZ48	mortar and grout (square feet)
BSZ06	fire doors (each)	BSZ49	tectum (square feet)
BSZ07	asbestos gloves (pair)	BSZ50	floor underlay (square feet)
BSZ08	firebrick (square feet)	BSZ51	brown or scratch coat (square feet)
BSZ09	raw asbestos (cubic feet)	BSZ52	oven/autoclave lining (square feet)
BSZ10	cementitious piping (linear feet)	BSZ53	brake lining (square feet)
BSZ11	asbestos curtain (square feet)	BSZB	black felt covering (square feet)
BSZ12	cementitious hood (each)	BSZC	seat covering (square feet)
BSZ13	asbestos pads (each)	BSZI	black insulation (square feet)
BSZ14	kiln (square feet)	BSZR	rubberized flooring (square feet)
BSZ15	electric wire covering/insulation (linear feet)	BSZS	black screen curtain (square feet)
BSZ16	asbestos siding (square feet)	BSZW	wall covering (square feet)
BSZ17	shingles (square feet)		

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

BULK SAMPLE SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-001	01	108	BS201	12x12 floor tile		Y Y ✓
002	↓	108	↓	(white w/black streak)		Y Y ✓
003	↓	504	↓	↓		N Y ✓
004	02	108	BSK	2x2 ceiling tile		N ✓
005	↓	218	↓	(chicken track)		N ✓
006	↓	517	↓	↓		N ✓
007	03	100	BSE	Canvas wrap pipe lns (8")	116, 117, 127	N ✓
008	↓	127	↓	↓		N ✓
009	↓	P1003	↓	↓		N ✓
010	04	100	↓	Canvas wrap pipe lns MJP (8")		N ✓
011	↓	127	↓	↓		N ✓
012	↓	P1003	↓	↓		N ✓
013	05	100	↓	Canvas wrap pipe lns (4")		N ✓
014	↓	127	↓	↓		N ✓
015	↓	P1004	↓	↓		N ✓
016	06	100	↓	Canvas wrap pipe lns MJP (4")		N ✓
017	↓	127	↓	↓		N ✓
018	↓	P1004	↓	↓		N ✓
019	07	116	BS203	Gasket type rope (1")		Y ✓
020	↓	116	↓	↓		Y ✓
021	↓	212	↓	↓		Y ✓
022	08	100	BS247	Duct Mastic (Red)		Y ✓
023	↓	116	↓	↓		Y ✓
024	↓	116 116	↓	↓		Y ✓
025	09	100	↓	Duct Mastic (Tan)		N ✓
026	↓	116	↓	↓		N ✓
027	↓	P1004	↓	↓		N ✓
028	10	200 (Hall)	↓	Duct Mastic (Black)	504, 200, 729	Y ✓
029	↓	504	↓	↓		Y ✓
030	↓	729	↓	↓		Y ✓
031	11	200	BS201	9x9 floor tile		Y Y ✓
032	↓	412	↓	(white w/black streak)		Y Y ✓
033	↓	700	↓	↓		Y Y ✓
034	↓	312	↓	↓		Y Y ✓
035	↓	532	↓	↓		Y Y ✓
036	12	125	BSK	2x2 ceiling tile		N ✓
037	↓	225	↓	(worm track)		N ✓
038	↓	102B	↓	↓		N ✓

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

BULK SAMPLE SHEET

Building No.: 024
Building Name: Pea Hall
Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-039	13	220	BSK	2x4 ceiling tile		N
-040	↓	224	↓	↓ (chicken track)		N
-041	↓	228	↓	↓ ↓ ↓		N
-042	14	220	BSV	Wall Board (Drywall)		<1
-043	↓	748	↓	↓ ↓ ↓		<1
-044	↓	616	↓	↓ ↓ ↓		<1
-045	↓	517	↓	↓ ↓ ↓		<1
-046	↓	311	↓	↓ ↓ ↓		<1
-047	15	200	BSZR	Baseboard w/mastic		N N
-048	↓	422	↓	↓ (black)		N N
-049	↓	628A	↓	↓ ↓ ↓		N N
-050	16	310P		Baseboard w/mastic		N N
-051	↓	310F		↓ (grey)		N N
-052	↓	310	↓	↓ ↓ ↓		N N
-053	17	615	BSZ01	Threshold (black)		N N
-054	↓	408	↓	↓ ↓ ↓		N N
-055	↓	208	↓	↓ ↓ ↓		N N
-056	18	107	BSK	2x2 ceiling tile	107, 109, 109A, 514	N
-057	↓	514	↓	↓ (linear fissures)	734	N
-058	↓	734	↓	↓ ↓ ↓		N
-059	19	P1004	BSS	Vibration Joint Cloth		N
-060	↓	P1003	↓	↓ (Black)		N
-061	↓	P1003	↓	↓ ↓ ↓		N
-062	20	7000	BSN	Mudded Packings	Stairs Stairs	N
-063	↓	P1000	↓	↓ (Drain bowls)	stairs	N
-064	↓	P1000A	↓	↓ ↓ ↓	switch room	N
-065	21	100	BSZ47	Foam Panel Adhesive		N
-066	↓	100	↓	↓ ↓ ↓		N
-067	↓	100	↓	↓ ↓ ↓		N
-068	24	102B	BSZ08	Welding Blocks		N
-069	↓	102B	↓	↓ ↓ ↓		N
-070	↓	102B	↓	↓ ↓ ↓		N
-071	25	102B	BSZ14	Kiln/Furnace lining		N
-072	↓	102B	↓	↓ ↓ ↓		N
-073	↓	102B	↓	↓ ↓ ↓		N
-074	26	102B	BSD	Ceiling Plaster		N
-075	↓	102B	↓	↓ (rough coat)		N
-076	↓	102B	↓	↓ ↓ ↓		N

Notes: Homogeneous Material Number "22" Not Used
" " " "23" " "

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

BULK SAMPLE SHEET

Building No.: 024
 Building Name: Pop Hall
 Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-077	27	102C	BSL	Partition Paneling		N
-078	↓	102C	↓	↓ ↓ ↓		N
-079	↓	102C	↓	↓ ↓ ↓		N
-080	28	102D	BSZ19	Lab Counter top		Y
-081	↓	312	↓	↓ ↓ ↓		Y
-082	↓	312	↓	↓ ↓ ↓		Y
-083	29	102D	BSZ02	Fume Hood Lining		Y
-084	↓	102D	↓	↓ ↓ ↓		Y
-085	↓	317	↓	↓ ↓ ↓		Y
-086	30	102C	BSZ18	Pipe Insulation (E-TAR, 12")		Y
-087	↓	102C	↓	↓ ↓ ↓		Y
-088	↓	102C	↓	↓ ↓ ↓		Y
-089	31	VOID	BSQ	Pipe Insulation (E-Tar, 12") MSP	NOT SAMPLE	VOID
-090	↓	VOID	↓	↓ ↓ ↓		VOID
-091	↓	VOID	↓	↓ ↓ ↓		VOID
-092	32	729	BSK	2x4 Ceiling tile		N
-093	↓	729	↓	(worm track)		N
-094	↓	729	↓	↓ ↓ ↓		N
-095	33	120A	BSK	2x2 Ceiling tile	(Room 120A)	N
-096	↓	120A	↓	(pin hole)	(After 4:30)*	N
-097	↓	120A	↓	↓ ↓ ↓		N
-098	35	100	BSZ18	Tar Coated Pipe Ins.	Hallway Ceiling	Y
-099	↓	212	↓	↓ ↓ ↓		Y
-100	↓	509	↓	↓ ↓ ↓		Y
-101	36	127	BSU	Duct Insulation		N
-102	↓	P1004	↓	(white canvas)		N
-103	↓	P1063	↓	↓ ↓ ↓		N
-104	37	127	BSH	Tank Insulation		N
-105	↓	127	↓	↓ ↓ ↓		N
-106	↓	127	↓	↓ ↓ ↓		N
-107	38	127	BSE	Canvas Wrap pipe Ins (2")	(Grand Floor MEK)	N
-108	↓	127	↓	↓ ↓ ↓		N
-109	↓	127	↓	↓ ↓ ↓		N
-110	39	127		Canvas Wrap pipe Ins (2") MSP		N
-111	↓	127	↓	↓ ↓ ↓		N
-112	↓	127	↓	↓ ↓ ↓		N
-113	40	#T30	BSE	Generator Exh. Insulation		Y
-114	↓	#T30	↓	↓ ↓ ↓		Y

Notes: Homogeneous Material Number "34" Not Used

BULK SAMPLE SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: _____

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10/97 - 3/12/97

Sample Number	Homogeneous Material Number	Sample Location (Room #)	Bulk Sample Code	Material	Comments	>1% Asbestos (Yes/NO)
024-115	40	130 TT7	BSE	Generator Exh. Insulation		Y
116	41	130	BSS	Vibration Joint Cloth		Y
117	↓	130	↓	↓	(Grey)	Y
118	↓	130	↓	↓	↓	Y
119	42	208D	BSK	2x2 white Quad Type Lay In.		N
120	↓	208B	↓	↓	ceiling tile	N
121	↓	204	↓	↓	↓	N
122	43	212	BSE1B	Pipe Insulation	Chasewong	N
123	↓	312	↓	↓	(felt/Tar coat)	Y
124	↓	324	↓	↓	↓	N
125	44	216	BSD	Plaster Ceiling Panels	(Auditorium)	N
126	↓	216	↓	↓	↓	N
127	↓	216	↓	↓	↓	N
128	45	216B	BSD	Wall Plaster (smooth)	(projection rm.)	N
129	↓	216B	↓	↓	↓	N
130	↓	216B	↓	↓	↓	N
131	46	312	BS202	Laboratory Sink		N
132	↓	312	↓	↓	↓	N
133	↓	317	↓	↓	↓	N
134	47	600	BSL	Acoustical Block (1x1)	(Room 600)	N
135	↓	600	↓	↓	with mastic	N
136	↓	600	↓	↓	↓	N
137	48	604	BSL	2'x3' Acoustical Panels	(Room 604)	N
138	↓	604	↓	↓	↓	N
139	↓	604	↓	↓	↓	N
140	49	114	BS201	12x12 Flex tile w/mastic	(tan w/brown)	Y
141	↓	114	↓	↓	↓	Y
142	50	114	↓	↓	(Brown w/Tan)	Y
143	↓	114	↓	↓	↓	Y
144	51	114	↓	↓	(Green)	Y
145	↓	114	↓	↓	↓	Y
146	52	114	↓	↓	(Green)	Y
147	↓	114	↓	↓	↓	Y
148	53	635	BSL	2x2 Acoustical panel	(Room 635)	N
149	↓	635	↓	↓	↓	N
150	↓	635	↓	↓	↓	N
151	26	102B	BSD	Ceiling Plaster		N
152	↓	102B	↓	↓	(Rough)	N

Notes: _____

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	01-001		01-002		01-003	
layer no.:	1	2	1	2	1	2
Material Type	Z01	Z01	Z01	Z01	Z01	Z01
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic	Floor Tile	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	White	Black	White	Black	White	Black
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes	None Detected	Yes
ASBESTOS(Type & Percent)						
Chrysotile	4	6	4	6		3
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	4	6	4	6	0	3
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	46	94	46	94	40	97
Calcite	50		50		60	
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A 1 Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,

David Griffin
 Microscopist

Wayne Johnson
 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.

Bldg 024

Charlotte, NC 28269

Poe Hall ACM Survey

Attn: Brian Ball

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008


BATCH NO.: 21215

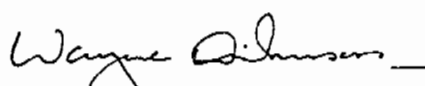
Sample number: layer no.:	02-004	02-005	02-006	03-007	03-008	03-009
Material Type	K	K	K	E	E	E
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Pipe Wrap	Pipe Wrap	Pipe Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Beige	Beige	Beige	Yellow/Tan	Yellow/Tan	Yellow/Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	20	20	20	68	68	68
Cellulose	50	50	50	10	10	10
Synthetic Fiber						
Other (specify Cotton)				10	10	10
NONFIBROUS MATERIALS %	30	30	30	12	12	12
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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 Microscopist


 Division IV

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REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

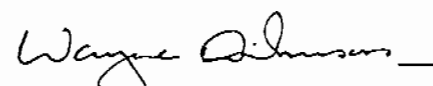
Sample number: layer no.:	04-010	04-011	04-012	05-013	05-014	05-015
Material Type	E	E	E	E	E	E
Gross Appearance/Texture	MJP	MJP	MJP	Pipe Wrap	Pipe Wrap	Pipe Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Yellow/Tan	Yellow/Tan	Yellow/Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30	68	68	68
Cellulose				10	10	10
Synthetic Fiber						
Other (specify Cotton	5	5	5	10	10	10
NONFIBROUS MATERIALS %	65	65	65	12	12	12
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,


 Microscopist


 Division M

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number: layer no.:	06-016	06-017	06-018	07-019	07-020	07-021
Material Type	E	E	E	Z03	Z03	Z03
Gross Appearance/Texture	MJP	MJP	MJP	Rope	Rope	Rope
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	White	White	White
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	Yes	Yes	Yes
ASBESTOS(Type & Percent)						
Chrysotile				70	70	70
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	70	70	70
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30			
Cellulose				20	20	20
Synthetic Fiber				10	10	10
Other (specify Cotton	5	5	5			
NONFIBROUS MATERIALS %	65	65	65			
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,

David Griffin

Microscopist

Wayne Johnson

Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

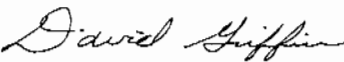
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

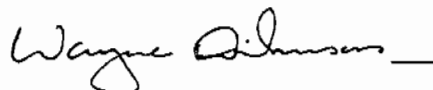
Sample number:	08-022	08-023	08-024	09-025	09-026	09-027
layer no.:						
Material Type	Z47	Z47	Z47	Z47	Z47	Z47
Gross Appearance/Texture	Mastic	Mastic	Mastic	Mastic	Mastic	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Red	Red	Red	Tan	Tan	Tan
IS ASBESTOS PRESENT?	Yes	Yes	Yes	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile	2	2	2			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	2	2	2	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify Cotton						
NONFIBROUS MATERIALS %	98	98	98	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

Respectfully submitted, PSI,


 Microscopist


 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	10-028	10-029	10-030			
layer no.:						
Material Type	Z47	Z47	Z47			
Gross Appearance/Texture	Mastic	Mastic	Mastic			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	No	No	No			
What color is it?	Black	Black	Black			
IS ASBESTOS PRESENT?	Yes	Yes	Yes			
ASBESTOS(Type & Percent)						
Chrysotile	10	10	10			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	10	10	10			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	90	90	90			
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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David Griffin
 Microscopist

Wayne Johnson
 Division IV

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Sample number:	11-031		11-032		11-033	
layer no.:	1	2	1	2	1	2
Material Type	Z01	Z01	Z01	Z01	Z01	Z01
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic	Floor Tile	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	White	Black	White	Black	White	Black
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes	Yes	Yes
ASBESTOS(Type & Percent)						
Chrysotile	4	5	4	5	4	5
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	4	5	4	5	4	5
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	50	95	50	95	50	95
Calcite	46		46		46	
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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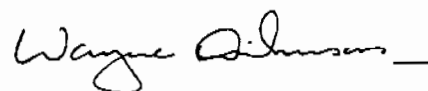
Sample number:	11-034		11-035			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	White	Black	White	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	4	5	4	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	4	5	4	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	50	95	50	95		
Calcite	46		46			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Division N

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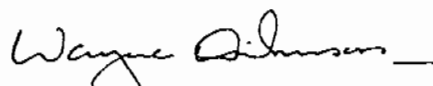
Sample number: layer no.:	12-036	12-037	12-038	13-039	13-040	13-041
Material Type	K	K	K	K	K	K
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Friable Tile	Friable Tile	Friable Tile
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Beige	Beige	Beige	Beige	Beige	Beige
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	20	20	20	20	20	20
Cellulose	50	50	50	50	50	50
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	30	30	30	30	30	30
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Division IV

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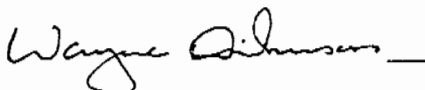
Sample number:	14-042			14-043		
layer no.:	1	2	Composite	1	2	Composite
Material Type	V	V	V	V	V	V
Gross Appearance/Texture	Jt Cmpd	Sheetrock	Drywall	Jt Cmpd	Sheetrock	Drywall
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	Yes	No	No	Yes
Is it fibrous?	No	Yes	Yes	No	Yes	Yes
What color is it?	White	White	White	White	White	White
IS ASBESTOS PRESENT?	Yes	None Detected	Yes	Yes	None Detected	Yes
ASBESTOS(Type & Percent)						
Chrysotile	<1		<1	<1		<1
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	<1	0	<1	<1	0	<1
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose		10	9		10	9
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	10	19	40	10	13
Calcite				60		6
Gypsum		80	72		80	72
Granular Minerals						
Other (specify)						

COMMENTS:

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PROJECT: NCSU

5035 A West W.T. Harris Blvd.

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REPORT NO.: 511-7A008

BATCH NO.: 21215

Sample number:	14-044			14-045		
layer no.:	1	2	Composite	1	2	Composite
Material Type	V	V	V	V	V	V
Gross Appearance/Texture	Jt Cmpd	Sheetrock	Drywall	Jt Cmpd	Sheetrock	Drywall
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	Yes	No	No	Yes
Is it fibrous?	No	Yes	Yes	No	Yes	Yes
What color is it?	White	White	White	White	White	White
IS ASBESTOS PRESENT?	Yes	None Detected	Yes	Yes	None Detected	Yes
ASBESTOS(Type & Percent)						
Chrysotile	<1		<1	<1		<1
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	<1	0	<1	<1	0	<1
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose		10	9		10	9
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	50	10	14	30	10	12
Calcite	50		5	70		7
Gypsum		80	72		80	72
Granular Minerals						
Other (specify						

COMMENTS:

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David Griffin

Microscopist

Wayne Johnson

Division IV

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REPORT NO.: 511-7A008

BATCH NO.: 21215

Sample number:	14-046				
layer no.:	1	2	Composite		
Material Type	V	V	V		
Gross Appearance/Texture	Jt Cmpd	Sheetrock	Drywall		
Is it homogeneous?	Yes	Yes	Yes		
Are there obvious layers?	No	No	Yes		
Is it fibrous?	No	Yes	Yes		
What color is it?	White	White	White		
IS ASBESTOS PRESENT?	Yes	None Detected	Yes		
ASBESTOS (Type & Percent)					
Chrysotile	< 1		< 1		
Amosite					
Crocidolite					
Anthophyllite					
Actinolite					
Tremolite					
TOTAL PERCENT ASBESTOS	< 1	0	< 1		
OTHER FIBROUS MATERIALS					
(Type & Percent)					
Fibrous Glass					
Cellulose		10	9		
Synthetic Fiber					
Other (specify)					
NONFIBROUS MATERIALS %	50	10	14		
Calcite	50		5		
Gypsum		80	72		
Granular Minerals					
Other (specify)					

COMMENTS:

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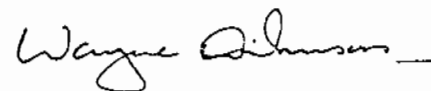
Sample number:	15-047		15-048		15-049	
layer no.:	1	2	1	2	1	2
Material Type	ZR	Mastic	ZR	Mastic	ZR	Mastic
Gross Appearance/Texture	Flexible	Clumpy	Flexible	Clumpy	Flexible	Clumpy
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Black	White	Black	White	Black	White
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	100	100	100	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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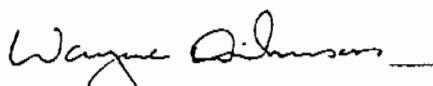
Sample number:	16-050		16-051		16-052	
layer no.:	1	2	1	2	1	2
Material Type	ZR	Mastic	ZR	Mastic	ZR	Mastic
Gross Appearance/Texture	Flexible	Clumpy	Flexible	Clumpy	Flexible	Clumpy
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Gray	White	Gray	White	Gray	White
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	100	100	100	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Sample number:	17-053		17-054		17-055	
layer no.:	1	2	1	2	1	2
Material Type	Z01	Z01	Z01	Z01	Z01	Z01
Gross Appearance/Texture	Floor Tile	Backing/Mastic	Floor Tile	Backing/Mastic	Floor Tile	Backing/Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	Yes	No	Yes	No	Yes
Is it fibrous?	No	Yes	No	Yes	No	Yes
What color is it?	Black	Brown	Black	Brown	Black	Brown
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose	7	90	7	90	7	90
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	73	10	73	10	73	10
Calcite	20		20		20	
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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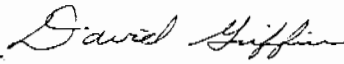
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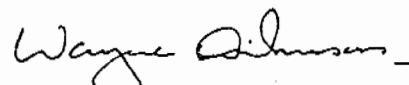
Sample number: layer no.:	18-056	18-057	18-058	19-059	19-060	19-061
Material Type	K	K	K	S	S	S
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Vib Jt Cloth	Vib Jt Cloth	Vib Jt Cloth
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Beige	Beige	Beige	Black	Black	Black
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	20	20	20	25	25	
Cellulose	50	50	50			
Synthetic Fiber						
Other (specify Cotton						80
NONFIBROUS MATERIALS %	30	30	30	75	75	20
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Respectfully submitted, PSI,


 Microscopist


 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: **PSI**
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: **NCSU**
 Bldg 024
 Poe Hall ACM Survey

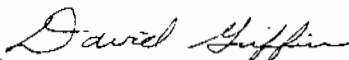
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

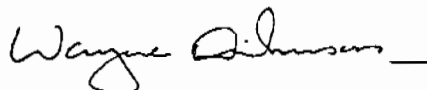
Sample number: layer no.:	20-062	20-063	20-064	21-065	21-066	21-067
Material Type	N	N	N	Z47	Z47	Z47
Gross Appearance/Texture	MJP	MJP	MJP	Mastic	Mastic	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	No	No	No
What color is it?	Gray	Gray	Gray	Tan	Tan	Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30			
Cellulose						
Synthetic Fiber						
Other (specify Cotton)	10	10	10			
NONFIBROUS MATERIALS %	60	60	60	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A 1 Subpt. F. July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21215

Sample number:	24-068	24-069	24-070	25-071	25-072	25-073
layer no.:						
Material Type	Z08	Z08	Z08	Z14	Z14	Z14
Gross Appearance/Texture	Brick	Brick	Brick	Cementitious	Cementitious	Cementitious
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	Tan	Tan	Tan	Tan	Tan	Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	100	100	100	100	100	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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Respectfully submitted, PSI,

David Shiffin
 Microscopist

Wayne Johnson
 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 1215

Sample number:	26-074	26-075	26-076			
layer no.:						
Material Type	D	D	D			
Gross Appearance/Texture	Plaster	Plaster	Plaster			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	No	No	No			
What color is it?	Off White	Off White	Off White			
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected			
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	80	80	80			
Calcite						
Gypsum						
Granular Minerals						
Other (specify Perlite	20	20	20			

COMMENTS:

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Respectfully submitted, PSI,

David Griffin

Microscopist

Wayne Johnson

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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

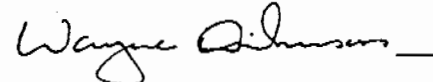
Sample number:	27-077	27-078	27-079	28-080	28-081	28-082
layer no.:						
Material Type	L	L	L	Z19	Z19	Z19
Gross Appearance/Texture	Friable Tile	Friable Tile	Friable Tile	Counter Top	Counter Top	Counter Top
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Lt Green	Lt Green	Lt Green
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	Yes	Yes	Yes
ASBESTOS(Type & Percent)						
Chrysotile				8	8	8
Amosite				2	2	2
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	10	10	10
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	40	40	40			
Cellulose	40	40	40			
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	20	20	20	90	90	90
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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TESTED FOR: PSI

PROJECT: NCSU

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Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21216

Sample number: layer no.:	29-083	29-084	29-085	30-086	30-087	30-088
Material Type	Z02	Z02	Z02	Z18	Z18	Z18
Gross Appearance/Texture	Hood Lining	Hood Lining	Hood Lining	Insul/Wrap	Insul/Wrap	Insul/Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Black	Black	Black	Black/Tan	Black/Tan	Black/Tan
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes	Yes	Yes
ASBESTOS (Type & Percent)						
Chrysotile	12	12	12	3	3	3
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	12	12	12	3	3	3
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass				15	15	15
Cellulose				20	20	20
Synthetic Fiber						
Other (specify Cotton)				15	15	15
NONFIBROUS MATERIALS %	88	88	88	47	47	47
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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Microscopist

Division IV

Information To Build On

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TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
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 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21216

Sample number: layer no.:	32-092	32-093	32-094	33-095	33-096	33-097
Material Type	K	K	K	K	K	K
Gross Appearance/Texture	Ceiling Tile	Ceiling Tile	Ceiling Tile	Ceiling Tile	Ceiling Tile	Ceiling Tile
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Gray	Gray	Gray
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	35	35	35	35	35	35
Cellulose	35	35	35	35	35	35
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	30	30	30	30	30	30
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

BATCH NO.: 21216

Sample number: layer no.:	35-098	35-099	35-100	36-101	36-102	36-103
Material Type	Z18	Z18	Z18	U	U	U
Gross Appearance/Texture	Insul/Wrap	Insul/Wrap	Insul/Wrap	Insul/Wrap	Insul/Wrap	Insul/Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	Yes	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Black/Yellow	Black/Yellow	Black/Yellow	White/Yellow	White/Yellow	White/Yellow
IS ASBESTOS PRESENT?	Yes	Yes	Yes	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile	3	3	3			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	3	3	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	80	40	80	60	60	60
Cellulose		20				
Synthetic Fiber						
Other (specify Cotton)				20	20	20
NONFIBROUS MATERIALS %	17	37	17	20	20	20
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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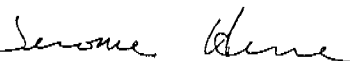
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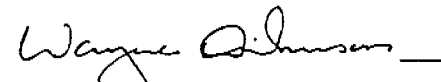
Sample number: layer no.:	37-104	37-105	37-106	38-107	38-108	38-109
Material Type	H	H	H	E	E	E
Gross Appearance/Texture	Insul/Wrap	Insul/Wrap	Insulation	Insul/Wrap	Insul/Wrap	Insul/Wrap
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	No	Yes	Yes	Yes
Is it fibrous?	Yes	Yes	No	Yes	Yes	Yes
What color is it?	Black/Yellow	Gray	Gray	Tan/Yellow	Tan/Yellow	Tan/Yellow
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	30	30	30	30	30	30
Cellulose	10			30	30	30
Synthetic Fiber						
Other (specify Cotton)	30	20		30	30	30
NONFIBROUS MATERIALS %	30	50	70	10	10	10
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Division IV

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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

Sample number: layer no.:	39-110	39-111	39-112	40-113	40-114	40-115
Material Type	E	E	E	E	E	E
Gross Appearance/Texture	Wrap/Insul	Wrap/Insul	Wrap/Insul	Insulation	Insulation	Insulation
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	Yes	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Tan/Gray	Tan/Gray	Tan/Gray	Gray	Gray	Gray
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	Yes	Yes	Yes
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite				10	10	10
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	10	10	10
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	5		5			
Cellulose						
Synthetic Fiber						
Other (specify Cotton)	75	90	75			
NONFIBROUS MATERIALS %	20	10	20	90	90	90
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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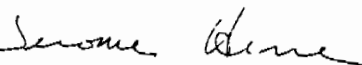
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

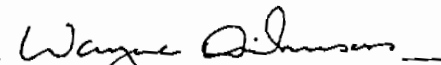
Sample number: layer no.:	41-116	41-117	41-118	42-119	42-120	42-121
Material Type	S	S	S	K	K	K
Gross Appearance/Texture	Vib Jt Cloth	Vib Jt Cloth	Vib Jt Cloth	Ceiling Tile	Ceiling Tile	Ceiling Tile
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	Yes	Yes	Yes	Yes	Yes
What color is it?	Gray	Gray	Gray	Gray	Gray	Gray
IS ASBESTOS PRESENT?	Yes	Yes	Yes	None Detected	None Detected	None Detected
ASBESTOS(Type & Percent)						
Chrysotile	60	60	60			
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	60	60	60	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass				30	30	30
Cellulose				45	45	45
Synthetic Fiber						
Other (specify Cotton)	30	30	30			
NONFIBROUS MATERIALS %	10	10	10	25	25	25
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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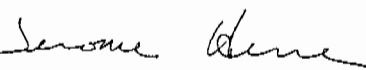
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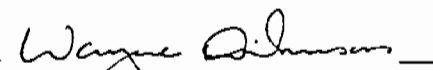
Sample number: layer no.:	43-122	43-123	43-124	44-125	44-126	44-127
Material Type	Z18	Z18	Z18	D	D	D
Gross Appearance/Texture	Insul/Wrap	Insul/Wrap	Insul/Wrap	Plaster	Plaster	Plaster
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	Yes	Yes	Yes	No	No	No
Is it fibrous?	Yes	Yes	Yes	No	No	No
What color is it?	Gray/Yellow	Gray/Yellow	Gray/Yellow	Tan	Tan	Tan
IS ASBESTOS PRESENT?	None Detected	Yes	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile		3				
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	3	0	0	0	0
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	60	60	60			
Cellulose	20	20	20			
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	20	17	20	50	50	50
Calcite						
Gypsum						
Granular Minerals				50	50	50
Other (specify)						

COMMENTS:

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Respectfully submitted, PSI,


 Microscopist


 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

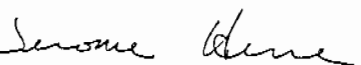
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

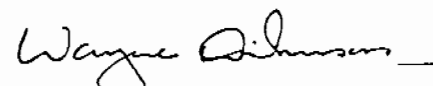
Sample number:	45-128		45-129		45-130	
layer no.:	1	2	1	2	1	2
Material Type	D	D	D	D	D	D
Gross Appearance/Texture	Smooth Plaster	Rough Plaster	Smooth Plaster	Rough Plaster	Smooth Plaster	Rough Plaster
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	No	No	No	No	No	No
What color is it?	White	Tan	White	Tan	White	Tan
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	50	100	50	100	50
Calcite						
Gypsum						
Granular Minerals		50		50		50
Other (specify)						

COMMENTS:

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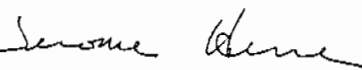
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

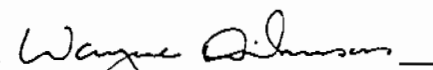
Sample number:	46-131	46-132	46-133			
layer no.:						
Material Type	Z02	Z02	Z02			
Gross Appearance/Texture	Sink Material	Sink Material	Sink Material			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	No	No	No			
What color is it?	Black	Black	Black			
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected			
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	100	100	100			
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

Quantification is based on a visual determination of the relative volume of bulk sample components. The results are valid only for the item tested. This report may not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. Method used: E.P.A. Interim Method for the Determination of Asbestos in Bulk Insulation Samples (40 CFR Ch. 1 Pt. 763, App. A to Subpt. F, July 1, 1987). Samples will be disposed of within 30 days unless otherwise notified in writing by client. No part of this report may be reproduced except in full with the written permission of PSI.

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 Division N

Information To Build On

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

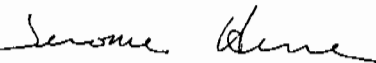
BATCH NO.: 21216

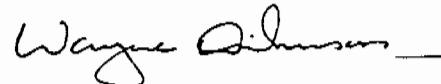
Sample number:	47-134		47-135		47-136	
layer no.:	1	2	1	2	1	2
Material Type	L	L	L	L	L	L
Gross Appearance/Texture	Acoust Block	Mastic	Acoust Block	Mastic	Acoust Block	Mastic
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	Yes
Are there obvious layers?	No	No	No	No	No	No
Is it fibrous?	Yes	No	Yes	No	Yes	No
What color is it?	White	Brown	White	Brown	White	Brown
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	None Detected
ASBESTOS (Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	0
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	70		70		70	
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	30	100	30	100	30	100
Calcite						
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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 Division N

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.

Bldg 024

Charlotte, NC 28269

Poe Hall ACM Survey

Attn: Brian Ball

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

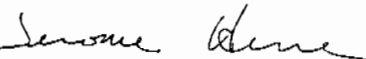
BATCH NO.: 21216

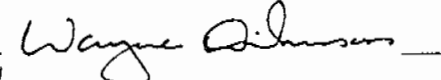
Sample number:	48-137	48-138	48-139			
layer no.:						
Material Type	L	L	L			
Gross Appearance/Texture	Acoust Panel	Acoust Panel	Acoust Panel			
Is it homogeneous?	Yes	Yes	Yes			
Are there obvious layers?	No	No	No			
Is it fibrous?	Yes	Yes	Yes			
What color is it?	Gray	Gray	Gray			
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected			
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0			
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass	40	40	40			
Cellulose	40	40	40			
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	20	20	20			
Calcite						
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Microscopist


 Division N

Information To Build On

TESTED FOR: PSI

PROJECT: NCSU

5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

Bldg 024
 Poe Hall ACM Survey

RECEIVED: 3/17/97

ANALYZED: 3/20/97

REPORT NO.: 511-7A008

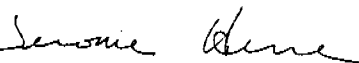
BATCH NO.: 21216


Sample number:	49-140		49-141			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Tan	Black	Tan	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	3	5	3	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	5	3	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	37	95	37	95		
Calcite	60		60			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Division IV

Information To Build On

REPORT OF BULK SAMPLE ANALYSIS FOR ASBESTOS

TESTED FOR: PSI
 5035 A West W.T. Harris Blvd.
 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
 Bldg 024
 Poe Hall ACM Survey

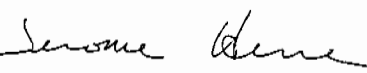
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

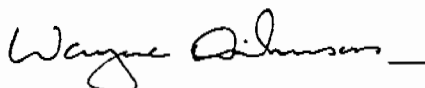
Sample number:	50-142		50-143			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Brown	Black	Brown	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS (Type & Percent)						
Chrysotile	2	5	2	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	2	5	2	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify)						
NONFIBROUS MATERIALS %	33	95	33	95		
Calcite	65		65			
Gypsum						
Granular Minerals						
Other (specify)						

COMMENTS:

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 Charlotte, NC 28269
 Attn: Brian Ball

PROJECT: NCSU
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 Poe Hall ACM Survey

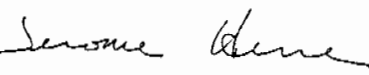
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

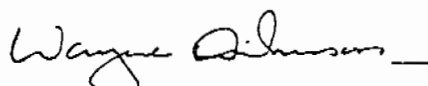
Sample number:	51-144		51-145			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Green	Black	Green	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	3	5	3	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	5	3	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	32	95	32	95		
Calcite	65		65			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

Sample number:	52-146		52-147			
layer no.:	1	2	1	2		
Material Type	Z01	Z01	Z01	Z01		
Gross Appearance/Texture	Floor Tile	Mastic	Floor Tile	Mastic		
Is it homogeneous?	Yes	Yes	Yes	Yes		
Are there obvious layers?	No	No	No	No		
Is it fibrous?	No	No	No	No		
What color is it?	Gray	Black	Gray	Black		
IS ASBESTOS PRESENT?	Yes	Yes	Yes	Yes		
ASBESTOS(Type & Percent)						
Chrysotile	3	5	3	5		
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	3	5	3	5		
OTHER FIBROUS MATERIALS						
(Type & Percent)						
Fibrous Glass						
Cellulose						
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	32	95	32	95		
Calcite	65		65			
Gypsum						
Granular Minerals						
Other (specify						

COMMENTS:

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 Attn: Brian Ball

PROJECT: NCSU
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 Poe Hall ACM Survey

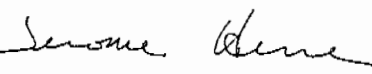
RECEIVED: 3/17/97 ANALYZED: 3/20/97 REPORT NO.: 511-7A008 BATCH NO.: 21216

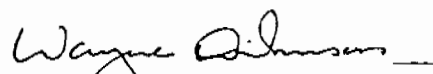
Sample number: layer no.:	53-148	53-149	53-150	26-151	26-152	
Material Type	L	L	L	D	D	
Gross Appearance/Texture	Acoust Panel	Acoust Panel	Acoust Panel	Ceiling Plaster	Ceiling Plaster	
Is it homogeneous?	Yes	Yes	Yes	Yes	Yes	
Are there obvious layers?	No	No	No	No	No	
Is it fibrous?	Yes	Yes	Yes	No	No	
What color is it?	Gray	Gray	Gray	Tan	Tan	
IS ASBESTOS PRESENT?	None Detected	None Detected	None Detected	None Detected	None Detected	
ASBESTOS(Type & Percent)						
Chrysotile						
Amosite						
Crocidolite						
Anthophyllite						
Actinolite						
Tremolite						
TOTAL PERCENT ASBESTOS	0	0	0	0	0	
OTHER FIBROUS MATERIALS (Type & Percent)						
Fibrous Glass	20	20	20			
Cellulose	50	50	50			
Synthetic Fiber						
Other (specify						
NONFIBROUS MATERIALS %	30	30	30	65	65	
Calcite						
Gypsum						
Granular Minerals				20	20	
Other (specify Perlite				15	15	

COMMENTS:

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 Microscopist


 Division N

Information To Build On



Professional Service Industries, Inc.

SAMPLE SUBMISSION REPORT

To: Acmlab / Joel Davidson	(1)	PSI Order No. 511-7A008	(5)	<input type="checkbox"/> Q <input checked="" type="checkbox"/> Non Q	(8)
From: Charlotte EMG	(2)	Date Shipped 3/11/97	(6)	Carrier Airborne Ex.	(9)
Client: NCSU	(3)	Date Sample Obtained	(7)	Sampled By Day Moore	(10)
Project: POE HALL - ACM Survey					(4)
Type of Sample: Suspect bulk ACM	(11)	Sample Size/Quantity	(152)		(12)
Type of Sample Containers: "WHEATON" CONTAMINATION VIALS	(13)	No. of Containers			
Identification Markings on Sample/Container: NUMERIC, 024 prefix designates POE HALL					(15)
Sample Represents: Suspect ACM					(16)
Required Tests: PLM - wallboard/joint compound composite samples					(17)
Specifications: Fax results to 704-558-2236 Day Moore					(18)
Disposition of Residual Sample					(19)
<input checked="" type="checkbox"/> Discard <input type="checkbox"/> Return to Client <input type="checkbox"/> Return to PSI Office Submitting Sample <input type="checkbox"/> Other (See Remarks)					
Reporting Instructions					(20)
<input checked="" type="checkbox"/> Report to PSI Office Submitting Sample <input type="checkbox"/> Report to Client per PSI Order <input type="checkbox"/> Other (See Remarks)					
Special Instructions (21)	Submitted & Reviewed By: (23)				
<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (See Remarks)					
Attachments (22)					
<input type="checkbox"/> No <input checked="" type="checkbox"/> Yes (Number)					
Remarks (24)	- Wallboard/joint compound analyzed + reported as composite sample - Bulk sample sheet attached for sample description				

ACKNOWLEDGEMENT

Date Received (25)	Received by (Dept./Office) (26)
STATUS (27)	
<input type="checkbox"/> Work proceeding, estimated reporting date: _____ <input type="checkbox"/> Work NOT proceeding, incomplete instructions (See Remarks). <input type="checkbox"/> Work NOT proceeding, insufficient sample quantity/size (See Remarks). <input type="checkbox"/> Work NOT proceeding, (See Remarks).	
Lab No. Assigned (28)	Receiving Office Representative (29)
Remarks (30)	

INSTRUCTIONS ON REVERSE SIDE

APPENDIX F.

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: Ground Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
100	21	Foam panel Adhesive		200 #	G	1	MER
	03	8' Pipe Ins		165 LF	G		F.G.
	05	4" Pipe Ins		48 LF	G		F.G.
	09	Yellow Duct Mastic		115 #	G		
	04	MJP - 8"		30 Ea	G		
	06	MJP - 4"		12 Ea.	G		
100 (Hall)	03,05	Above ceiling piping		N/A	G		
101	09	Yellow Duct Mastic		15 #			
102	09	Yellow Duct Mastic		22 #			
	14	Sheetrock		140 #			
102B	24	Welding Blocks		54 Ea.			
	25	Furnace Block lining		86 #			(3 Furnaces)
	26	Ceiling Plaster		1070			
102C	27	Partition Paneling		30 #			
102D	29	Lab Counter top		12 #			
	29	hood lining		32 #			
102C	30	Pipe Ins. - 12" (E-Tan)		12 LF			
	31	ASOC MJP		1 Ea			
106	N/A	F.G. Pipe Ins (8")		35 LF			Not Sampled
	N/A	F.G. Pipe Ins (4")		10 LF			
	09	Yellow duct Mastic		36 #			
108B	02	2x2 C.T.		1 Box (12)			Stored
108	01	12x12 F.T.		286 #			
	02	2x2 C.T. (fissure)		164 #			
	15	Black baseboard		78 LF			
	N/A	F.G. Pipe Ins (8")		20 LF			Not Sampled
107	18	2x2 C.T. (fissure)		62 #			
109	18	2x2 C.T. (fissure)		140 #			
110	13	2x4 C.T. (chicken)		249 #			
112	14	Sheetrock		104 #			
	15	Black baseboard		112 LF			
116	08	Red Duct Mastic		8 #			
	09	Yellow Duct Mastic		28 #			
	03	8" Pipe Ins.		152 LF			
	05	4" Pipe Ins.		95 LF			
	04	8" MJP		32 Ea			
	06	4" MJP		32 Ea			
	07	gasket rope		3 LF			

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Pool Hall
Specific Area: Ground Floor

Inspector(s): J. Silvestri
D. Moore
Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
120	07	2x2 C.T.		104 ϕ	G	L	
	15	Black Board		20 LF			
	14	Sheetrock		280 ϕ			
120A	01	2x12 FT.		315 ϕ	G	L	
	15	Black Board		63 LF			
	14	Sheetrock		205 ϕ			
	18	2x2 C.T. (fissure)		12 ϕ			
	33	2x2 C.T. (Pin hole)		2 108 ϕ			
	15	Black Board		30 LF			
122	14	Sheetrock		390 ϕ			
123	08	Red duct mastic		8 ϕ			
125	12 12	2x2 C.T. (worm)		64 ϕ			Jan. Closet
	35	Pipe Ins. (Tar coat)		22 LF			
127	03	8" pipe Ins		46 LF			
	05	4" pipe Ins		112 LF			
	04 4	8" MSP		18 Ea			
	06 6	4" MSP		26 Ea			
	36	Duct Ins		84 ϕ			
	11A	F.G. (12")		55 LF			
	08	Red Duct Mastic		12 ϕ			
	37	Tank Insulation		76 ϕ			
	58	Pipe Ins (2")		32 LF			
	39	2" MSP		3 Ea.			
130	40	EXHAUST INSULATION		18 LF			
	41	VJP - Green		2 ϕ			
	08	Red duct Mastic		6 ϕ			
	09	Tan duct Mastic		4 ϕ			
114	49	Mosaic Floor Tile (12x12)		5 ϕ			
	50			5 ϕ			
	51			5 ϕ			
	01			5 ϕ			
100	98	Tar Coated Pipe Ins	Above Hallway ceiling	320 LF			Water supply (Electro rooms)

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: POE HALL
Specific Area: 2nd Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
200	11 ✓	9x9 white w/Black F.T.		4923 #	G	L	Hallway
	10	Black Duct Mastic	Above ceiling	?			
200	None	None					Electrical
201	None	None					Womens
202	14	Sheetrock		856 #			
	11 ✓	9x9 white F.T.		1182			
204	42	2x2 C.T. (Quad)		495 #			Carpet
	14	Sheetrock		1075 #			
	15	Black Baseboard		82 LF			
204A	14	S. Rock		210 #			Carpet
	15	B. Base		20 LF			
204B	14	S. Rock		320 #			
	15	B. Board		30 LF			
204C	14	S. Rock		320 #			
	15	B. Board		30 LF			
204D	14	S. Rock		365 #			
	15	B. Board		38 LF			
204E	14	S. Rock		370 #			
	15	B. Board		28 LF			
204A,B,C,D,E	#42	2x2 C.T. (Quad)		120 # Ea.			
208	14	S. Rock		520 #			
	15	B. Board		60			
	42	2x2. C.T. (Quad)		293 #			
208B	14			360 #			
	15			28 LF			
	42			36 LF			
208C	14			260 #			
	15			28 LF			
	42			100 #			
208D	14			315 #			
	15			32 LF			
	42			214 #			
208H	14			105 #			
	15			24 LF			
	42			146 #			
208G	14			210 #			
	15			32 #			
	42			127 #			

Notes:

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: 2nd floor

Inspector(s): J. Silvestri
 Date of Inspection: 5/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
205	11 ✓	9x9 Floor tile	Basement	382 #	←	←	
	14	Sheetrock		385 #	←	←	
206	14	Sheetrock		425 #			Carpets
	15	Baseboard		55 LF			
206A	14	Sheetrock		185 #			
212	07	Gasket type rope	Penetration	2 #			
	43	Tar paper pipe ins.	Chaseway	20 LF	↓	↓	8" O.D.
	35	Tar coated pipe ins.	Chaseway	10 LF			4" O.D.
216	44	Conduits Panel	Ceiling	450 #			Aluminum
	14	Sheetrock	lecture area	25 #			
219	14	Sheetrock		835 #			
	15	baseboard		94 LF			
221	14	Sheetrock		315 #			
	15	baseboard		32 LF			
225	12	2x2 C.T. (warm)		104 #			
	14	Sheetrock		310 #			
	15	baseboard		36 LF			
225 B	12	2x2 C.T. (warm)		98 #			
	14	Sheetrock		360 #			
	15	baseboard		32 LF			
226	12	2x2 C.T.		214 #			
	14	Sheetrock		365 #			
	15	baseboard		42 #			
226A	12			98 #			
	14			340 #			
	15			34 #			
226B	12			98 #			
	14			340 #			
	15			34 #			
226C	11 ✓	9x9 F.T.		140 #			
	14	Sheetrock		350 #			
	15						
216B	11 ✓	9x9 Floor tile		153 #			Proj. Book
	45	Wall plaster		872 #			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: 2ND Floor

Inspector(s): Don Moore
John S. Vestri
Date of Inspection: 3/10/1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
Flw (2)	11 ✓	9" x 5" w/ w/ bk SF2 Ffrcnt	elevation	72 SF	G	L	
209	15	tile board + mastic		23 LF	G		+17 (3 SF)
	11 ✓	FT		553 SF	↓		
	13	02 2' x 2' CP		553 SF	↓		
	14	wood board + joint mastic		437 SF	G		
211	15			39 LF	G		+17 (3 SF)
	11 ✓				G		
	13 02				G		
	14			565 SF	G		
213	NS	Ceramic Floor + w/ tile					
	NS	metal CP w/ FG					
	35 ✓	Pipe Mastic	Pipe Chase	3 LF	G		pipe chase
214	11 ✓			553	↓		
	13 02			553	↓		
	14			647 SF	↓		
218	11			1220 SF	G		
	13 02			929	↓		
	17			6 SF			
	14			838 SF			
220	11						
	13						
	14			232 SF			
	17			78 SF			
224	11			550			
	13			550			
	14			217 SF			
	17			6 SF			
228	11			544			
	13			544			
	14			640 SF			
	17			5 SF			
200	17	threshold		80 LF			hallway
	10	Back Duct Mastic	Above Ceiling	1200 1200			↓
	08	Red Duct Mastic	↓	30 LF	↓	↓	↓

Notes:

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: 3rd Floor

Inspector(s): J. Silverstri
D. Moore
Date of Inspection: 3/10/07

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
300	11 ✓	9x9 floor tile		3749 #	G	L	Hallway
300	14	Sheetrock		930 #			
	15	Baseboard		214 LF			
300B	11	9x9 F.T.		64 #			
300C	14	Sheetrock		200 #			
	15	Baseboard		38 LF			
300D	14	Sheetrock		290 #			
	15	Baseboard		38 LF			
300E	12	2x2 C.T. w/w m		96			
	14	Sheetrock		340 #			
	15	Baseboard		36 #			
300G	12	S. Rock		320 #			
	14	Baseboard		34 LF			
300H	14	Sheetrock		340 #			
	15	Baseboard		36 #			
	12	2x2 C.T.		96 #			
300J	14	S. Rock		320 #			
	15	b. board		34 LF			
300L	14	S. Rock		340 #			
	15	b. Board		36 LF			
300M	12	2x2 C.T.		96 #			
300M	14	S. Rock		340 #			
	15	b. Board		34 LF			
300N	14	S. Rock		340 #			
	15	b. Board		34 LF			
300P	14	S. Rock		420 #			
	15	b. Board		46 LF			
300S	14	S. Rock		340 #			
	15	b. board		32 LF			
308	43	Tar paper pipe ins	Chowway	180 LF			3rd → Penthouse
	35 ✓	Tar coated pipe ins.		90 LF			"
306	11 ✓	9x9 F.T.		136 #			
	14	Sheetrock		335 #			
309	35 ✓	Tar coated pipe ins	Chowway	10 LF			Men's
310	16	Grey base board		185 LF			
	14	Sheetrock		1410 #			

Notes: 300 - Hallway

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: Third Floor

Inspector(s): J. Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments		
310B	11	9x9 F.T.		680 #	G	L			
	14	Sheetrock		145 #					
	15	Baseboard		48 LF					
310C	11	9x9 F.T.		128 #	↓				
	14	Sheetrock		210 #					
310D	11	9x9		128 #					
	14	Sheetrock		320 #					
310E	11	9x9		41 #					
	14	Sheetrock		220 #					
310F	16	Grey baseboard		22 LF			↓		
	14	Sheetrock		280 #					
310G	11	9x9 F.T.		126 #			↓		
	14	Sheetrock		320 #					
310H	11	9x9		126 #					
	14	S.R.		320 #					
310J	11	9x9		86 #					
	14	S.R.		280 #					
310K	11	9x9		41 #					
	14	S.R.		220 #					
310L	11	9x9		126 #					
	14	S.R.		320 #					
310M	11	9x9		126 #					
	14	S.R.		320 #					
310N	11	9x9		126 #					
	14	S.R.		320 #					
310P	16	grey baseboard		48 LF					
	14	S. Rock		610 #					
311	11	9x9		263 #					
	14	Sheetrock		685 #					
	15	black baseboard		12 LF					
312	11	9x9 F.T.		1123 #					
	14	Sheetrock		892 #					
	28	Lab counter top		128 #			green		
314	14	Sheetrock		240 #					
	15	Black baseboard		28 #					
314A	14	Sheetrock		180 #					
	15	Black baseboard		18 LF					

Notes: 310A - 11

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Pop. Hall
Specific Area: Third Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
315	14	Sheetrock		4200	G	L	
	15	Black baseboard		42 LF			
315A	14	S.P.		310			
	15	B. Board		42 LF			
315B	14	S.P.		810			
	15	B. Board		42 LF			
316	11	9x9 F.T.		203			
	14	S.P.		315			
	15	Black Baseboard		16 LF			
317	11	9x9 F.T.		1070			
	14	Sheetrock		880			
	28	Lab counter tops		275			green
	15	Black Baseboard		180 LF			* TRANSITE exhaust pipe - RUNS INTO HALL
	29	Fume hood lining		32			
	46	Lab sink		5 Ea			
320	11	9x9 F.T.		1123			
	14	Sheetrock		895			
	15	Black baseboard		22 LF			
324	43	Tar paper pipe ins.	Chaseway	270 LF			3rd - paint
	35	Tar coated pipe ins.	↓	180 LF			"
325	02	2x2 CT. (chicken)		52			Women's
326	14	Sheetrock		185 LF			
	15	black baseboard		1410			
326c	14	sheetrock		145			
	15	black base		46 LF			
326B	11	9x9 F.T.		68			
	14	sheetrock		140			
326D	14	sheetrock		210			
	15	baseboard		42 LF			
326E	14			200			
	15			22 LF			
326F	14			200			
	15			22 LF			
326G	14			200			
	15			22 LF			
326J, L, M	14			200			
	15			22 LF			

Notes:

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Pe Hall
 Specific Area: 3rd Floor

Inspector(s): J. Silvestro

Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
326K	14			210 #	G	2	
	15			42 LF			
326 H	14			210 #		1	
	15			42 LF			
326 N	14			210 #			
	15			42 LF			
326 P	14			210 #			
	15			42 LF			
326 R	14			210 #			
	15			42 LF			
326 S	14			215 #			
	15			62 LF			
300	17	Threshold		80 #			Hallway
	08	Red Duct Mastic	Above Ceiling	30 #			
	09	Yellow/Tan Duct Mastic		50 #			
	10	Black Duct Mastic		120 #			
	98	Tar Coated Pipe Ins		320 LF			
	NS	Transite Pipe (12")	↓	30 LF			↓
324	NS	Transite Pipe (12")	Chimney	55 LF			Exhaust to 20

Notes: * Not Sampled / destructive measures required

FIELD ASSESSMENT SHEET

Building No.: 0244
Building Name: Poe Hall
Specific Area: Fourth Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
400	11	9x9 F.T.		3749 #	✓	✓	Hallway carpet
400	14	Sheetrock		3612 #			
	15	Black Baseboard		379 LF			
400B	11	9x9 F.T.		271 #			
	14	Sheetrock		340 #			
	15	Black Baseboard		28 LF			
409	14	Sheetrock		760 #			
	15	Baseboard		22 LF			
400C	14	S. Rock		2100			
	15	Baseboard		60 LF			
400D	14	Sheetrock		210 #			
	15	Baseboard		16 LF			
	11	9x9 F.T.		56 #			
400F	14	Sheetrock		180 #			
	15	B. Board		15 LF			
400G	14	Sheetrock		170 #			
	15	Baseboard		15 LF			
400H	11	9x9 F.T.		63 #			
	14	Sheetrock		125 #			
400J	11	9x9 F.T.		199 #			
	14	Sheetrock		235 #			
402	14	Sheetrock		2100 #			
	15	Baseboard		240 LF			
402B	11	9x9 F.T.		68 #			
	14	Sheetrock		138 #			
402C	14	Sheetrock		210 #			
	15	Baseboard		62 LF			
402D	14	Sheetrock		325 #			
	15	Baseboard		62 LF			
402E	14			205 #			
	15			28 LF			
402F	14			205 #			
	15			28 LF			
402H	14			205 #	✓	✓	
	15			28 LF			
402K	14			205 #			
	15			28 LF			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Boe Hall
 Specific Area: 4th Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
402L	14			205 #	G	L	
	15			28 LF			
402M	14			205 #			
	15			28 LF			
402G	14			325 #			
	15			62 LF			
402J	14			325 #			
	15			62 LF			
402N	14			325 #			
	15			62 LF			
402P	14			325 #			
	15			62 LF			
402R	14			325 #			
	15			62 LF			
402S	14			225 #			
	15			62 LF			
405		- CONCRETE					Telecom
406	35	tar coated pipe lvs		10 LF			Men's
408	14			400 #			
	15			42 LF			
409A	11	9x9 F.T.		68 #			
	14			138			
	15			0			
408B	14			210			
	15			36 LF			
408C	14			330 #			
	15			36 LF			
410	11	9x9 F.T.		268 #			
	14	Sheetrock		450 #			
412	11	9x9		209 #			
	14	Sheetrock		415 #			
	15	Base board		33 LF			
412A	14			210 #			
	15			42 LF			
412C	14			436 #			
	15			31 LF			
	11			225			

Notes: Sheetrock = drywall

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Pre Hall
Specific Area: 4th Floor

Inspector(s): J. Silvestri

Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
412 B	14			2300	G	L	
	15			31 LF			
412 D	11			548			
	14			720			
	15			28 LF			
413	12	2x2 C.T. (worm)		59			
	35	Tar coated pipe Ins	Above ceiling	12 LF			
414	11	9x9		828			
	14	Sheetrock		5200			
	15	Baseboard		24 LF			
414 A	11	9x9		266			
	14			315			
	15			24 LF			
417	11			812			
	14			265			
417 A	11			131			
	14			420			
	15			20 LF			
417 B	11			131			
	14			320			
	15			20 LF			
418		None	None				
419		None	None				Women's
420	12	2x2 C.T. (worm)		556			
	14	Sheetrock		640			
	15	baseboard		64 LF			
422	12	2x2 C.T. (worm)		1008			
	14			1100			
	15			110 LF			
424	12	2x2 C.T. (worm)		67			
	14			250			
	15			20 LF			
424 A	12	2x2 C.T. (worm)		538			
	14	Sheetrock		240			
	15	baseboard		24 LF			
400	17	Threshold		80			Hallway
	10	Black Ductmaster	Above ceiling	105			

Notes:

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Poe Hall
Specific Area: 5th Floor

Inspector(s): Doug Moore
John S. Washki
Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
50001	011	9'x9' FT		3762SF	G	L	HALL
	NS	1'x4' Metal Glue w/ EG		3762SF	G		
517	011			549 SF	G		
	02			549 SF	G		
	17			5 SF	G		
	014	wallboard		403 SF	G		
0514	NS	Conc/Tile Floor		94 SF	G		
	18	2'x2 linear		94 SF	G		
0520A	011	Carpet (Erie Co)		452	G		
	014			860	G		EXPOSED
520H	014			210 SF	G		CONCRETE
	011			41	G		PERK
520G	014			210 SF			
	011			41			
520F	011			41			
	014			210			
520E	011			41			
	014			210			
520B	011			49			
	014			220			
520C	011			124			
	014			535			
520D	011			124			
	014			535			
520J	011			124			
	014			535			
520K	011			124			
	014			535			
520L	011						
	014			560			
520M	011			128			
	014			240			✓
	02	2x2 CP		128			CP
525	NS	CONC FL / CONC WALLS		76 SF			
	43			73 LF			Pipe Chase

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10-1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
500	014			380	G	L	
	011			271	G		
		open conc. deck					
502A	011					↑	MEASURE! OPEN TO CONC. DECK
	014			600SF			
	015			67LF			
502B	011			66		↑	
	014			165SF			
	015						
502C	011			124		↑	
	014			260			
	015			30			
502D	011			124		↑	
	014			280			
	015			32			
502E	011			41		↑	
	014			200			
	015			24			
502F	011			280 124		↑	
	014			280			
	015			32			
502G	011			41		↑	
	014			200			
	015			24			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
510D	011	Fiber Ce		126	G	L	
	014			320			
	015			32			
510E	011			126			
	014			320			
	015			32			
510F	011			126			
	014			320			
	015			32			
510G	011			41			
	014			180			
	015			26			
510H	011			41			
	014			180			
	015			26			
510J	011			41			
	014			180			
	015			26			
510K	011			126			
	014			320			
	015			32			
510L	011			126			
				320			
				32			
510M	011			126			
	014			320			
	015			32			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: DOE HALL
Specific Area: 5th Floor

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: _____

S10 - OPEN TO LOWER DECK

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
502 H	011			41	G	L	
	014			200			
	015			24			
502 J	014			244	↓	↓	
	015			40			
	011	FT under CA		124			
502 K	014			245	↓	↓	
	015			41			
	011	FT below Ca		124			
502 L	014			210	↓	↓	
	011	FT under CA		247			
	015	blk baseboard		62			
		ALL 502 OPEN DUCT					
508	NC	Concrete + Deck + block wall + cov. wall	electrical chase				+ telecom
509	43	Tar paper wrap 2" O.D.	pipe around	73 LF			Messrs
510 A	011	FT under ca		907	G		
	014			1280 SF			
	015			145 LF			
510 B	011			68 SF	↓	↓	
	014			160 SF			
	015			17			
510 C	011			128	↓	↓	
	014			320			
	015			32			
506	098	Tar Coat Pipe Ins	Above Ceiling	70 LF	↓	↓	Hallway
	100	Black Duct Mastic	↓	90 LF			

Notes: _____

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th Floor

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
526					G	L	
528	014						+ 95 by BASEBOARD
	02						
	11 (015)						
528A	011	FT under carpet					
	014						
	02						
528B	014			196 SF			
	011	under Carpet					
	02	2x2 CP					
528E	014			196			
	011	FT below Ca					
	018	2x2 CP linear					
528G	014			196			
	011						
	018						
528H	014			196			
	011						
	018						
528J	014			2340			
	011			41			
	018			41			
528F	014			230			
	011			86			
	018			86			
	015			36			✓
528D	05			35			
	014			240			
	011			86			
537	015			88 LF			
	014		310 →	813			
	011	FT under Ca		813			
	02			813			

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FL.

Inspector(s): Doug Moore
John S. Iveski
 Date of Inspection: 3/10-1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
510 N	011			120			
	015			38LF	G	L	
	04			320SF			
5001		Concrete Fire Doors					
5002	1	Concrete Fire door					
515	011			94			
	014			310SF			
	017			3SF			
516	011			94			
	014			310SF			
	017			3SF			
518	011	Fire door - Con		93			
	014			310			
	017			3SF			
522	011			465			
	014			1020			
522A	011			94			lab
	014			300			
522B	011			94			
	014			94			
522C	011			144			
	014			410			

Notes: _____

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th Floor

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
522D	011	FF below Ceiling	100	100	G	L	
	014			260			
522E	011		57	57			
	014			260			
522F	011		57	57			
	014			295			
522G	011			94			
	014						
522H	011			28			
	014			110SF			
522J	011			28			
	014			110SF			
523	011	FF below CA		185			
	014			840 SF			
	NS	metal grid FF ceiling		185			
	017	Threshold		5 SF			
529	011	FF below CA		557			
	014			875			
	017			5 SF			
530	011			23233			
	014						
	017						
	017						
504	011			184			
	014			310			
	017 01			11			
	010			2 SF			

Notes:

North Carolina State University Asbestos Assessment Survey
 PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 5th FLOOR

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10-13/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
504 G	011			380	G	L	
	01			34			
	014			780			
	10	duct black mastic		6 SF			
505	011	Fiberline CA		195			
	014			420			
506	011	Fiberline CA		128			
	014			390			
0511	011	Fiberline CA		700 SF			
		WALLS covered w/ Fiberglas panels, open deck (concrete)					
512	011			668			
	014			920 SF			

Notes: _____

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: POE Hall
Specific Area: Sixth Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
600	11			4031 #	G	L	Hallway observation
600	11			190 #			
	14			620 #			
	47	Acoustical Block		70 #	G		*BD stored, occ
604	48	2x3 Acoustical panel		102 #	G		
	11	9x9 F.T.		622 #			
	14			910 #			
604B	4			28 #			
C, D, E, F, G	44			150 #			
605	11			263			
	14			650 #			
	15			68 LF			
605A	11			558			
	14			960 #			
606		None					
602	14			1286 #			
	15			110 LF			
602B	11			68 #			
	14			175 #			
602C	14			210 #			
	15			28 LF			
602 D, F, H	14			350 #			
K, L, N	15			42 LF			
602M	14			340 #			
	15			36 LF			
602 E, G, J	14			280 #			
	15			45 LF			
607	35	Tar coated pipe	Chaseway	18 LF			
600	15	Baseboard:	by 3607	8 LF			Hallway
608	14			1575 #			
	15			156 LF			
608A	11	9x9 F.T.		68 #			
	14			130 #			
608D	11	9x9		128 #			
	14			210 #			

Notes:

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

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FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: Sixth Floor

Inspector(s): J. Silvestri
 Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
608E, H,	11			1260	G	L	
J, M, N,	14			330			
608P	14			310			
	15			55 LF			
608 F, G, K,	11			96			
L	14			340			
612	12	2x2 C.T. (warm)		131 800			
	14			390			
	15			35 LF			
612B	12	2x2 CT (warm)		131			
	14			390			
	15			35 LF			
612C	12			532			
	14			2050			
	15			115 LF			
612D	12			533			
	14			1410			
	15			130 LF			
614 614	11	9x9 F.T.		40			
	14			140			
615 615	11	9x9 F.T.		41			
	14			180			
613	35	Tar coated pipe	Above ceiling	12 LF			
616	11			255			
	14			140			
617	11			97			
	14			350			
618	11			97			
	14			350			
622	11			97			
	14			350			
624	11			97			
	14			350			
620	11			124			
	14			420			
621	11			124			
	14			420			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

2/4

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Pol Hall
Specific Area: Sixth Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
625	11			124 #			
	14			420 #			
626	11			124 #			
	14			420 #			
628	14	Sheetrock		275 #			
	15	baseboard		42 LF			
628A	14			420 #			
	15			48 LF			
628B	14			280 #			
	15			48 LF			
629		NONE					
631	11			41 #			
	14			270 #			
632	11			40 #			
	14			270 # 170 #			
630		NONE					women
634	12	2x2 C.T. (worm)		671 #			
	14	Sheetrock		1170 #			
	15	baseboard		117 LF			
634B	11	9x9 F.T.		92 #			
	14			440 #			
635	11			554			
	14			1170 #			
	53	2x2 Acoustical panel		96 #		4	
636	11	9x9 F.T.		548 #			
	14	Sheetrock		960 #			
	02	2x2 chicken track C.T.		548 #			
637 637	#	9x9 F.T.		200 #			
	14			645 #			
	15	Baseboard		72 LF			
638 638	#	9x9 F.T.		140 #			
	14			645 #			
	15			72 LF			
639 639	#	9x9 F.T.		140 #			
	14			645 #			
	15			72 LF			

Notes:

Sheetrock = Drywall



North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: Boe Hall
Specific Area: Sixth Floor

Inspector(s): J. Silvestri
Date of Inspection: 3/11/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
640	14			970#	C	L	
	15			52 LF			
640A	11	9x9 F.T.		68#			
	14			170#			
640B	14			270#			
	15			0			
640 C, D, E	11			124#			
	14			270#			
600	17	Threshold		80#			hall way
	10	Black Trid Mastic	Above Ceiling	90#			
	98	Tar wrapped Pipe Ins		55 LF			
	38	2" Canuco wrap Pipe Ins		10 LF			
	39	2" Assoc. MJP		4 Ea			
			By EM 626				

Notes: _____

North Carolina State University Asbestos Assessment Survey
 PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th

Inspector(s): Doug Moore
John Silvestri
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
707	011			101	G	L	
	014			240			
	017			2			
709A	011			100			
	014			220			
	017			2			
711	011			101			
	014			220			
	017			2			
717	011			44			
	014			120			
	017			2			
718	011			122			
	014			260			
	17			2			
720	NS	STOP - Concrete + block					
720B		Concrete metal G.I.O.C.P					
716	011	helo		41			
	014			120			
	017			2			
720C	011	Ft below CA		100 700			
	17			100 38			
	02			100 200			
	014			380			
720E	011			93			
	17			36			
	02			93			
	014			200			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: FOOTBALL
Specific Area: 7th FL

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
0000	NS	METAL GRID CP	HALL	363762	G	L	
	011			3762	G		
	014						
734	018			59 SF			
736A	011			549 SF			
	014			430 SF			
739	011			264 SF			open deck
	014			380 SF			
740	011			539 SF			open deck
	014			640 SF			
742	011			810			
	014			280			
	017			24 LF			OPEN DECK
738F	014			180			
738	014			660 SF			open deck
738A	014	Conc. Floors		200			
738C	014			240			
738B	014			240			
738D	014			240			
738E	014			240			
743	NS	Concrete 10" O.D. FG pipe ins.		10'	TO G		
744							Women's RA
749	011			127	G	L	
	014			220	G		

Notes:

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

ing No.: 024
 Name: POE HALL
 ic Area: 7FL

Inspector(s): Doug Moore
John S. Vestri
 Date of Inspection: 3/10-1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
50	011			124	G	L	Open rack
	014			410	G		
	017			2 SF			
54	011			124	G		
	014			380			
	017			2			
755	011			124			
	014			380			
	017			2			
760	011			124			
	014			380			
	017			2			
761	011			124			
	014			380			
	017			2			
762	011			273			
	014			280			
762A	011			130			
	014			240			
762B	011			110			
	014			200			
703	011			126			
	014			380			
	017			2			
704	011			124			
	014			380			
	017			2			

Notes: _____

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
Building Name: POE HALL
Specific Area: 7th Floor

Inspector(s): Doug Moore
John Silvestri
Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
708	011		1	124	6	6	OPEN Deck
	014			380			
	017			2	2		
710	011			124			
	014			380			
	017			2 Ea			
712	011			124			
	014			380			
	017			2			
713	011			124			
	014			380			
	017			2			
714	011			273			
	014			380 120			
	017			2			
714A	011			130			
	014			140			
	017			2			
714B	011			111			
	014			340			
715	NS	Concrete + block construction					
719	43		Pipe Chase	73LF			

Notes: _____

North Carolina State University Asbestos Assessment Survey

PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th Floor

Inspector(s): Doug Moore
John S. Westra
 Date of Inspection: 3/10 - 1997

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
724	011			259	G	L	
	014			260	↓		
	017			2	↓		
	02			259	G		
725	011			126			
	014			340			
	017			2			
726	011			126			
	014			340			
	017			2			
728	011			126			
	014			340			
	017			2			
730	011			126			
	014			340			
	017			2			
732	011			271			
	014			60			
	017			2			
732A	011			126			
	014			240			
	017						
732B	011			120			
	014			240			
	017						
700	08	Tar Coated Pipe Ins	Above Ceiling	40 LB			
	10	Black Duct Ins	↓	30 LB			
	08	Red Duct Mastic	↓	20 LB			
	09	Tan Duct Mastic	↓	0 LB			
	11						

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: Poe Hall
 Specific Area: 7th Floor

Inspector(s): Don Moore
John Silvestri
 Date of Inspection: 3/10/97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
0751	011			101	G	L	
	014			230			
752	011			103			
	014			230			
753	011			103			
	014			230			
756	011			103			
	014			230			
758	011			90			
	014			210			
700	011						
	014						
700A	011	- Concrete floors					
	014	Open Decks					
		wood walls					
700B	011						
	014						
700C	011						
	014						
700D	011						
	014						
705	011						
	014						
706	011			101			
	014			230			

Notes:

North Carolina State University Asbestos Assessment Survey
PSI Project Number 511-7A008

FIELD ASSESSMENT SHEET

Building No.: 024
 Building Name: POE HALL
 Specific Area: 7th FL.

Inspector(s): Dan Moore
John Silvestri
 Date of Inspection: 3/10 / 97

Room Number	Homogeneous Material Number	Material Description	Material Location	Quantity	Condition (G, D, SD)	PFD (1,2,3,4)	Comments
733	014	Concrete Floor		410 SF	G	L	
746	014		945				
746A	014		451				
746B	014		453				
746B	014		453				
746C	014		464				
746D	014		464				
746E	014		464				
746F	014		464				
747	014			120			
	011/17			46			
	10	Black Marble		4 SF			
748	014			120			
	011			41			
	017			2			

Notes:

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